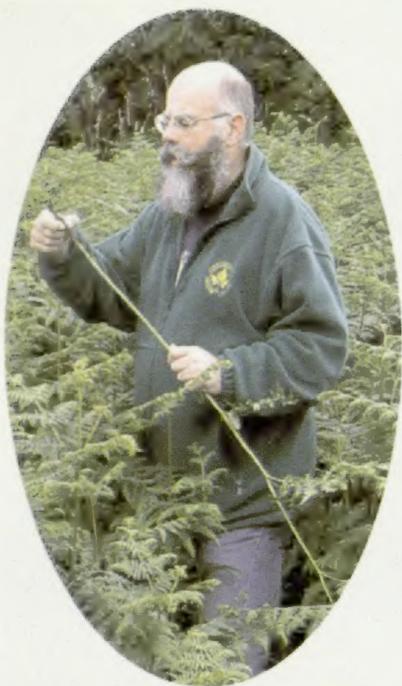


EDITORIAL



Editor modelling the new BPS fleece as he considers a bracken stipe for sectioning.

What a cover! Every year I try to find a 100% impact picture, but there are so many constraints that it is hard to choose. Firstly, it has to be an outstanding picture, of good composition and high technical quality (depth, clarity, colour etc.). It must be in portrait orientation, so landscape shots are not much use unless they are amenable to cropping. Next, it must have dark areas against which the text will show up clearly, and it is a BPS rule that the cover should be related to something inside. This year the search was brief with an almost instant result. Yvonne Golding had sent me a CD of digital photos which I explored to see if there were any that suited the 2005 contents. The second picture I came to looked suitable and I quickly imported it into last year's *Pteridologist* cover. It was stunning and only required a little darkening and some minute light patches to be 'cloned' or 'smudged' out so that they did not interfere with the clarity of letters that happened to coincide with them. Can you spot where I've fiddled with the picture?

At a time when we had no idea I would choose one of her pictures, Yvonne suggested *Pteridologist* might host a fern photography competition. If we make her the first winner, that should set things off. The annual prize will be your picture on the cover of *Pteridologist*. If you would like to join in, please send me your best fern pictures, preferably digital ones, which will retain their quality better than prints etc.

This spring, whilst taking photos of unrolling bracken crosiers, I found I was pointing the camera at an evil creature that was obsessed with pouncing on and eating the blood of the next mammal to pass by - me. It

was a male of the common sheep tick *Ixodes ricinus* (right). After I'd got a few decent pictures I moved my finger towards my pet tick to see whether it might respond. It did. It reared up and shuddered as it tried to work out where I was. As I gradually came closer it got more and more agitated and then suddenly jumped. I snatched my hand away and my little friend tumbled into the vegetation, disappointed. I had witnessed how efficiently a tick can transfer from its elevated lurking perch to an innocent victim.

This tick is the vector of the bacteria that cause Lyme disease. Living in a tick hotspot, I often find them in personal crevices and, since I know more people who have this horrible, debilitating affliction than I do for many better known diseases, I have become more careful. Also, I want to remind others of what is a positive, if low, risk. Pteridologists who venture into the field should be aware of ticks and Lyme disease, but please don't worry so much that you never again set foot in the countryside. Lyme disease is still rare, but very difficult to diagnose and lasts for life. Many country GPs are clued up, but others never encounter Lyme disease. The bacteria are cryptic, so proving their presence is not always possible. Symptoms are incredibly diverse and often like those of M.S., M.E. or depression, so the wrong diagnosis is a distinct probability. It is a good idea to learn about it yourself, and there is plenty of information on the internet as well as *Ticks: a lay guide to a human hazard* by George Hendry and Darrel Ho-Yen (Mercat Press, 1998).

The best protection is to wear clothing that will help to keep ticks out and, when you get home, check for any that have sneaked in. If you find one on your body, remove it methodically. If you just tug at it, the head might be left behind, and cause trouble. Therefore, use forceps, pressed firmly against the skin around the head end: grip, pull without twisting, extract and disinfect. In the unlikely event that a halo of inflammation appears around the bite, get medical attention immediately and mention ticks to the doctor.

I have had surprisingly little feedback in response to last year's invitation, but one correspondent suggested a bracken moratorium. I don't want to sideline the world's top fern entirely, so if you have some red hot bracken news, please do send it. I was so intrigued by the folk lore about bracken 'root' (*Bracken Lore* p. 114) that I had to test it. After several disappointments I learnt where to look (above) and how to cut the rhizome and stipe. My local bracken patch provided some convincing little pictures (opposite).

This edition has been brought to you by a team. I have had the assistance of two co-editors who took charge of the major articles, making my task significantly lighter this year. Dealing with every word at every stage of production meant that I eventually got bored with the texts and lost the ability to spot errors. As I write this, I have just formatted the entire magazine, but this time texts have been prepared for me so that I can concentrate on ensuring that pictures make sense and that the pages are pleasant to look at and comfortable to read. I can balance layouts with fresh eyes, making fine adjustments to design with a more openly creative mind, whilst still enjoying the words and correcting remaining typos. My thanks for that to Adrian Dyer and Yvonne Golding, as well as several other back-room volunteers who cast a fresh eye over *Pteridologist* before it went to the printer.

James



Ixodes ricinus

authors, please read

ADVICE FOR AUTHORS

Pteridologist welcomes contributions written in English on all aspects of the natural history and horticulture of ferns and related plants, indeed, anything fern-wise that will be enjoyed by a wide range of readers. Please refer to past editions for ideas regarding scope and presentation.

SCRIPT: Ideally text should be provided in the form of a WORD, RTF or TEXT file on a floppy disc, CD-ROM (PC or MAC) or e-mailed. I can scan typescripts and, if I must, even type spidery manuscripts. However, surely it is not the editor's job to sort out basic use of English. Authors are expected to use reasonably correct **splelugg**, **Grammer** and **punc;tua.tion**, and write in such a way that the **meaning** of the words is conveyed.

One space between sentences and (I never thought I'd need to mention this) one space between words, please. *2005: I still need to mention it!*

CONVENTIONS: Scientific names should be in italics thus: *Polystichum setiferum*, (if typed or in manuscript, underlined). Variety names should be in normal type, capitalised and enclosed in single inverted commas thus: *Polystichum setiferum* 'Plumoso-divisilobum'. Common names should be in lower case thus: soft shield fern.

ILLUSTRATIONS: As JPEG etc., but I have scanners so please send line art, good photo prints (accompanied by their negatives) or 35 mm slides which I will return. If supplying silhouettes ensure they are not of squashed and shrivelled fronds, but actually look like the fern they came from, and are of decent quality. Send files larger than ~500Kb on floppy disc or CD-ROM please, not by e-mail. **COPY DEADLINE: 31st December, 2005**

PLEASE: check your contribution thoroughly for errors and ensure you have adhered to these simple procedures before you send it.

To discuss your ideas: ☎ 01599 566291; ✉ pteridologist@ebps.org.uk (or write a letter)

PTERIDOLOGIST 2005

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COVER PICTURE: *Dicksonia antarctica* photographed by Yvonne Golding in Cornwall (see page 110 for Tree-Fern Newsletter No. 11).

Unless stated otherwise, photographs were supplied by the authors of the articles in which they appear.

DISCLAIMER:

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BRACKEN LORE

see page 114 & Editorial

Apparently, if you cut the stem or 'root' of bracken you will see, variously: an oak tree, the initials J.C. or G.O.D. or a Double-Headed Eagle.

The Editor tried it himself.



Oblique section of rhizome

JC - but the 'C' is back-to-front.
The section counterpart is the same.



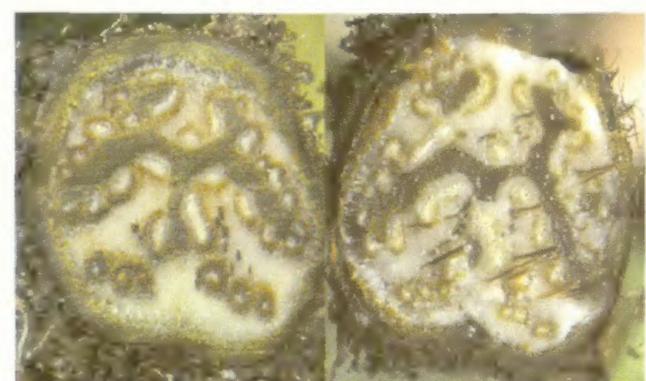
Oblique section of stipe

Pull frond and cut where the green stipe darkens to see a mature oak tree growing on a green hill.



Oblique section of stipe

Cut as above, lower down in the dark region. A tree with two large oak leaves or a spread eagle?



Transverse sections of stipe

Convincing eagle with feathery body, two wings, two feet ... and two heads.

Polystachy is the term given to a horsetail (*Equisetum*) shoot when, instead of producing just a single terminal cone, it has multiple small cones adorning its branch tips.

Sometimes cones occur on all branches, or sometimes on just the uppermost ones, normally in addition to the more regular large cone produced on the tip of the main shoot. It is a spectacular phenomenon, and the Editor was right to raise an eyebrow at finding it (*Pteridologist*, 2002). He challenged any reader "Has anyone found a polystachion?" I reply "yes", but I should have probably said this long ago, and can't think why I didn't.

Three thoughts come to mind as a result of this challenge: the *occurrence* of polystachy, what *causes* it, and is it *significant*?

OCCURENCE?

Polystachy is indeed an unusual phenomenon in *Equisetum*. It occurs sporadically, here-and-there in wild specimens in widely disjunct localities. It is far from unknown in several species, and past pteridologists, who always had an eye for the curious, not infrequently collected herbarium specimens for several *Equisetum* species (right). I have personally encountered it in the field on only three occasions in half a century of horsetail study. In North Wales and Northumberland it occurred in *Equisetum palustre* and, in the Canary Islands, I saw *E. ramosissimum* doing the same thing. However, in herbaria I can remember seeing it also in specimens of *E. fluviatile* and *E. sylvaticum*, as well as quite frequently in *E. palustre*.

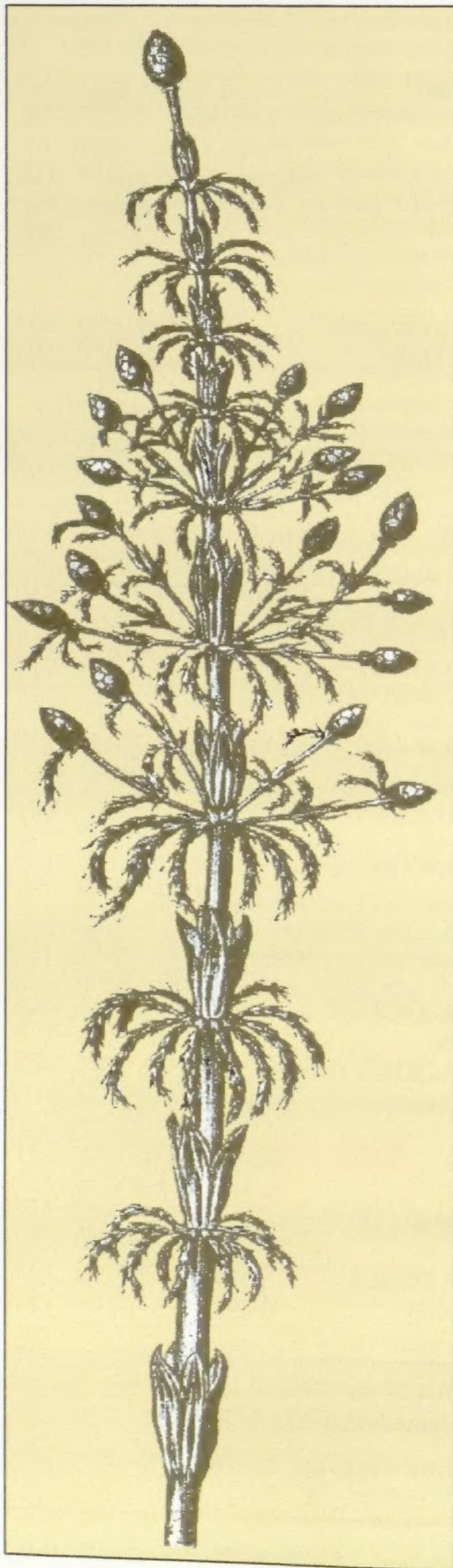
CAUSES?

Observation in the field gives some clues to this. The occurrence of polystachy is, I think, basically a genetic trait to which certain colonies of *Equisetum* are particularly pre-disposed. However, this does not rule

POLYSTACHY IN *EQUISETUM* - POLY WHAT?

Chris Page

Gillywood Cottage, Trebost Lane,
St Stythians, Truro, Cornwall TR3 7DW



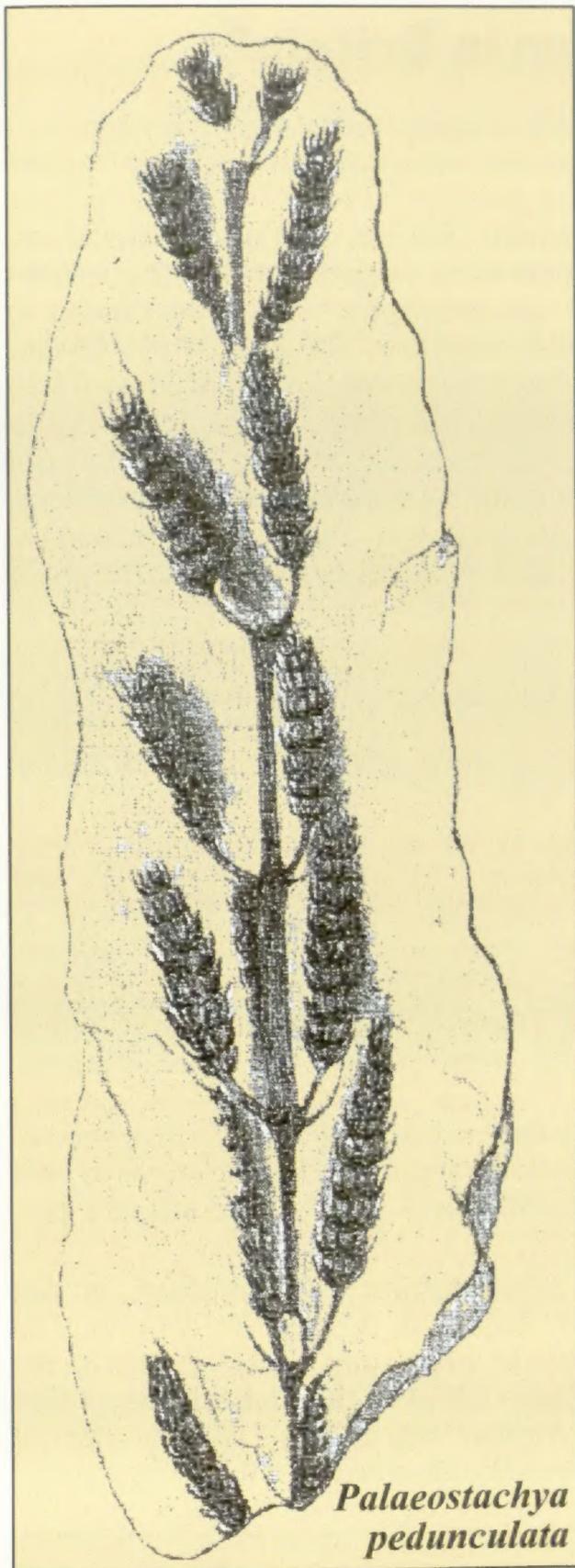
Polystachy in
Equisetum sylvaticum

out that certain environmental conditions may need to occur to bring such growth forms into full expression, suggesting that it is the result of an environmental trigger operating on a rare but already established genotype.

Where I have found polystachy, it has not been restricted to just one shoot, but has tended to occur to a greater or lesser degree in multiple shoots of a particular colony, all of which probably belong to a single clone. Further, when I had opportunity to observe one such colony (*E. palustre*) successively over a three-year period in Northumberland. Polystachy there occurred each year in the same site, but the polystachious shoots were more numerous in some years than in others. Whatever this trigger is, it would have to operate in the previous season, when the structure of the following year's shoot buds are being actively laid down. From field observations, I suspect that unusual degrees of site flooding may be contributory.

SIGNIFICANCE?

Polystachy may, at first, seem like one of the freak forms of pteridophyte structure which occasionally occur, such as frond forking in ferns, but have no real evolutionary significance. But with polystachy in *Equisetum* this is not so, for it is the re-occurrence of a very ancient trait once present more widely in early Equisetalean ancestors, for example the Carboniferous horsetail *Palaeostachya pedunculata* (opposite). It is also fundamentally a simpler structure for the plant to achieve than is the more normal form of growth. For in all *Equisetum*, iteration and reiteration of structure is the norm, with the growing apex producing repeated vegetative nodes, then switching (usually suddenly and irrevocably) to production of fertile whorls instead (each whorl of which is the exact homologue of a vegetative one - Page 1972). In modern *Equisetum*, when the main shoot



Palaeostachya pedunculata

switches growth modes, a similar switch is normally suppressed in the side shoots, and my inference is that it is more advanced to be able to instruct different shoots to behave differently than it is to allow them all to follow the same general pattern. Supporting this view is that fossil Equisetaleans exist in which multiple cones on all of the axes (main and lateral) appear to be the norm, and such fossils occur at least as far back as the Carboniferous, if not the Devonian!

Today polystachy would seem to be an occasional throwback to this very ancient growth habit, reviving a particularly ancient growth pattern. There may be much we can yet learn from the careful study of such unusual and exciting occasional individuals.

REFERENCE

Page C.N. (1972). An interpretation of the morphology and evolution of the cone and shoot of *Equisetum*. *J. Linn. Soc. Bot.* 65: 359-397.



John Ray and his *Equisetum palustre* 'polystachion' (1724)



Ferns on the Isle of Skye

Mike Taylor

Westlea, Kyleakin,
Isle of Skye, IV41 8PH

Since moving to Skye in 1991 I have been studying the distribution of ferns on the Island and have constructed a website www.skyeferns.co.uk to record my findings.

Druery, in *Book of British Ferns* (1902) records that a Mr Puller found a variety of lady fern on the Island in 1864 which was named 'Pullerii'. It is described as a pinnate form with short rounded pinnules à la 'Frizelliae', but closer. If any member has this variety growing in their garden I would like a photograph to include on my web site.

Also Clapham, Tutin & Warburg, *Flora of the British Isles* 2nd edition (1962) states that *Cystopteris montana* is present on Skye. I have not been able to trace the source of this record, so if any reader can throw any light on it I would be most grateful.

Thyrsopteris elegans

Frank McGavigan

Endemic to the Juan Fernández Islands off Chile, this beautiful fern is seriously threatened in the wild. Its frost tolerance and general hardiness are as yet unknown in this country.

A number of specimens were recently distributed to interested fern lovers by the Royal Botanic Garden Edinburgh and it would be good to know over the next year or two how they are surviving British conditions. Plants apparently grow best in moist but well-drained humus.

If you own this fern please keep a track of its progress and send a brief account periodically to me at scotland@ebps.org.uk. In due course I will produce a summary of our experiences.



Thyrsopteris elegans

What happened to *Asplenium fontanum* in Britain?

Alastair C. Wardlaw

92 Drymen Road, Bearsden, Glasgow G61 2SY

Asplenium fontanum the Smooth Rock Spleenwort raises at least two interesting questions: Why is it not in the British flora today? And, was it formerly a native British species which went extinct - perhaps the first and only British fern species to suffer this fate in the last 150 years?



Figure 1. *Asplenium fontanum* in *The Nature Printed British Ferns* (Moore, 1859).

Records of *Asplenium fontanum* in Britain

The several Victorian fern books which I consulted mostly treat *A. fontanum* as a sufficiently definite member of the British flora to justify an illustration and several pages of text. Moore, for example, in *The Nature Printed British Ferns* (1859) includes *A. fontanum* (Figure 1) as 'one of our rarest native ferns, and is indeed considered by many botanists as altogether an alien'. After some discussion, he concludes 'we are therefore, as it seems to us bound to retain it in the British flora'.

Also in 1859, evidently a bumper year for fern books, Sowerby in *The Ferns of Great Britain* describes and illustrates it (Figure 2) but notes that 'most of our botanists doubt its title to admission among British species'. Who these botanists were, and the basis of their opinions, is not stated. The justifications for inclusion are records of

occurrences in Amersham, Belfast, Matlock, Stonehaven, Westmoreland and Yorkshire, suggesting that the species although rare was at one time quite widely distributed in Britain. Sowerby's final citation is The Rev. W.H. Hawker who had found *A. fontanum* last year (i.e. 1858) 'growing in some quantity on a very old wall near Petersfield, in Hampshire'.

Lowe, a few years later (1867) in *Our Native Ferns*, expresses no doubts about the native status of *A. fontanum*, although conceding that it is 'a very rare British fern'. He goes on to provide woodcuts of five variants of *A. fontanum* found in Britain, including crested and depauperate forms.

Several decades later, Druery (1910) in *British Ferns and their Varieties* includes *A. fontanum* as a native British species but remarks that 'none of such finds are of recent date'.

In 1940, we find Hyde & Wade in *Welsh Ferns* describing *A. fontanum* as 'not a native of Britain', and commenting that a herbarium specimen from Wales is probably a dwarfed form of *Athyrium filix-femina*. However, as recently as 1996, the 7th Edition of *Welsh Ferns* (Hutchinson & Thomas) retains one-third of a page for *A. fontanum* and even provides a Welsh name: *Duegre dynen Lefn y Creigiau*. The question of whether it might at one time have been a genuine native British species is not addressed, the authors simply giving the status as 'not confirmed for the British Isles' and 'all records are pre-1930'.

In other recent monographs, *A. fontanum* is not mentioned by either Jermy & Camus (1991) in *The Illustrated Field Guide to Ferns and Allied Plants of the British Isles*, or by Page (1997) in the 2nd Edition of *The Ferns of Britain and Ireland*. Nor is it in *The New Atlas of the British & Irish Flora* (Preston *et al.*, 2002).



Figure 2. *Asplenium fontanum* in Sowerby (1859) *The Ferns of Great Britain*. This does not look like the same species as in Figure 1.

Cultivation of *Asplenium fontanum* in Britain

A. fontanum seems not to present special problems for cultivation outdoors in Britain, except for extreme attractiveness to slugs. I have grown this species, sourced from near Aix en Provence, since 1990 in a limestone rockery (Figure 3) and in close proximity to *A. viride*, which is not nearly so slug-attractive. This leads me to wonder if the absence of *A. fontanum* from the British flora today is due to factors other than climatic. Should we, for example, be researching the gametophyte for *its* growth requirements?

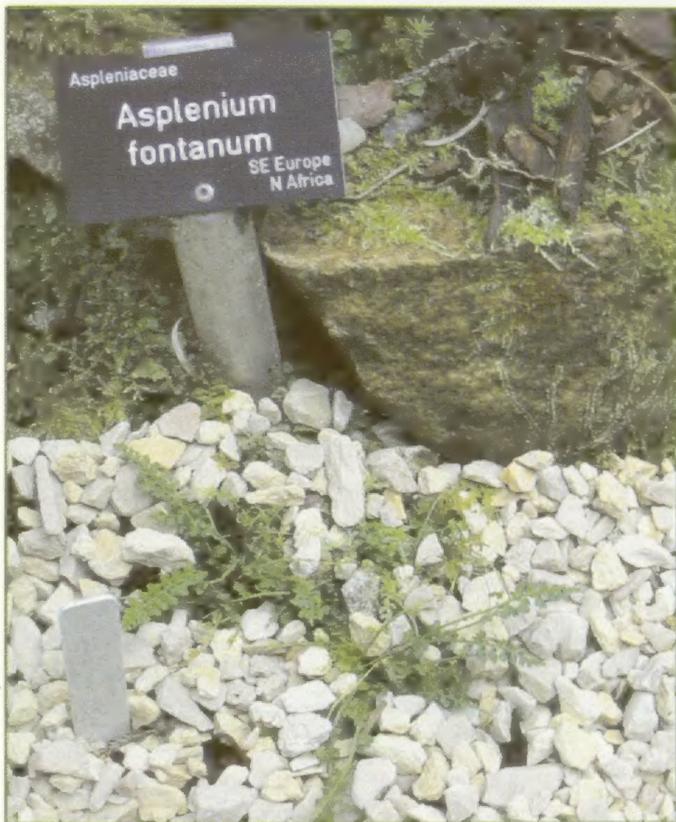


Figure 3. *Asplenium fontanum* growing in limestone chips in the author's garden (left) with extensive slug damage on fronds of lower right crown.

In the flora of France, the distributions of *A. fontanum* and *A. viride* are remarkably similar (Figs. 4 & 5). Both are ferns of calcareous rocks and are locally abundant, as is *A. viride* in Britain (Figure 6). By contrast, *A. fontanum* is no longer in the British flora. However, it *may* have been a British species in Victorian times.

Conclusions

- 1) *A. fontanum* probably does not exist as a wild species in Britain today.
- 2) Adult sporophytes of this species have survived for an extended period of cultivation in northern Britain, in a climate much cooler and wetter than the South of France.
- 3) The common inclusion of *A. fontanum* in books on British ferns from the Victorian era suggests that this species may indeed have been a British native at one time, albeit very rare. It is difficult to believe that Moore (for example) would have based his nature prints (Figure 1) on specimens of doubtful identity or provenance, or obtained abroad.
- 4) With the indiscriminate plundering of wild ferns even rarities, during the Victorian era, it would not be surprising if an already scarce species was extirpated to the last plant.

***Asplenium fontanum* may, therefore, be a British fern that became extinct during the Victorian era.**

- 5) Although in France *A. fontanum* and *A. viride* are both locally abundant and are similarly restricted to limestone areas, only *A. viride* is locally abundant and widely distributed on calcareous rocks in Britain. Why the British and French abundances of these two species are so different remains a mystery.

Acknowledgements

I am grateful to R. Prelli for permission to reproduce the distribution maps in France of *A. viride* and *A. fontanum* from R. Prelli & M. Boudrie (1992): *Atlas Écologique des Fougères et Plantes Alliées*. Éditions Lechevalier, Paris. I thank the Queen's Printer and Controller of HMSO for permission to copy the © distribution map of *A. viride* in Britain which was published by

C.D. Preston, D.A. Pearman & T.D. Dines (2002) in *New Atlas of the British & Irish Flora*, Oxford University Press.

I am indebted to several colleagues for helpful and detailed comments (ranging from supportive to dismissive!), but since they cannot be summarised adequately in the space available and with attribution, I thought it best to withhold names.



Figure 4. Distribution of *A. fontanum* in France (Prelli & Boudrie, 1992).



Figure 5. Distribution of *A. viride* in France (Prelli & Boudrie, 1992).

Asplenium viride Green Spleenwort

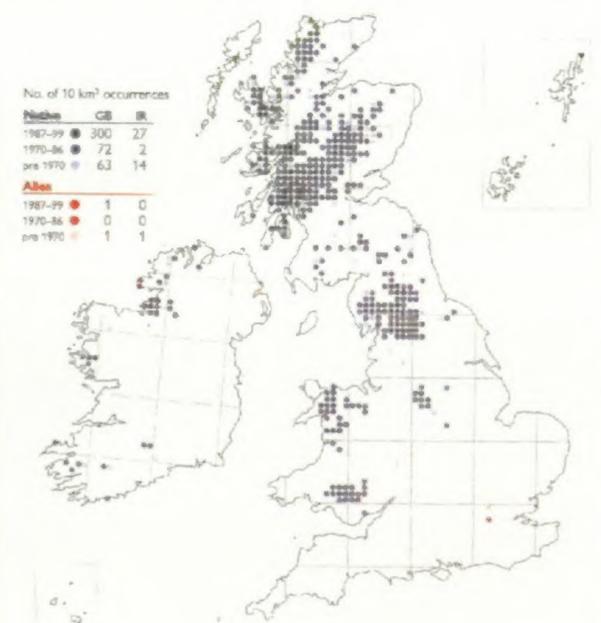


Figure 6. Distribution of *A. viride* in Britain (Preston *et al.*, 2002).



The picture shows only the right hand side of a double carving

Fern Carving in New Zealand

Frank McGavigan

This wonderful carving of *Cyathea dealbata* is in the Kauri Museum at Matakohē, north of Auckland, New Zealand. The carver was Harold Vivian Ward (1869-1930), the Head Carver of the Kauri Timber Company, and the wood is kauri itself (*Agathis australis*), a gigantic tree native to New Zealand.

What is remarkable about this life-size piece is the beautiful intricacy of the carving not just of one frond but also of one overlapping another. Anyone who has ever attempted to draw a fern, let alone carve one, will know just how difficult it is to capture the delicacy of the fronds while retaining botanical accuracy. Ward has achieved both magnificently.

The Kauri Museum celebrates the lives and toils of the pioneering kauri loggers and gum diggers and is one of the best museums in the world, a must for any visitor to New Zealand.

Bracken? Just The Ticket

Martin Spray

The Pludds, Forest of Dean, Gloucestershire

Further to my *Two Cheers for Bracken* (*Pteridologist* 2003) here in the Forest of Dean the third, and loudest, cheer is for another traditional use, which seems still to persist. Bracken, known locally - as in other parts of Britain - just as *fern*, is abundant in many clearings and in parts of the woodland, especially where free-range sheep have kept down woody understorey growth.

Whereas in some parts of the country greensward was in demand, hereabouts the greater privacy afforded by *Pteridium* was sought. As Chaucer sweetly puts it:

Quite as fine as any velvet,
on which a man his love could lay
as on a featherbed, to play.

Couples/lovers who appeared to be about to seek it were teasingly asked if they had got their *Fern Tickets*. Were, or are, Forest Tickets valid in other areas?

Ed. There is a continental parallel, about 50 years before Chaucer, in a 15th century French song: "Allez à la fougère, et n'y demourez pas". Let's disappear into the bracken, and don't you be shy about it (*Pteridologist* 1995, p. 256).



GRAHAM ACKERS WRITES

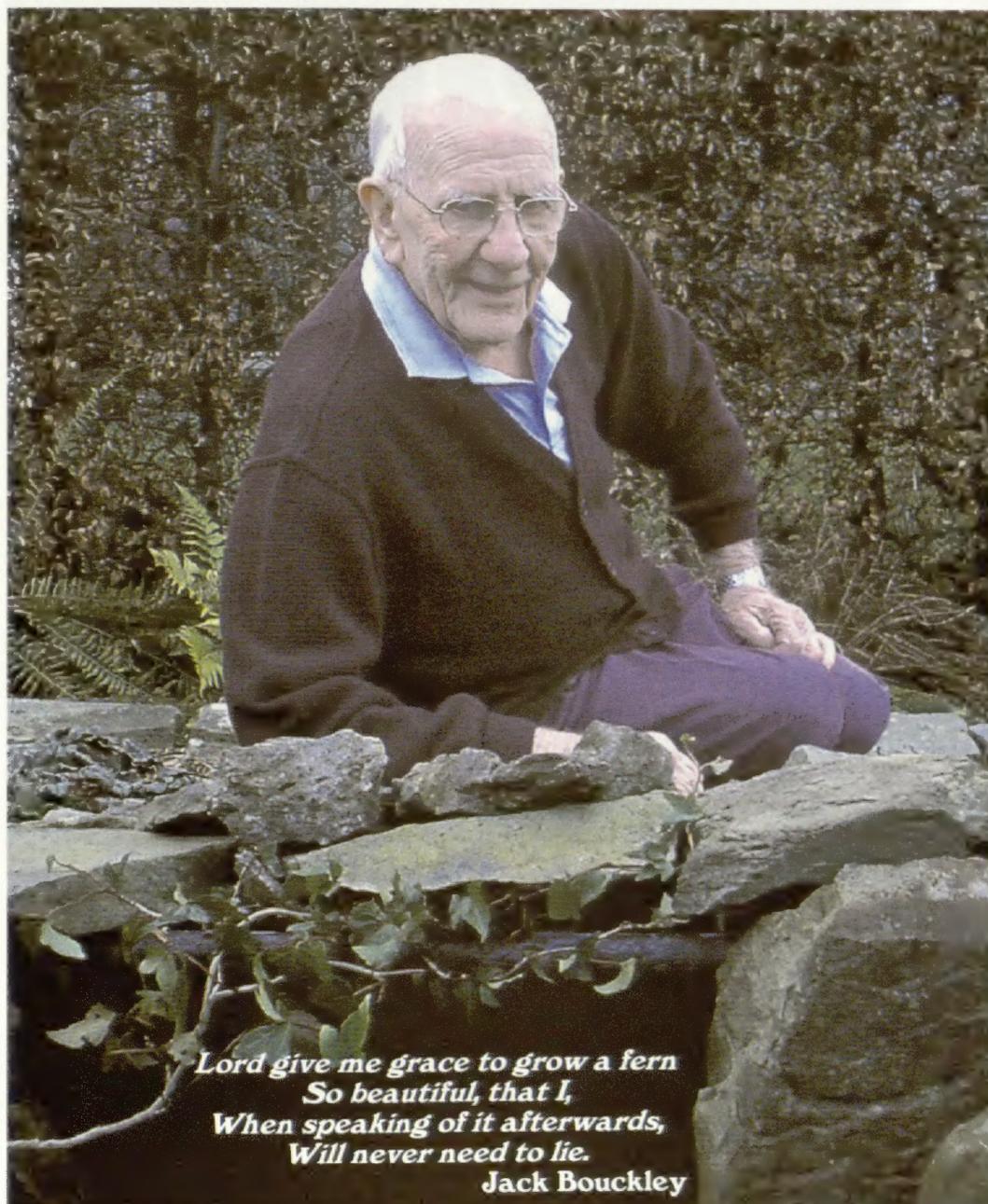
Grateful thanks to all those members who returned the Members' Questionnaire distributed with the 2004 Bulletin. The responses are now being analysed, and it is hoped to give feedback to members in the 2005 Bulletin.

IN THE GARDEN

FERNS IN MY GARDEN - *Trichomanes speciosum*

Jack Bouckley

209 Woodfield Road, Harrogate HG1 4JE



Lord give me grace to grow a fern
So beautiful, that I,
When speaking of it afterwards,
Will never need to lie.
Jack Bouckley

A few years ago I was given a small plant of *Trichomanes speciosum* and, after a lot of experimenting, I found a place where it seemed to be happy, if growing very, very slowly. This was in a Wardian case - actually a glorified aquarium - in a shaded part of one of my cold greenhouses. When it was fit to exhibit I thought: "What if I raised the whole lot up a couple of feet where interested people would be able to see, photograph and study it more easily?" This move was almost a catastrophe as in the matter of only a few weeks the whole plant started to wilt alarmingly. Returned to its old position my Killarney soon recovered, though I cracked one side of the tank as I moved it.

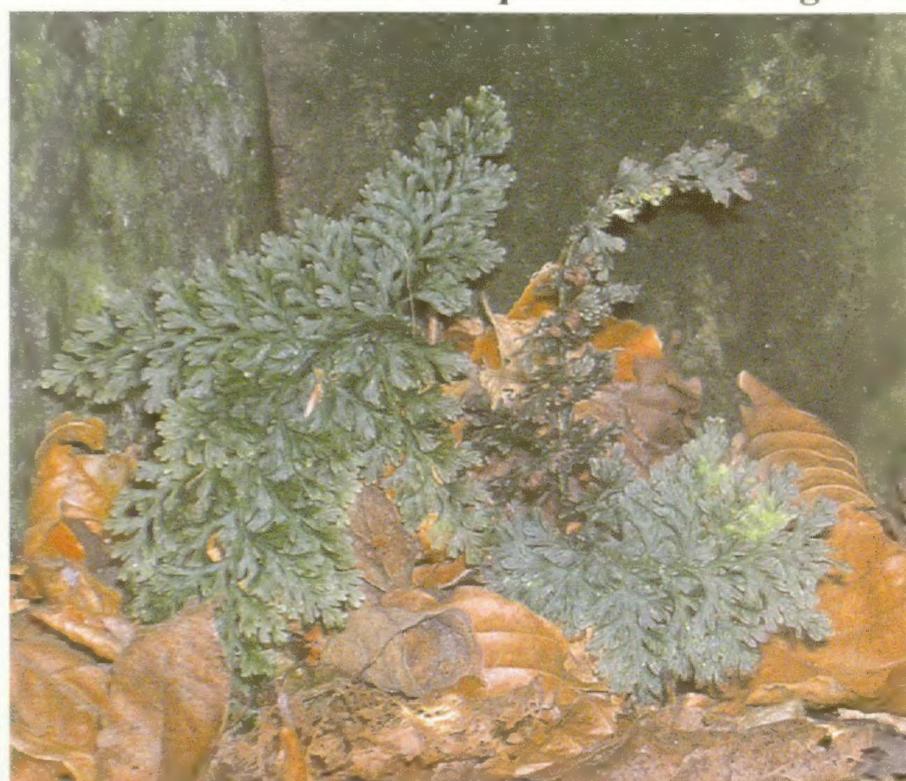
I was still not happy with this arrangement, but it struck me that the plant needed a situation more in keeping with where it grows in the wild. I wondered if a small grotto might be the answer, but in my dry Harrogate garden? I could try.

First I dug a 1 m² hole about 45 cm deep with a sloping channel leading from surface level (the path) down to the far end. I lined the path with polythene, so that all the rain water that fell there would run down into the grotto, and covered that with gravel. The fern went right at the back of grotto. The hole is lined with rock and the actual excavation - not the path - is roofed with small pieces of rock supported

by steel bars so that any rain or snow melt drips through onto the hallowed ground. It certainly works, as the soil there always seems to be dampish, even after very dry weather. In effect it receives around three times the normal rainfall. Eventually, this rocky roof will be disguised with plants which do not mind arid conditions and so it will look like a natural part of the garden.

The Killarney fern has now been in residence in its grotto for a couple of years and is growing, not as fast as I had hoped, but the photographic record shows increase in size. As a matter of interest there is also a very nice specimen of *Athyrium filix-femina* 'Frizelliae' which has established itself from some spore that floated into the grotto. It is better than any that I have elsewhere in the garden.

 The original plant



PHOTOS: JAMES MERRYWEATHER

PHOTOGRAPHY

for

The Plantfinder's Guide

Martin Rickard

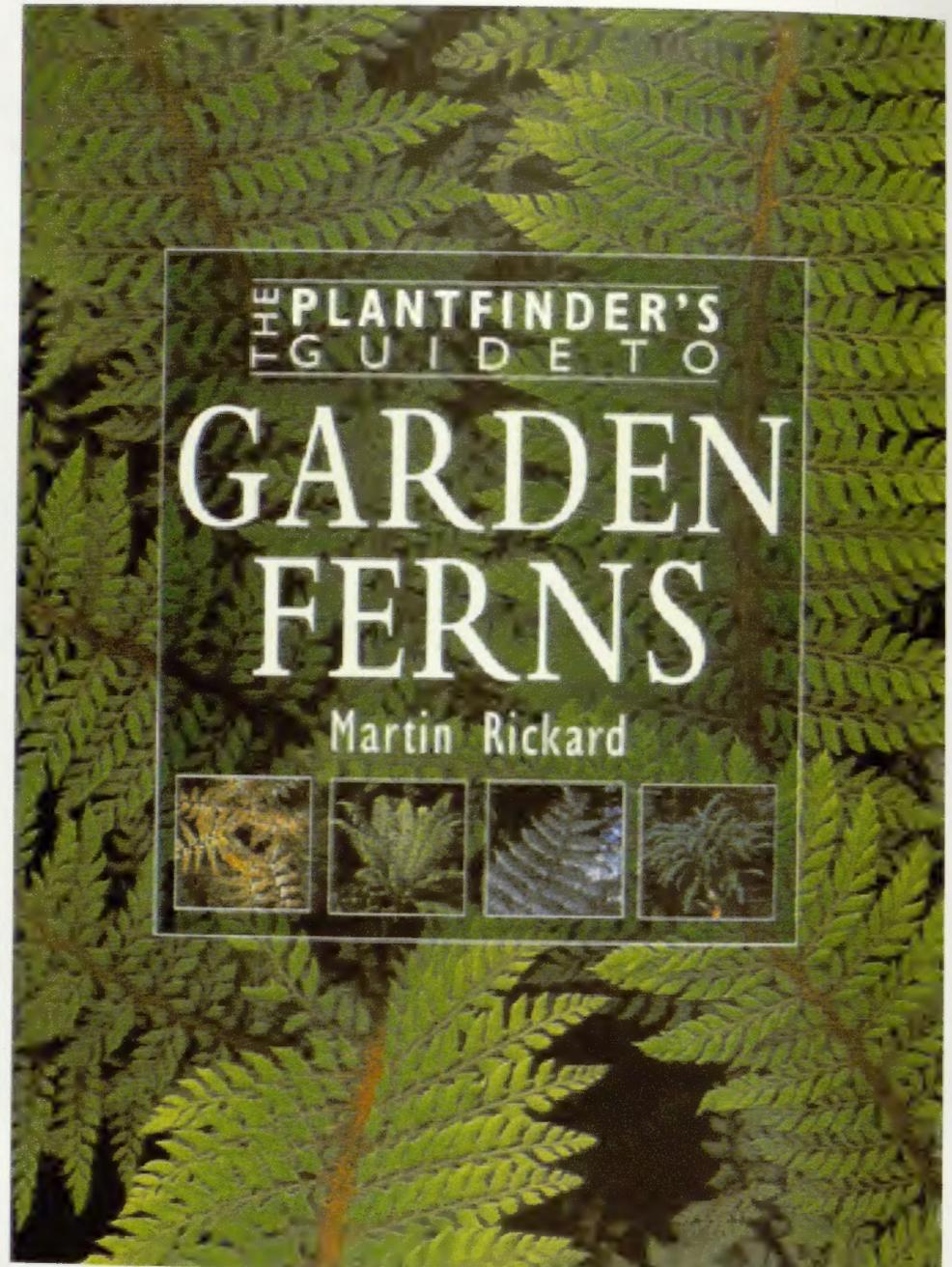
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Your editor has received several requests that I might explain how the photographs for my *Plantfinder's Guide*¹ were assembled. I hope the following account answers the questions although, sadly, I do not know any technical details. They might even be trade secrets.

This book was published in 2000 and, while its success has exceeded my expectations, I do realise much of the appeal is in the photographs - only a few of which did I take! The publishers employed two professional photographers, Marie O'Hara for the field shots and Karl Adamson for the double page spreads taken indoors.

BEGINNINGS I was not the first choice to write this book. Initially John Bond of the Savill Gardens in Berkshire was approached and indeed some photos were taken by Marie at the Savill Gardens under John's supervision. Two of these were used (see pp. 20, 25). Sadly John's wife fell ill and so far as I know he never began actually writing the book. I believe he had signed the publisher's contracts so it was a difficult time for him and eventually he asked David and Charles to be released. This they did and, presumably at John's suggestion, they contacted me. I was delighted to be asked, if a little daunted. One problem was finding the time while at the same time running my nursery, Rickards Hardy Ferns Limited. (Sadly not long after John's wife died and John too passed away a year or two later).

Inevitably I dragged my feet; there was always something more pressing to do. Photographs were, however, the big problem. I was well aware that years before Jimmy Dyce had written a very good fern book but because he could not gather enough suitable photos no prospective publisher was interested. Through the late summer of 1998, I received phone calls from the publishers to see how things were going, the answer was that they weren't, but I did not exactly phrase it like that! Marie wanted to get on with it, but by late summer most ferns were tired and not photogenic. We did, however, make a start on the polypodies in the garden. When Marie came and eventually started taking pictures I was horrified how long each shot took. I could not spare the time. Therefore, I marked all the polypodies I wanted taken and left her to it, I cannot remember now if it took one or two days. The plants were at their peak but unfortunately I did not see the photos until the following spring, too late to retake any until the following autumn, which would be past the publisher's deadlines. The resultant pictures were beautifully composed but in quite a few cases they were not diagnostic. Even



though they were my plants, I could not identify them all so some had to be discarded, but fortunately enough were fine (see pp. 131-141). From this exercise I learnt that there were no short cuts, it was not fair to expect a photographer, however accomplished, to know the salient points of each fern. In future I would have to be on hand while pictures were being taken.

LEARNING CURVE Also in the autumn of 1998 I had to supply fronds of the polypodies to Karl Adamson to take the double page spreads. I selected typical fronds of all the main cultivars, packaged them individually in polythene and sent them down to Karl in London. I heard no more until I was shown proofs the following spring. They were a disappointment. Through no fault of Karl's the fronds had not travelled well in the post. Virtually all were not flat and many had to be discarded. The resultant plates (numbers X and XI) were not as comprehensive as I had hoped and the fronds were not as fresh as they should have been. By spring 1999, therefore, as a result of my inexperience, progress had been slow. We had photos of the polypodies as outlined above but little else.

All the time the editorial staff at David and Charles were chasing me. How was the text coming on? Sad to admit, it wasn't. I prevaricated with various excuses until late May/June when in desperation, Anna Mumford, the Commissioning Editor, suggested I set a timetable of two sections of text a week. Bear in mind I had signed contracts to provide copy to a timetable and I was not just late I had

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not even started. How Anna kept her patience with me I do not know! David and Charles were contracted to Timber Press in the USA to have the book in proof that autumn so they too were potentially in a corner.

Not only did I have to find time to write the book in the height of summer when the nursery was at its busiest, but we also needed to take all the photographs. Following the disappointments of the previous autumn I made two decisions: one, I needed to be present when the garden shots were taken and two, Karl would have to bring his studio to Tenbury if we were going to get good quality fresh fronds for the double page spreads. The text was another matter. I couldn't see a way out until Helen Smith, then working for me on the nursery, told me to forget the nursery for the next two weeks and get on with the book. Helen was worth her weight in gold. I went home and two weeks later the text was virtually finished. I had always been suspicious of E J Lowe's claim that he wrote *British Ferns* in the Young Collector series in six weeks - I believe it now!

GARDEN SOLUTIONS Both Marie and Karl readily agreed to help sort things out. I eventually spent several days in the garden/nursery with Marie, often starting early in the morning when the wind was minimal. Readers may have noticed some of the cunning little tricks we used. Many of the ferns illustrated are in fact in pots. We covered the pot rim with moss and set it amongst pieces of wood. Hopefully it looked like the ferns were growing in a stumpery. Another ruse was to photograph the tree-ferns, all in pots, in certain convenient spots in the garden near their fern house. They were too heavy to move far! I wonder how many readers noticed that *Dicksonia fibrosa*, *Cyathea australis* and *C. medullaris* were all taken in the same spot? We also needed some ferns in garden shots over and above what was available in the garden at Kyre, so Marie kindly came over to Rita Coughlin's and Clive and Doreen Brotherton's gardens in the Birmingham suburbs as well as Burford House garden in Tenbury. Of course in three or four days it proved impossible to get all the photos we needed, so quite a few came out of my slide collection. These are usually recognizable as being in a different style from Marie's. All in all we ended up with more photos than the publishers could use so everything was fine.

STUDIO SOLUTIONS The double page spreads were all produced by Karl Adamson. The day before he was due at Kyre I collected a very good range of *Cheilanthes* fronds from Clive and Doreen Brotherton, keeping them in polythene overnight. I gathered all the other specimens from my collection fresh on the day. Most could, therefore, be photographed within an hour of picking. Eventually when Karl appeared he had an estate car literally packed to the roof with his equipment, including back seat and front passenger seat - I could now see why he wanted to do the photography in his London studio. One thing in particular

caught my attention. Why did he have a roll of fuse wire? The answer was he expected to fuse my lights every time he took an exposure. I was fascinated.

There was some concern that my sitting room would not be large enough but Karl just managed to fit his equipment in. He built up a box-like structure about seven feet tall, six feet wide by 5 feet deep. Top bottom and all sides were packed with flash units. The cameras were set near the ceiling looking down onto a frosted glass plate. Under the glass plate were numerous more lights. To take each exposure Karl arranged the given fronds in such a way that the eventual double page spread would look like one photo, not two, but at the same time it was important that the crease between pages did not spoil the clarity of any frond. Once satisfied with the arrangement Karl took the photo. Wow! The flash was incredible, and yes, it did trip my fuses as Karl expected.

The end result of this exercise was eleven double page plates which really sold the book. Because of the configuration of the lighting no shadow is visible beneath the fronds, the lighting throughout is even and the clarity of the images perfect. In addition, Karl's arrangement of the fronds is artistic and perfect to my eyes.

SUCCESS I am confident that the illustrations in the book very significantly helped sales. In particular the double page plates. I sold the book at flower shows and I knew once someone asked to see a copy they would almost certainly buy it if they flicked through the pages, catching sight of Karl's beautiful plates.

So there we have it. The book's sales far exceeded my expectations and this was in no small measure due to the skill of Marie and Karl - and also to Helen for being in the right place at the right time.

¹ Rickard, MH (2000). *The Plantfinder's Guide to Garden Ferns*. David & Charles (UK); Timber Press (USA). £17 incl. p&p from the author.



IDENTIFICATION

POLYSTICHUM RICHARDII

split at last

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Fans of New Zealand ferns may like to know that the taxon *Polystichum richardii* has finally been split. It has long been known to be polymorphic, e.g. "A common and very variable plant, now thought to comprise more than one species" (Brownsey & Smith-Dodsworth, 2000). BPS members visiting New Zealand certainly noticed this variability too - and also remarked on the frequency of the entity ("We also saw our first New Zealand *Polystichum*, *P. richardii*, which subsequently became a common sight", noted in Wardlaw *et al.* 2000 reporting on the BPS New Zealand field meeting at our first site near Mt. Cavendish north of Lyttleton Harbour on 12 February 2000).

'*Polystichum richardii*' can be differentiated from other New Zealand polystichums particularly "by the indusia with dark centres, and scales with fringed bases" (Brownsey & Smith-Dodsworth, 2000). However, new work has now concluded that four taxa are involved (Perrie *et al.*, 2003). I met Leon Perrie at the RBGE Edinburgh Symposium ("Ferns for the 21st Century") in 2004, following which he kindly sent me a copy of his paper. The four new taxa are:

Polystichum neozelandicum subsp. *neozelandicum* (Fig. 1), *P. neozelandicum* subsp. *zerophyllum*, *P. oculatum* (Fig. 2) and *P. wawranum* (Fig. 3). They form the morphological continuum shown from left → right in Table 1. The name *neozelandicum* pre-dates *richardii* which is why the latter has disappeared completely. The first and last species (both tetraploids) are quite distinct, and it is the authors' contention that had it not been for the existence of the two *P. neozelandicum* subspecies (octoploids), which are morphologically intermediate, they would have been differentiated as separate species some time ago.

In the paper, the four taxa are separated on grounds of:

- Morphology - scale size and shape, ratios of pinnae distance and width, size of the dark centres of the indusia, number of annulus cells, and spore sizes.
- Cytological and molecular analyses.
- Geographical distribution.



Figure 1. *Polystichum neozelandicum* subsp. *neozelandicum*

In the field, the most useful and reliable characters are the size of the indusium dark centre, scale size and shape, and the colour of the mid-vein/leaf. Based on these characters, the ferns that I observed commonly on the Banks Peninsula during my 2004 visit to New Zealand were *P. oculatum* (I did not observe "*P. richardii*" anywhere else during that visit). I would like to think that the shape of the secondary pinnae was also a good field character ("the secondary pinnae vary from round-ended and smooth-edged to deeply dissected with sharp points", Brownsey & Smith-Dodsworth, 2000). My Banks Peninsula plants had very pointed secondary pinnae giving a very 'spiky' gizz to the lamina, whereas the photograph on plate 30B in Patrick Brownsey's book (possibly one of the *P. neozelandicum* sub-species) has a noticeably less 'spiky' lamina. This character is not given as a differentiator in Leon Perrie's paper, and the frond outlines in the paper are a little too small to see any clear differences in this character. However, Leon tells me that the degree of 'spikiness' (as well as the spacing of the lamina segments) can be helpful, although there is considerable overlap

between taxa, and variation within taxa.

It would be futile at this late stage to try and guess the identities of the '*P. richardii*' entities observed by the BPS excursion to New Zealand in February 2000! There is a further historical twist in that the authors point out that the morphological characters given by Patrick Brownsey as differentiating '*Polystichum richardii*' (see start of this article) are not unique because overlap with *P. vestitum* is possible!

If you plan to do any ferning in New Zealand in the near future, I recommend getting hold of a copy of Leon Perrie's excellent paper, otherwise one might have to await a third edition of Patrick Brownsey's book! Now that the New Zealand blechnums and polystichums have been "sorted", I am making a plea to the pteridologists to give us amateurs some help with the New Zealand aspleniums. The good news from Leon Perrie is that this is now in hand!

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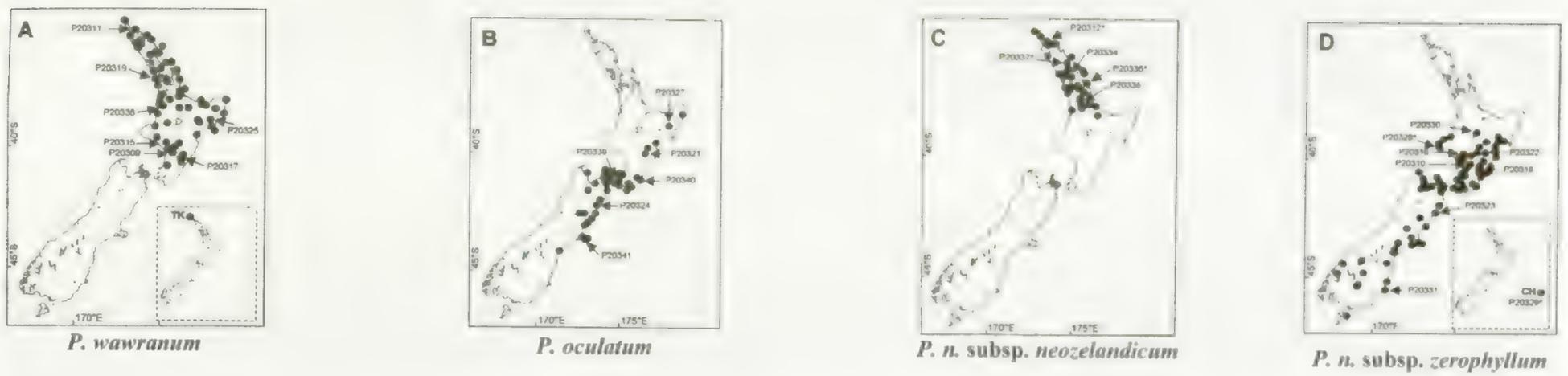


TABLE 1. The most useful field characters, but please refer to the paper (Perrie *et al.*, 2003) for more details.

	<i>Polystichum wawranum</i>	<i>Polystichum neozelandicum</i> subsp. <i>neozelandicum</i>	<i>Polystichum neozelandicum</i> subsp. <i>zerophyllum</i>	<i>Polystichum oculatum</i>
Average indusial surface area occupied by a dark centre	2.6%	42.2%	29.7%	19.2%
Average minimum to maximum mid-scale widths	75-300 μm (almost hair-like)	185-420 μm	310-580 μm	1460-1630 μm (noticeably wide)
Primary costae and lamina colour comparisons	Primary costae noticeably darker			More or less the same colour
Spikiness	Least spiky	On a continuum to \rightarrow		Most spiky
Spacing of lamina segments	Closest set	On a continuum to \rightarrow		Most widely spaced
Geographical distribution	North Island	Northern half of North Island	Scattered throughout both islands	Southern half of North Island and northern half of South Island

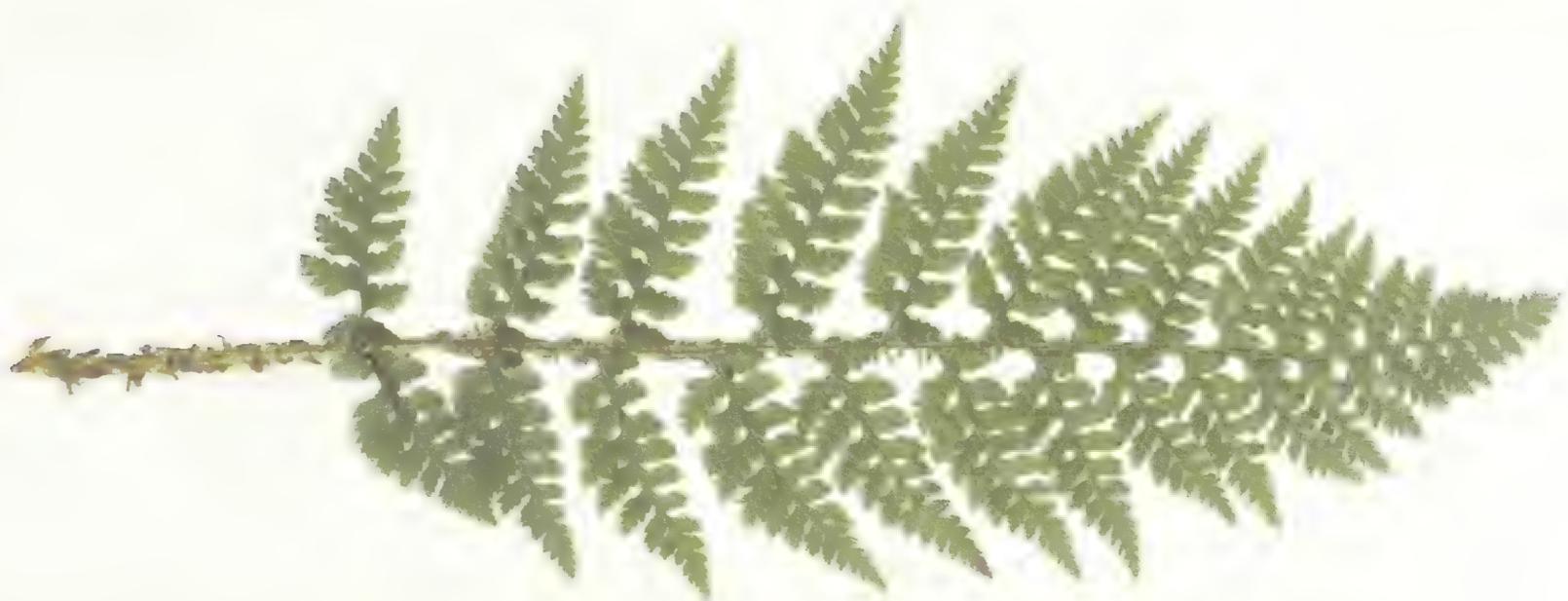
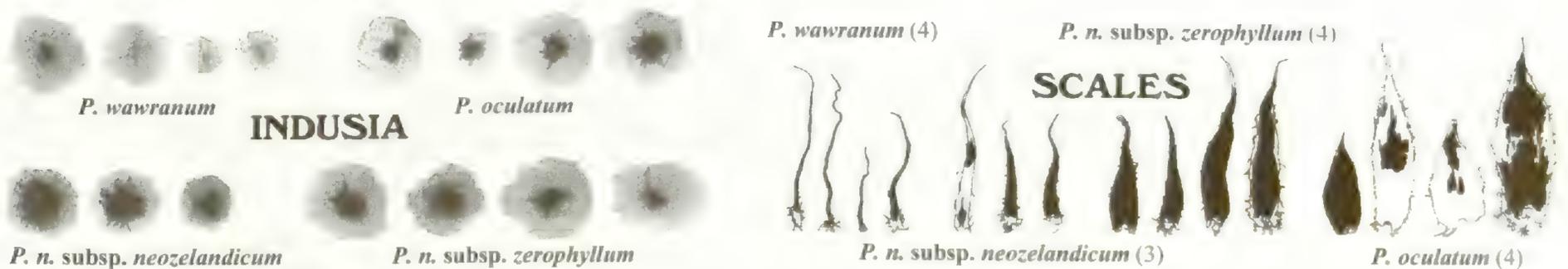


Figure 2. *Polystichum oculatum* showing widely spaced lamina segments.

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Figure 3. *Polystichum wawranum* with characteristically close-set pinnae

PHOTO: LEON PERRIE

With thanks to Leon Perrie for commenting on an earlier version of this article. Leon can be contacted at: e-mail: leonp@tepapa.govt.nz, and post: Te Papa, P.O. Box 467, Wellington, New Zealand. Diagrams and maps reproduced from Perrie *et al.*, 2003 by kind permission of the Royal Society of New Zealand.

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Filmy Ferns in Fiction



John Buchan's novel *John Macnab* begins with middle-aged Sir Edward Leithen in a sorry state of mind:

He was so completely fatigued with life that he neglected to be cautious at crossings, as was his habit, and was all but slain by a motor-omnibus. Everything seemed weary and over-familiar - the summer smell of town, the din of traffic, the panorama of faces, pretty women shopping, the occasional sight of a friend. Long ago, he reflected with disgust, there had been a time when he had enjoyed it all.

Leithen escaped to the Scottish Highlands in search of inner peace through rest and adventure, but took his depression with him:

He had been for a long walk in the rain, and the scent of wet bracken and birches and bog myrtle, the peaty fragrance of the hills salted with the tang of the sea, had failed to comfort, though not so long ago, it had the power to intoxicate. Scrambling in the dell of a burn, he had observed both varieties of filmy fern and what he knew to be a very rare cerast, and, though an ardent botanist, he had observed them unmoved.

Bracken occurs frequently enough in literature, but how many authors mention *Hymenophyllum*, let alone go to the trouble to remind the reader that there are two British species, and then move on to rare mouse-ear chickweeds?

Which New Zealand Fern Book?

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New Zealand is startlingly rich in ferns and any fern lover would welcome the opportunity to visit this wonderful country. But which fern guide to buy? For a country with only four million inhabitants there is a surprisingly large choice and almost every bookshop stocks a selection.

The obvious place to start is Brownsey and Smith-Dodsworth's *New Zealand Ferns and Allied Plants* (ISBN 1-86953-003-9). Now in its second edition (always a good sign) it is the only fully comprehensive guide covering all 194 native and 32 introduced species. Each is given a detailed description and a paragraph on distribution and habitat. Many also have cultivation instructions, useful for those who wish to try NZ ferns in their own gardens. There are identification keys for both genera and species which appear accurate and clear, coloured photographs for most species, and numerous detailed line drawings, often enlarged, for clarification of identification issues.

And yet, on my recent first visit to New Zealand I hardly opened my copy. Thrown into a new environment where none of the ferns was familiar I needed to get my bearings with a quick and easy identification guide, not lose myself in the minutiae of technical detail. Also Brownsey and Smith-Dodsworth is too big to be carried around on a field trip, the distribution information refers to places that require a familiarisation with NZ geography, the photographs are grouped together away from the text, and the keys...well, I contend that most people don't use keys but rather flick through the illustrations until they find what they're looking for. Not very scientific I know, and the professional botanists will protest, but it is surprising how quickly one gets there by this method. However, the illustrations need to be clear and with six photos to a page Brownsey and Smith-Dodsworth's are too small to be helpful.



In anticipation of some of these difficulties I had bought on spec Lawrie Metcalf's *A Photographic Guide to the Ferns of New Zealand* (ISBN 1-877246-94-8) before leaving the UK. Pocket diary size (perfect for field trips), with a fern per page, it covers 108 species, with a more than adequate description and a distribution map for each. There is a two-page, simplified key. It seemed ideal, but again when I came to consult it I found the photographs too small to be much use in identification except for the most obvious species.

A better small guide, only slightly larger, but covering fewer ferns (65) is Brian Parkinson's *Common Ferns and Fern Allies* in the Mobil New Zealand Nature Series (ISBN 0-7900-0698-7). The descriptions are shorter and there are no distribution maps, but the photographs are larger (even than Brownsey and Smith-Dodsworth's) and clearer in that they focus on the distinguishing characteristics of each fern. I did not come across this book in New Zealand (it may now be out of

print) so cannot fully judge its practical use in the field. It dispenses with a key altogether.

Andrew Crowe is both a naturalist and an educationalist who has written many NZ nature guides from trees to sea shells. He has a real grasp of how to make identification simple and clear. His *Which Native Fern?* (ISBN 0-14-301801-9) is excellent: a slim paperback, it covers 46 ferns each with a colour photograph, a life-size silhouette of a small part of a frond, a distribution map, a diagrammatical indication of its altitude range, a line drawing of the plant's habit with an indication of size, a brief description, cultivation instructions, and a simplified key. Who could ask for more?

Well, Andrew Crowe himself obviously felt he could improve on it, and has produced in addition *The Life-Size Guide to New Zealand Native Ferns* (ISBN 0-14-301924-4) which contains, as its name implies, life-size photographs of single fronds of 41 ferns along with brief descriptions. The photo of *Leptopteris superba* (Prince of Wales Feathers) is the only one in all the guides that shows the essentially three-dimensional nature of this fern's fronds, and I found myself turning first to this book when I came across a new fern. Of course it has its limitations: it is an awkward A4 size (though thin enough to slip easily into a ruck-sack), the life-size photos obviously do not work so well with larger ferns though the tree ferns come out well, and there are no distribution maps or any of the other information in Crowe's earlier book.

None of these guides is perfect (and there are others, either not so good or out of print). However, for a short trip to New Zealand, and remember you will need a tree book, a flower book, and a bird book also, I would recommend Andrew Crowe's *Which Native Fern* supplemented by his *Life-Size Guide*, both cheap and readily available in New Zealand. Of course the serious pteridologist could not manage without Brownsey and Smith-Dodsworth as well, but then you would want a longer visit.

Tree-Fern Newsletter No. 11

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Cyathea dregei Outdoors in UK



Cyathea dregei, growing out of doors in Logan Botanic Garden, south of Stranraer in South-West Scotland (July, 2004). This plant is part of a group that was established outside in 2003. Originally grown from spores at the Royal Botanic Garden Edinburgh (of which Logan is an out-station), the ferns had been kept under glass for several years until trunks started to form. It is quite exceptional to see trunked plants of this South-African species, planted outside in Britain. Wrapping has been provided for the two winters so far.

Tree Ferns and the RHS

The increasing prominence of tree ferns in UK horticulture is signalled by their appearance in each of the first three 2005 issues of *THE GARDEN*, the premier journal of the Royal Horticultural Society.

Tree-fern trading. In the January issue, Sir Peter Crane, Director of the Royal Botanic Gardens, Kew, 'weighed up some myths about the international trade in these exotic plants'. He focused mainly on the large-scale importation of *Dicksonia* trunks from Australia and New Zealand into Britain. In the main, his conclusions were reassuring. Compared with international trade in other plants, the export of tree ferns is apparently well regulated and well managed.

Nowadays most of the Australian *D. antarctica* either comes from commercially-managed forests or through salvage from development sites. Thus 'the regulatory provisions' (i.e. the tagging system on harvested trunks) should provide 'a degree of confidence to British gardeners that they are not contributing to the decline of these magnificent plants in the wild.'

Asylum seekers? To me, Sir Peter is saying that the original wild habitats are being lost anyway, through conversion into commercial forests or for human occupation, both activities taking place independently of the consequences to tree ferns. If therefore some of the trunks can be salvaged and made available to horticulture, at least the plants themselves have a chance of continued existence, even though their original habitat may be lost. In modern parlance the harvested tree ferns have become *asylum seekers*, looking for a good home away from their native land!

Vehicle for pests. Asylum seekers, human and pteridological, may bring not only themselves but also unwanted parasites. The February issue of *THE GARDEN* reported DEFRA's (Department of Environment, Food and Rural Affairs) concern that tree-fern trunks are the vehicles for alien pests. The list of these intruders hoping to crawl and slither uninvited into the UK includes spiders, slugs and snails, flatworms and millipedes. Be vigilant!

Winter protection. The March issue of *THE GARDEN* endorses the advice previously given in these Newsletters that *D. antarctica* generally needs winter protection in UK gardens, except near southern and western coasts or where a mild microclimate is provided by surrounding buildings. The RHS article emphasises the importance of trunk watering (but not into the crown) and describes the chicken-wire-and-straw winter-insulation system.

Next TF Newsletter. Pictures, notes and articles on tree ferns should be sent to me as soon as possible. I am generally short of copy! [ditto - ed.]

Disclaimer: Views expressed in this Newsletter are not necessarily those of the British Pteridological Society. ACW

Tree-fern Conservation? - New Zealand replies

Peter Lynch in the last issue of this Newsletter [*Pteridologist* 4 (3): 81, 2004] wrote: 'visiting New Zealand in March 2003, I was horrified to see the scale of destruction of native tree-fern forests'. His article was illustrated with pictures of tree-fern trunks being used as fencing material and for the edging of bunkers on golf courses. He went on to report his correspondence with the New Zealand Government and the apparent indifference of the authorities to what was happening to tree ferns in that country.

Two New Zealanders wrote to me in response to Peter's article. Patrick Brownsey is co-author of the standard book on New Zealand ferns, and John Hawkins worked in the forestry industry in the North Island of New Zealand before going to live in Sweden. It was John who put me on to the highly relevant paper by Ogden *et al.* (1997) which is summarised briefly at the end of this article.

Patrick Brownsey writes

As you will know from your visit to New Zealand a few years ago, *Dicksonia squarrosa* is widely used here for fences and retaining walls. It is a common and widely distributed species in New Zealand, and not at all threatened. The species frequently grows in groves because of its stoloniferous habit. It also has a remarkable ability to sprout new trunks if the main one is damaged, due to the presence of buds on the main trunk (see Fig. 100B in Brownsey & Smith-Dodsworth, *New Zealand Ferns and Allied Plants*).

Trunks of *Dicksonia* are commonly sold in garden centres and elsewhere for use in fences and retaining walls. It is undoubtedly true that the less scrupulous dealers illegally strip trunks out of native forest for this purpose. I can remember visiting an area of bush near Wellington shortly after this had happened on one occasion and was appalled at the destruction. However, I can report that many years later, a lot of those tree ferns have regenerated as a result of the growth habit of the plant described above. This, of course, in no way detracts from the seriousness of removing the plants in the first place.

More enlightened traders do what Peter Lynch describes in his article. *Dicksonia* grows extraordinarily well under the vast tracts of introduced *Pinus radiata* forest that have been planted in New Zealand. The tree ferns grow especially well in the central North Island around Taupo and Rotorua where much of the ground has a thick layer of ash from the historical Lake Taupo eruptions (Lake Taupo itself is a huge collapsed volcanic crater). They grow quickly and can be harvested regularly without causing any destruction to native forests. They will not survive once the pine forests themselves have been harvested.

I cannot comment on their ability to grow eight-foot trunks within the harvesting cycle of 25-30 years of the pine. I simply don't have any statistics on that point, but it wouldn't surprise me if they could grow that quickly in favourable situations. I think it also needs to be remembered that they will continue to grow quickly once transplanted. The specimens with eight-foot trunks illustrated by Peter may have been growing for some time since they were harvested.

It also needs to be appreciated that the trunks of *D. squarrosa* can continue growing when used as fencing, even if they have been cut at the base and at the crown. Their growth habit enables them to do this quite readily. I suspect that some of the ferns in Peter's illustration are doing precisely that, although the article itself makes no mention of it. I have often seen fences of cut trunks that have quite literally become living fences of tree ferns.

So, in summary, it is perfectly *possible* to maintain a sustainable harvest of *Dicksonia* trunks in New Zealand without doing any damage to native forest. However, having said that, there is no doubt that illegal felling of tree ferns does take place, causing significant impact on native forest. The tree fern trade encourages bad habits, but the damage is probably not as great or as long-lasting as might be imagined at first sight. Certainly, in my view, there are much more pressing conservation issues in New Zealand than this particular one, although every effort needs to be made to stamp out bad practice.

Patrick Brownsey

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John Hawkins writes

I grew up in the backblocks of New Zealand and worked as a forester in the Central North Island pine plantations, after graduating from University and before coming to Sweden to work in the forestry here. I'm probably therefore in a position to make a few comments.

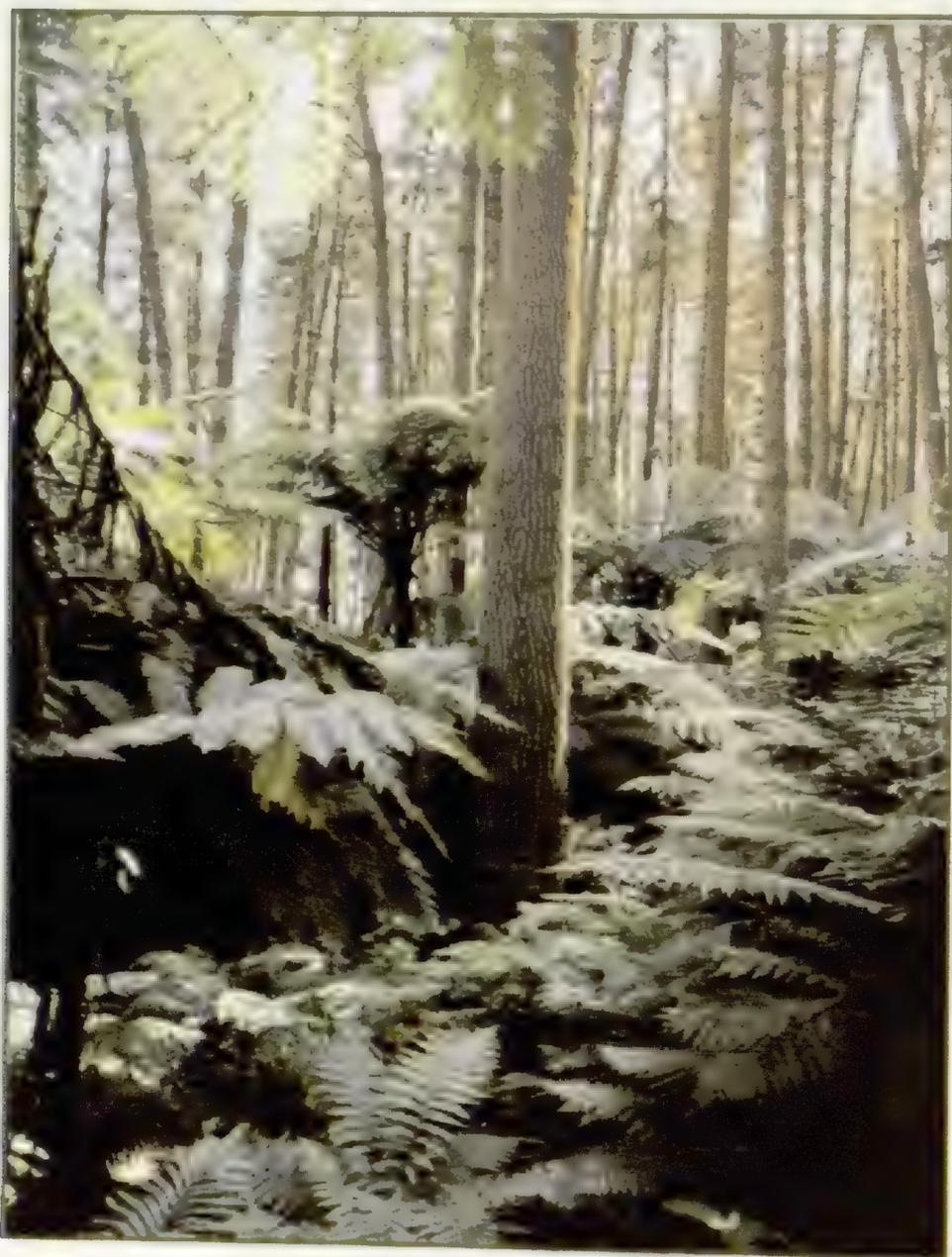
Tree fern stems, dicksonias in particular, make good construction material, especially for fences. The only disadvantage is that the stems must be allowed to dry out thoroughly before use so that they do not start growing.

Tree ferns are plants of the bush edge and of clearings, so there are plenty of them about on marginal farmland and along logging roads in pine plantations. Virgin bush in New

Zealand is well protected. The only cutting in such bush, of which I was aware, was along the West Coast of the South Island, which I gather has now ceased. It may also happen



on Maori tribal land, which is outside normal laws as it is regarded as a customary right. I don't think the Maori would be harvesting tree ferns though, as tree ferns are generally fairly sparse under virgin bush and probably not worth the bother.



Tree ferns colonising the understory of a commercial forest in the North Island of New Zealand. Photo: Carter Holt Harvey Forests.

I've no statistics on growth rates, but I do remember in my late teens cutting down large numbers of *D. squarrosa* in regrowth scrub that had been burnt over when I was a child. I also recall a *D. fibrosa* branch (*D. fibrosa* does branch like *D. squarrosa*, but not very often) that I planted outside my bedroom window when I was about 13 years old, and which was at head height when I left NZ ten years later. So a growth rate of 10-15 cm per year would be a conservative estimate, and would give a reasonable sized stem over a 25-30 year forestry rotation.

We often sprayed with herbicide before replanting with pine. Despite this, there were numerous tree ferns sprouting from broken-off stems. Regeneration additionally occurs from surrounding stands with mature ferns, and presumably from spores left in the soil. Pine forestry in New Zealand cannot really be compared to conifer forestry in the Northern Hemisphere. Depending on the locality, it should perhaps be compared with forests in sub-tropical regions. In combination with the low density of planting (200-400 pine stems per hectare), the undergrowth can become very thick, particularly during the early stages before canopy closure. At this point the tree ferns have better survival than most other undergrowth.

Finally, the prices paid for tree ferns in the UK are occasionally reported in New Zealand newspapers, with a great deal of amusement and a certain amount of antipodean smugness. A good parallel might perhaps be if hawthorn bushes were to be dug up in waste areas in the UK and exported to New Zealand!

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Ecological Study of Recolonisation

In a detailed 12-page article with 5 tables, 7 figures and 23 references, Ogden *et al.* (1997) describe the recolonisation of the understory of commercial *Pinus radiata* forests in the North Island of New Zealand. They report that mature forests contained a total of 5 species of tree ferns, 31 species of other ferns and 12 native shrub species. The entire article in original format can be downloaded from the web (www.nzes.org.nz/).

The tree ferns, which appeared spontaneously in the understory, were in decreasing order of abundance: *Dicksonia squarrosa*, *D. fibrosa*, *Cyathea dealbata*, *C. medullaris* and *C. smithii*. Densities of 2,000-2,500 tree ferns per hectare (including small plants) were reached, with *D. squarrosa* comprising 84% of the individuals overall. The authors concluded that tree-fern regeneration occurred through a combination of vegetative growth from trunks not killed by the logging and treatments preparatory to planting the pine, and from gametophytes. There was no specific mention of possible soil spore banks, or spores being blown in from outside areas.

In 20-year old forests, the maximum trunk heights of the tree ferns were 1.3, 1.9, 0.2, 0.8 and 1.8 metres respectively for *C. dealbata*, *C. medullaris*, *C. smithii*, *D. fibrosa* and *D. squarrosa*. The corresponding heights in 67-year forests were 2.6, 9.2, 8.2, 2.8 and 7.8 metres.

The authors point out that commercial pine plantations may have significant conservation value for maintaining native plant species and that important factors are the mean rotation time and maintaining pockets of native forest or mature pine stands nearby.

Reference

Ogden J., Braggins J., Stretton K. & Anderson S. (1997). Plant species richness under *Pinus radiata* stands on the central North Island volcanic plateau, New Zealand. *NZ. J. Ecol.* 21(1): 17-29.

Versatile *Dicksonia antarctica*



D. antarctica in its native habitat in a Tasmanian forest.



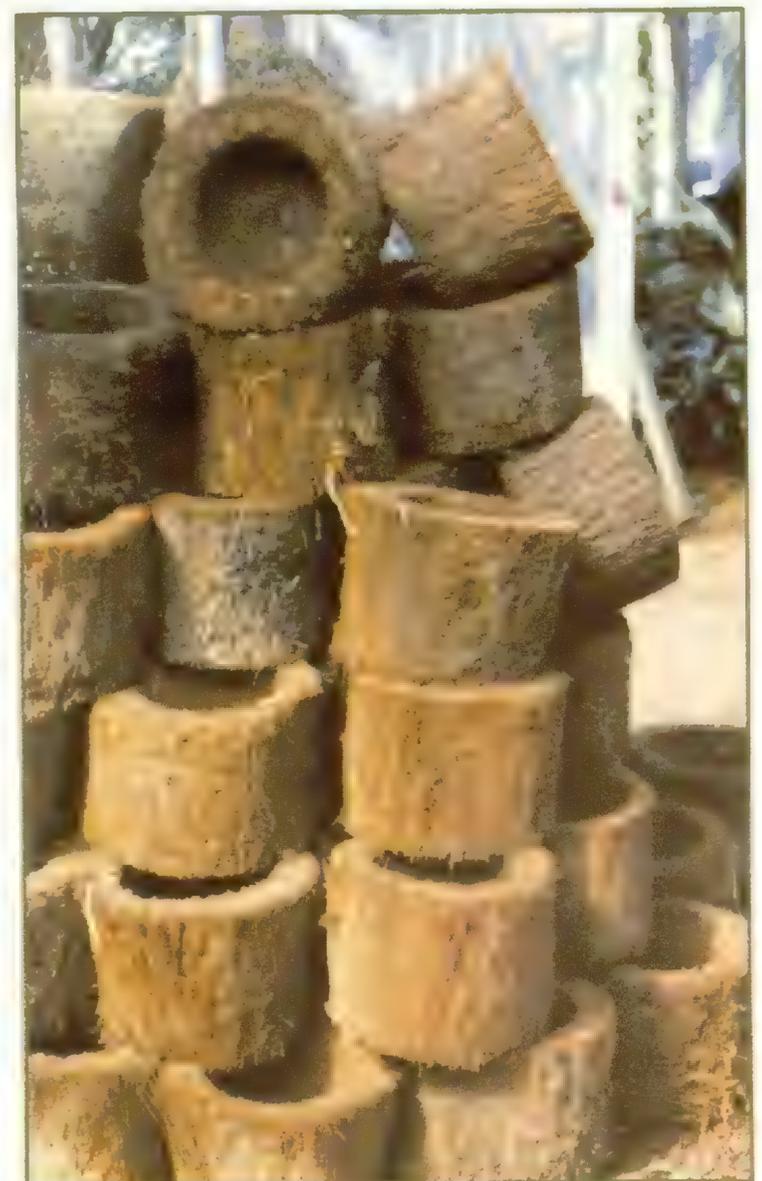
Salvaged trunks of *D. antarctica* being grown to a saleable size, in a former potato field, under the blazing Australian sun, on a farm south of Melbourne, kept moist by overhead sprinklers and protected from wind by ragwort (?), which they eventually shade out. With sun and fertilizer these tree ferns grow much faster than they would in the forest.



D. antarctica in Edinburgh, in the sunken courtyard of a café on Rose Street (behind Jenners store), exposed to the sky, without winter wrapping and without frost damage to fronds, post-winter.



Trackway of salvaged *D. antarctica* trunks over a wet patch in a Tasmanian forest.



Plant pots from *D. antarctica* trunks.

BRACKEN LORE

Bracken and Oaks

A voracious reader with an ear for oral tradition in Devon and farther afield, the Victorian botanist and folklorist, the Reverend Hilderic Friend, recorded much that still invites attention. Some of his notes on the bracken, *Pteridium aquilinum* L., are for instance worth pursuing, in particular the one which has it that the "root" of that plant, cut across, reveals the image of a minuscule oak (Friend, 1886).

It is easy enough to match this note. Thus, an informant tells me that, as a child in the 1950s at Cudworth, near Ilminster in south-west Somerset, he was taught to pull a bracken root out of the ground and then, for the clearest image of an oak-tree, to slice diagonally across the root (Patten, 2002). My own variant of this practice, learnt in the early 1940s in north Staffordshire, involved rather cutting across the stem, to reveal an image of the oak in which Charles II hid.¹ Writing in 1989, a Londoner even recalls being told as a boy that he would see Charles himself in the oak, and wondering as a result, what those would have seen who split bracken stems before 1651 (Vickery, 1995). There is an answer to this question, as we shall see.

For the moment, however, our concern continues to be with the version of the tradition that even led, in West Somerset, to *Pteridium aquilinum* being called the *oak-fern*. On this the dialectologist and folklorist Frederic Elworthy comments: "If the stalk is cut across near the root there are dark markings on the section which strongly resemble a very symmetrical oak tree" (Elworthy, 1888). The identical Norfolk name, recorded in 1878, is rather similarly explained. It comes "from the appearance of the vascular bundles in the rhizome" (Britten and Holland, 1878-86). To these rather detached accounts another must be added in which superstition plays a part. Dating back to 1853 and relating to "Croydon and elsewhere", it reads, "Cut a fern-root slantwise, and you'll see a picture of an oak-tree: the more perfect, the luckier chance for you" (Gibson, 1853).

Bracken and Initials

All this suggests a widespread and uniform tradition. In fact, there are

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**Sa che quando si taglia a
sghembo lo stelo di una felce,
ci si vede la figura
dell' Aquila bicipite?**

variations. A west Sussex note of 1878 refers to the custom "of cutting the common brake or fern just above the root to ascertain the initial letters of a future wife's or husband's name" (Vickery, 1995). About 1830, the same custom was known in East Anglia, while in 1887 it was recorded as far west as Cornwall. By contrast, an Irish belief of much the same period has it that the root of a fern cut transversely reveals the initial of a chief, "and to him it is thought the land on which this plant grew formerly belonged".

Yet another strand of the tradition can be followed as far back as 1816, to Thomas Wilkie, a native of the village of Bowden near Melrose in southern Scotland. He wrote that the witches there detested the bracken, "because it bears on its root the letter C, the initial of the holy name Christ, which may plainly be seen on cutting the root horizontally". The theme is taken up as late as 1979, when a correspondent, writing to a newspaper about a childish game called "Holy Bracken" and played in Scotland some seventy years before, spoke of the initials JC revealed by severing a fern stalk close to the ground. To find a well-formed example of this sacred signature was considered very lucky (Opie and Tatem, 1989; Roud, 2003).

Looking farther afield, we find that in Germany, from the second half of the seventeenth century onwards, there were names for *Pteridium aquilinum* along the lines of *Jesus-Christus-Wurzel* ("Jesus Christ root"), and these lead us back, not to Scotland, but now to Ireland, where our plant was called *fern of God*, "from an old belief that if the stem is cut into three pieces there will be seen on the first slice the letter G, on the second O, and on the third D" (Marzell, 1943-79).

Bracken and Eagles

It will already be clear that the scrying of shapes and letters in bracken stalks or rhizomes was not merely British tradition. Consider the present-day botanical name, *Pteridium aquilinum*. This goes back to *Pteris aquilina*, chosen in 1752 by Linnaeus, who in 1745 had noted: "Cut across obliquely, the root contains a fair likeness of the Imperial Eagle". The reference here is to the Two-headed or Double Eagle that from the twelfth century had formed the German Emperor's coat of arms and was, in 1806, to become the emblem of the Austrian Empire.

Whether or not Linnaeus was here recording his own observations, they were not without precedent. As early as 1551, the Protestant priest, physician and botanist Hieronymus Bock had written: "One other thing I must mention, that seems to me quite miraculous. It is that, as soon as the rhizome is cut through, each side of the section reveals a black bird with outspread wings, the whole representing an eagle with two heads against a white background." After explaining that this is in reality made up of tiny black veins in the rhizome, he goes on: "Have I not often wagered that with a single cut or stroke I would produce a clear-cut image of the Emperor's coat of arms?" Later, in 1625, another authority wrote: "If in Germany you cut the rhizome of the Great Fern across, you find an eagle in it. If you uproot it in France, you find a lily in it."

Certainly there turns out to be a well-established link between bracken and heraldic eagles. The German common name is in fact *Adlerfarn*, "eagle fern", and dialects of the language echo this in various ways.

No doubt similarly influenced by Linnaeus, other languages make the same connection, from Scandinavia to Italy. Even in France, despite the contention that a lily is the plant one might expect to see, *Pteridium aquilinum* is *fougère à l'aigle* or *fougère impériale*, the first of which Italian matches with *felce aquilina* (Marzell, 1943-79),² a name we may associate with a question put by the Italian writer Gabriele d'Annunzio (1863-1938): "Do you know that when a fern stalk is cut across obliquely, an image of the Two-headed Eagle is revealed?" (Battaglia, 1972). Compare here an anecdote recounted by the Viennese geologist and politician Eduard Suess (1831-1914). When, in the autumn of 1868, he was travelling in the Bergamasque Alps, he was held up by torrential rain, and had to spend two days in the hut of an ancient goatherd. Here he was fed on goat's milk and celery, and questioned much about his native land. Inspired by their lively talk, on the second day the goatherd took his guest by the hand and led him through pouring rain to where a large specimen of *Pteridium* grew. Cutting through its stem, he said portentously: "Do you see? Here God the Father has left the Emperor's imprint on our land. Here in the mountains we now know that it will again be his" (Marzell, 1943-79).

From Bracken to Bananas

The material so far presented must now be viewed in its wider context. With this in mind, consider first the following account from the Cotswolds, in which a pious man, employed in a sawmill and given to singing hymns while working, is taunted for his Christian faith by an aggressively atheistic workmate. Holding up a piece of wood that awaits the saw, the atheist says: "I ood as soon believe in thuk thur Cross as thee doost zeng about as I ood believe as thur's a cross in this yur bit o' ood!" Lo and behold! As the saw cuts through the wood, the perfect form of a cross is revealed at its centre. From that day on, the atheist is a different man (Hall, 1991).

This legend, which has a medieval ring about it, matches the accounts of sacred symbols to be found in bracken. These thus turn out not only, as we have seen, to have close counterparts in Europe, but also to be part of a wider tradition, according to which plants, and even some creatures, carry

within them evidence of divine truths. Here again, Hilderic Friend is a useful source of information. In the garden of a Cistercian convent in Rome there was, he tells us, a *zucca*, or gourd, which, when cut through, showed a green cross inlaid on the white pulp, and having at its angles five seeds, representing the five wounds (Friend, 1886).

Perhaps, though, the most elaborate representation of the Crucifixion is to be found in the passion flower *Passiflora caerulea*, which gets its very name from what Spanish friars saw in it on first coming across it in America. For them, it mysteriously displayed all aspects of Christ's passion, from the five wounds to the crown of thorns (Friend 1886; Marzell, 1943-79; Vickery, 1995).

As for creatures, rather than plants, that testify to Christ's sufferings, there is the pike, which bears the instruments of the Passion in its head, while in the bones of a cod you may see a cross (Hoffmann-Krayer and Bächtold-Stäubli, 1927-42). Compare also the cross on the back of the ass, a sign of its services to Christ, and the stag with a cross in its antlers, the sight of which converted the huntsman given to pursuing game when he should have been at church on red-letter days (Schneider, 1994).

For present purposes, however, the closest match to the bracken is, improbably perhaps, the banana. Of this Friend says that, in places as far apart as China and the Canaries, people shied away from cutting it through with a knife, because to do so would reveal an image of the Crucifixion (Friend, 1886). A more recent account reflects rather less sacred concerns. According to this, a girl can "ask" a banana whether her boyfriend is being faithful. "When the question has been put, the lower tip of the fruit is cut off with a sharp knife, and the answer is found in the centre of the flesh, either a Y meaning Yes or a dark blob ● meaning No" (Opie and Opie, 1959). Not surprisingly, perhaps, the same method could be used to solve other kinds of personal problem (Vickery, 1995). As with the bracken, a single aspect of one and the same plant is the focus of religious or quasi-religious belief on the one hand, and self-interested superstitious practice on the other.

Notes

1. Vickery's fourth account of how to find an oak in a fern is based on this information under the headword *bracken*. The attribution, given there as "Bath, Avon, January 1991" (Vickery, 1995), would benefit from amendment in the light of what I have said above.

2. Although its Italian name might lead one to believe otherwise, the *felce quercina* (Battaglia, 1972) does not contain the image of an oak ("quercia"). It is the Polypody, *Polypodium vulgare* L., once, but now no longer, known in English by the parallel name of *oak fern*, "because that species is frequently seen perched on the stems and branches of oak trees" (Britten and Holland, 1878-86; and see page 124 *et seq.*).

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FOCUS ON FERNERIES



Mount Lofty Botanic Garden was opened to the public in 1977, about twenty-five years after the first parcel of land had been purchased. It is in the high-rainfall region of the Mount Lofty Ranges, about 15 km east of South Australia's capital city, Adelaide. The Garden was established to display plant collections from temperate and cool-temperate regions of the world, to complement the subtropical, warm temperate and Mediterranean climate plants grown in Adelaide Botanic Garden (18.5 Ha) situated on the Adelaide Plain, and the South African and southern Australian collections at Wittunga Botanic Garden (15 Ha) in the upper foothills¹.

FERN GULLY *South Australia*

Nicola Fidler

Mt Lofty Botanic Garden, 16 Lampert Road, Piccadilly 5151, South Australia

Covering approximately 100 Ha, the Garden has a wide range of taxonomic, geographic, ecological and horticultural thematic plantings, aided by the complex topographic relief of the site with north and south facing slopes and sheltered gullies. Soils on the hillsides are very shallow, infertile acid grey podsol, with deeper, more fertile grey-brown podsol in the valleys.

The cultivated fern collection in Fern Gully comprises 91 genera in 27 families. In addition, eight native fern species: *Adiantum aethiopicum*, *Asplenium flabellifolium*, *Blechnum minus*, *B. nudum*, *B. wattsii*, *Cheilanthes austrotenuifolia*, *Pteridium esculentum* and *Gleichenia microphylla* occur in natural bushland on other parts of the property.

Fern Gully was established during the mid-1970s, in response to the growing public interest in ornamental horticulture. Also the increasing knowledge and horticultural skills to propagate ferns from spores contributed to the initial momentum of the project. It then became possible to obtain spores from overseas and to display comprehensive collections of exotic species and cultivars in the open garden, most of which were new to Australian gardeners.

The environment to grow ferns is created by Australian rainforest and rainforest margin species of trees, shrubs, climbers and other plants, principally the components of the Great Dividing Range and coastal brush forests of the eastern mainland states of Queensland, New South Wales and Victoria from as far west as the Grampians (Victoria). The plantings reflect the natural transition of these areas, from the wetter gully bottoms where ferns dominate, through the rainforest trees and shrubs on the slopes, to the drier outer edges and open heath areas.

Tasmanian species are represented in a spur gully to the west of Fern

Mt Lofty Botanic Garden Statistics

Geographical location	34°58' S, 138°42' E
Height above sea level	670 m
Temperature	
Mean daily minimum	8.1°C
Mean daily maximum	17.7°C
Lowest recorded minimum (24 June 1944, 9 July 1944)	-3.9°C
Highest recorded maximum (12 January 1939)	41.3°C
Mean annual precipitation	1191 mm (47 inches)

General view of upper Fern Gully: In the left foreground is *Cyathea muelleri* and in the right foreground, *Cyathea medullaris* with its characteristic dark skirt of dead fronds. In the middle distance is the tall thin-trunked *Cyathea cunninghamii* amongst *Dicksonia antarctica*. The head of the micro-sprinkler in the left foreground is approximately 3 m above the ground.



FOCUS ON FERNERIES

Gully and the gully to the east is devoted to New Zealand species, tying to the Australian plantings at the confluences of the creeks, which mark the boundaries of the sections. The adjacent gully to the west is planted with South American species. This deliberate juxtaposition also allows interpretation of the Gondwanan theme.

Fern Gully now displays a collection of ferns, both species and cultivars, drawn from worldwide sources. This is the only area of the Garden where ferns are the priority and the sprinkler system and watering regime have been designed for their needs. Water is delivered by microsprinklers set 3m high, supplemented by large-volume 'Monsoon' sprinklers used on heatwave days to raise the humidity. The length of time and frequency of watering is at the judgment of the gardener in charge. Inappropriate watering causes damage in two ways: not enough in hot weather results in visible wilting due to low relative humidity and ultimately to reduced growth rates; too much leads to excessive leaching of nutrients and the soil conditions becoming anaerobic.

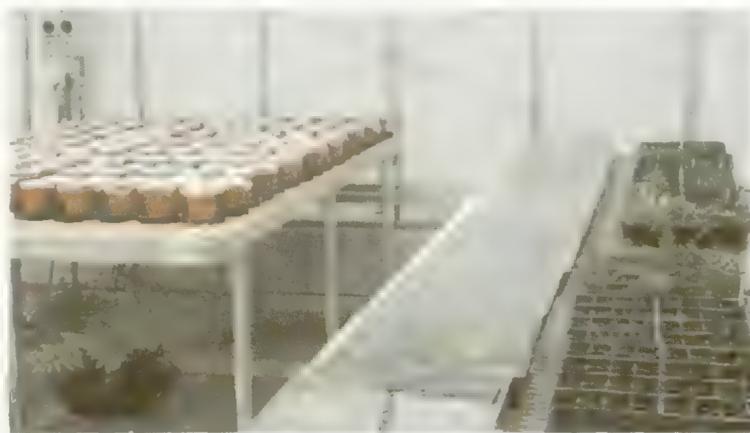
Seasonal horticultural activities include light applications in spring and autumn of 50/50 agricultural lime/crushed dolomite limestone, spring applications of Rapid Raiser™ (Neutrog Australia Pty Ltd)², an organic, pelletised fertilizer (N:P:K 4:3:1.5) and light applications of well-aged wood chips in spring and autumn. Weeds are controlled by hand-weeding and judicious herbicide use: fluziafop-butyl (systemic) for grasses and paraquat (contact) for broadleaf plants. Under an evergreen canopy of mainly *Eucalyptus obliqua* (Messmate Stringybark), there is a continuous 'rain' of leaf and twig litter which requires constant housekeeping to keep the fern crowns and pathways clear. The frequent attention also reduces the likelihood of feral blackbirds nesting in tree fern crowns, which can lead to rotting.

The most obvious fern components of the Gully are members of the Cyatheaceae and Dicksoniaceae. All Australian and New Zealand species are represented, plus many of those from other parts of the world. Based on the 2003 IUCN Red List of Threatened Plants^{3,4}, there are 210 (33.7%) and four (9.8%) members of Cyatheaceae and Dicksoniaceae respectively classified as threatened. Of the subsets Endangered and Vulnerable, *Cyathea kermadecensis*, *C. australis* subsp. *norfolkensis*, *C. brownii*, and *C. howeana* are in the collection. Additionally, there are several accessions from South America, Papua New Guinea and Pacific Islands grown from wild-collected spores which are yet to be identified to species level. Within the wider interpretation of the term 'tree fern'⁵, members of the genera *Leptopteris*, *Osmunda* and *Todea* (Osmundaceae) and *Sadleria* (Blechnaceae) are also displayed.

All other fern plantings are also conservation prioritised. For example, a species classified as *Endangered*, *Vulnerable* or *Rare* in the aforementioned IUCN Red List, where suitable, takes priority over the representation of others with little or no conservation value. However, this principle may be moderated, as some common and vigorous species help to create conditions to allow the growing of rarer species. Also it may be counter-productive to remove established 20-year old plants to make way for a rare plant which may not meet aesthetic expectations.

In our experience ferns display a great deal of horticultural 'flexibility', often thriving in conditions quite different from that of their native climatic range, which encourages us to trial species from anywhere in the world. In practice there are losses but, given that there is little or no cultural information for many species, I believe it is a tribute to the skill of our horticultural staff that we are able to grow such a wide range of ferns from so many different regions.

One of the challenges faced by a large public garden, insignificant to most private garden owners, is the potential for loss of specialist knowledge due to staff promotions, retirements, transfers and the like. Within the Botanic Gardens of Adelaide, mechanisms and routines have been established so that detailed knowledge is recorded and does not exist exclusively in the heads of individual staff members.



Spore pots and sporelings in the dedicated glasshouse.

Ferns grown from wild-collected spores are a significant asset in terms of the Botanic Gardens of Adelaide's world-wide role in *ex situ* conservation. Fern fertilization takes place after spore release and spores are therefore genetically uncontaminated, despite similar species growing in close proximity. This contrasts with the situation in flowering plants where seed from wild-collected plants in cultivation may be the result of hybridization. Furthermore, as the ferns in the collection are named and their history well-documented, their value as a source of spores for revegetation projects is very high. The interest generated among garden visitors by a memorable, botanically-significant fern collection displayed in a beautiful setting can also aid conservation programmes by raising awareness.

At the pure sensory level, it is difficult to be unaffected by a walk through Fern Gully, whatever the season. It is a cool lush green haven on a hot summer's day and in winter, the effect of misty rain is truly magical. Come and visit us if you are ever in Adelaide.

FOOTNOTES

- 1 www.botanicgardens.sa.gov.au
- 2 www.neutrog.com.au/index/home
- 3 Wardlaw A.C. (2002). Conservation of tree ferns *ex situ*. *Fern Gaz.* 16: 393-397.
- 4 www.redlist.org
- 5 Large M.F. & Braggins J.E. (2004). *Tree Ferns*. CSIRO Publishing, Australia.

AROUND YORKSHIRE

Brodsworth Hall, Doncaster

Most of the ferns in the Baker collection are doing well and are a real picture. Another 300 plants have been planted, not in the quarry but nearby, and a further 300 will be added soon.

Askham Bryan College, York

The college is planning to plant three ferneries in woodland, a wet area and on limestone. Askham Bryan specialises in horticulture and already some of the students and staff are showing quite an interest in the world of the pteridophytes. So far there has not been any mention of horsetails etc. but who knows, given time.

York Cemetery

This planting continues to expand slowly. It was a very pleasant surprise when I had a letter from a BPS member from Leeds telling me that he had a number of good plants which he was willing to donate. They were duly delivered and we planted around twenty more ferns in an area which the cemetery staff had prepared.

If members have any rare or unusual ferns they are willing to donate to any of these projects will they please contact Jack.

Jack Bouckley
209 Woodfield Road, Harrogate HG1 4JE

ATTADALE GARDENS

Two large beds by the paths leading to the fern house have been landscaped and planted with ferns which had been temporarily planted in the storage area (see *Pteridologist* 4: 3, 2004 88-9).

Last year we collected spores for propagation from most of Peter Hainsworth's collection (and others) and I can say that the process was kind to us. At the time of writing we are about to start transplanting our sporelings into 3" pots from plug trays and hope that we shall be able to have examples of some 100 different varieties next year.

Geoffrey Stephenson, Head Gardener
Attadale Gardens, Strathcarron IV54 8YX

PATIENCE IS A VIRTUE

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Some of the first advice I was given (and pass on) about growing ferns is that they require lots of patience. How true that is! A few years ago, in a garden centre, I saw a "platycerium pole" - platycerium growing out of holes cut in the side of length of plastic drainpipe. Inspired by this, I made something similar by wrapping cork tiles (softened with steam) around an 18-inch length of 4 inch diameter drain pipe, then cutting two 3 inch diameter holes in the side. I glued a drip tray to the bottom and planted a

P. bifurcatum in each hole, attached with some ribbon around the pole. I used orchid compost to fill the pole.



All was fine until early 2002 when one of the platyceriums snapped off under its own weight, despite the supporting ribbon. Try as I may, I never did manage to revive the bit which fell off and I never got round to plugging the gap in my pole, either with another platycerium or a piece of cork. The remaining platycerium continued to flourish. Imagine my pleasure when some two years after the disaster a baby platycerium started to grow out of the hole - presumably from the root mass which had been left behind. A year on it is still growing, having put out both the "shield" fronds and "stag horns". As they say, sometimes it does pay to wait.

ECOLOGISTS' COALITION

WHO KILLED THE LADY?

Ecological disciplines are combined to solve a puzzle

James Merryweather

When I visited the gorge of *Allt a Ghiubhais* (Mountain stream with Scots pine) in north-west Scotland in the company of a zoologist friend we, as it were, went our separate ways together, one searching for interesting plants, the other for mammal tracks and signs.

High above our heads the native pines after which the gorge is named clung to the cliff sides and the trees dominating the steep, mossy slopes were mostly birch with a few pines, some achieving magnificent stature where they rooted here in richer soil. The rocks of the gorge are base poor and free draining, and do not support a particularly rich flora. Even in late March it is relatively easy to identify most ferns from their dead fronds and the expected abounded: *Athyrium filix-femina*, *Dryopteris filix-mas*, *D. affinis* subsp. *borreri*, *D. dilatata*, *D. aemula*, *Oreopteris limbosperma*, *Blechnum spicant* and *Hymenophyllum wilsonii*. Oak and beech fern were almost certainly there too, but not detectable unless you knew exactly where to look for withered frond remains.

When we began the scramble into the gorge the zoologist soon discovered signs left by the otters as they climb the rocky streambed on their way all the way from the sea to lochans high in the hills. They deposit "spraints", she explained, characteristic cylindrical faeces or oily blobs and smears, placed on prominent rocks and elevated turfs to mark their territorial boundaries, routes of passage and activity sites. Sprainting stations are easily seen, once you get your eye in, for regularly used grassy sites are domed humps which are greener and denser than their surroundings due to the fertilising effect of the droppings. The vegetation on marked rocks may be urine scorched so they are bald on top, their sides colonised by what seem to be specialists; tolerant micro-algae and mosses. A close look soon confirms the presence of spraints and the bold may care to take a confirmatory sniff, for the odour is not unpleasant and there is none other like that of otter: musky and sometimes quite fishy. The spraints here contained bone fragments that had belonged to no fish, and were probably evidence of a frog feast.

My friend was cautious, however, not to presume otter, for other mustelids (marten, weasel, stoat etc.) leave deposits like these, the most notorious being the increasingly common alien, mink. I understand that, unlike otter spraint, mink scat (faeces) smells vile, but here the odour was quite pleasant, indeed distinctly ottery.

There was similar evidence of animal activity a few metres above the streambed, a recess in the rocks that was obviously a recently occupied den. Within the den there was plenty to show that it had seen decades of use, for the floor was devoid of vegetation; just a deep layer of dry dung. The entrance was a maze of tracks worn through the vegetation. At first we assumed it was an otter's "holt".

In relative safety, well to the left of the entrance, there was a lady fern with crosiers just beginning to unfurl. Right in front, was another with several crowns, but it was stone dead. It had been mercilessly trampled, and something had defecated on it innumerable times. Right on top of the uppermost crown was a fresh slimy deposit, which at first looked like an otter spraint of the liquid sort, but when checked for that familiar odour there was none. On reflection, it did look too pallid and gooey. If not otter or mink, for the smell was not at all revolting, then it seemed likely that pine martens must be the den's occupants and it was they that deposited the corrosive markers and killed the fern. However, there must have been a period when the

den was unoccupied, for the fern had had the chance to grow to maturity before being heartlessly murdered by a family of inconsiderate animals.

There is rather more mammalian dung here than pteridology. I am grateful to have received some observations from Adrian Dyer which redress the balance and might provoke further discussion:

When we talk about the potentially lethal effects of mammals on ferns, we speak of e.g. grazing damage and treading-disturbance. I can recall no talk of pteridocide by dunging and it is an interesting addition to the list of hazards in the life of a fern. It is maybe too localised to be significant for survival of a common species but perhaps potentially important for small populations of rare species.

However, this introduces the broader issue of the interaction between ferns and vertebrates, about which we know little. Perhaps there is little to know. There are some observations on insects and bracken, and bracken is no doubt cover for some birds and mammals, but what about other fern species? Could, for instance, a large stand of *Dryopteris dilatata* form a habitat with particular characteristics that are favoured by animals? In the reverse direction, some animals benefit ferns, at least to the extent that soil disturbance, or even in the case of burrowers, excavation, is probably important in providing micro-habitats for gametophyte establishment.



Mammal den. 1 Living lady fern with expanding crosiers; 2 Dead lady fern; 3 Grey blob of faeces (Pine Marten?) on top of faecal heap & fern.



WHY RECORD FERNS?

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BIOLOGICAL POTENTIAL OF FERNS AS ENVIRONMENTAL MONITORS

Ferns have never been so important, for they are of potentially high indicator value, especially of change. Six main innate properties of ferns combine to provide their species with particularly high monitoring strengths:

- 1 Most ferns, as species, are highly mobile with time, for, in contrast to flowering plants, ferns spread by minute airborne spores. At least some of these are likely to become blown for appreciable distances.
- 2 This high dispersability combines with often quite short generational intervals, and thus potentially short minimum life-cycle turnover times.
- 3 Most ferns then become long-lived perennials, with spores produced annually in prodigious numbers. Many can additionally bank spores in soils (Dyer & Lindsay, 1992), adding to the potential sources from which new plants may appear, even from beyond the range of present plants, if environments change.
- 4 It seems characteristic of moisture-loving plant and animal groups in general, that they have particularly high environmental sensitivities (Page, 2001), while specific conditions may be especially important at critical life-cycle stages.
- 5 Many pteridophytes are tolerant of a wide range of edaphic (rock and soil) types, which include a range of nutrient-poor terrains, bare rock surfaces, and of a great variety of disturbance surfaces, both natural and man-made. Sites for fern establishment are then overridingly microclimatically prescribed (Page, 2004; 2005b).
- 6 Ferns are relatively large vascular plants, for which the presence in the field is thus easily detected, and unusual changes can rapidly come to notice. Many can also be recorded on a year-round basis.

In combining the many biological elements of these ecological assets, fern ranges thus have great potentials to adjust rapidly with time to detailed changes in a wide range of terrestrial environments (Page, 2001; 2002b). Rather few other biological groups possess all of these abilities.

PURPOSE AND SCOPE OF FERN RECORDING

Change is almost always both a vital and an integral component of the dynamics of pteridophyte occurrence (Page 2001; 2002a, b). But the collection of records of the occurrences and distributions of ferns and fern allies, and of changes in their patterns of ranges, has for all too long been regarded as the sphere more of 'vicars in dog-collars and elderly ladies in tweeds', than of scientists. However, such recording is a collective exercise, and pteridology owes much to generations past for the achievements to date, laying clear foundations for today's comparisons, in which Britain and Ireland have particularly excelled (Jermy *et al.*, 1978).

New information may be as simple as filling perceived geographic 'gaps' to find locations for species not hitherto known. Such 'fern hunting' has always been one of the aims of fieldwork. But such fieldwork also stimulates us to look more closely at what we have (and have not) in any one area, and also to examine critically taxa encountered that 'look different'. Such recorders provide many separate 'eyes' with which not only to spot the unusual, but also to observe change.

QUALITY AND QUANTITY OF DATA

All pteridological information is only as good as the *quality*, rather than just the *quantity*, of the data collected. Information on unusual finds, such as of the occurrence of taxa out of their usual range, or of questionable taxa, needs to be competently checked and authenticated as necessary. In Britain and Ireland at least, but increasingly too in Europe and further afield, we are fortunate to have a number of dedicated biological recorders, widely scattered but each expert on their regions, while BSBI has also taxonomic referees.



Field discussion of *Cystopteris diaphana* in Cornwall. The author with Ian Benallick & Rose Murphy.

PHOTO: IRINA GURFYEVA

FERN RECORDING



Tunbridge filmy fern (*Hymenophyllum tunbrigense*)
in West Argyll, Scotland.

PHOTO: CHRIS PAGE

Provided that adequate field data are collected initially, the ultimate deposition of record vouchers and of novel materials in herbaria is especially important. These serve to permanently authenticate species occurrence in both place and time, and provide a firm basis if future taxonomic challenges (and taxonomy is always evolving) should require retro-authentication of earlier records. Fortunately, shoots of horsetails or fronds of ferns can usually be collected and preserved with minimal damage to persistence of the plants in the field, and sent for refereeing as necessary.

SCALES AND MEASURES OF CHANGE

There is a very great need in pteridology, worldwide, for accurate recording of changing patterns of fern distributions which can throw light on overall environmental changes and trends at a great variety of scales (Page, 2001; 2005b). An important element of this is that, especially with the aid of modern computing programmes, data can be accurately presented in a wide variety of forms and can be constantly updated in ways at which our Victorian forbears would have marvelled (and some of us still do!). In assimilating and presenting this information, pteridophyte atlases vary in range from the continental (Jalas & Suominen, 1972) to the national (eg. Jermy *et al.*, 1978) and to the county scale (e.g. Murphy, Page & Parslow, 2005). There is something to be learned from every scale: the larger the scale, the wider are the generalisations which can be drawn on the basis of critically-checked distributions; the smaller the scale, the more detailed is the level at which data can be handled and trends first perceived and identified.

But, importantly, there are also observations to be made at scales varying from the local down to population level and to the minute. All are scales at which individuals can most closely observe local change. Recurring factors of the habitat itself, including disturbance regimes, also vary in scale, usually from the small to the minute, yet can be vital in opening new situations for prothallial establishment (Page, 2002a, b; 2005a). In this, the sheer dynamism of pteridophytes in the field needs to be recognised, and direct

application of simple, low-tech, low-cost field experimentation is clearly possible. Critically recording such details is an important forward role to be achieved by pteridologists, with information derived from the local picture ultimately providing the fundamental basis of the interpretation of the wider view.

WHAT WE NEED TO RECORD

What we need to know most on smaller scales is how populations and their component species change with time, and how such changes link to shifts in their habitats. Is there a steady population turnover of ferns with time? How static or mobile are the habitat changes themselves? Are elements of pattern-and-process involved and are these cyclical? Or are changes seral, and if so how does the pteridophyte component respond to changes in relation to the habitats around them? What stimulates the suitability of the microsite origin of establishing gametophytes, and where do these arise? How many plants succeed and how many fail, and what time-scales are involved? Is species diversity habitat-prescribed, and if so, at what stage in their establishment? What conditions prescribe greater suitability for one species than another? On these scales, probably little is stationary, and complex patterns are often likely to be subtly involved. Deducing cause and effect is the challenge.

Important beginnings in such studies were made particularly by Bob Lloyd and Michael Cousens in America from the 1980s, and more recently, they have been independently taken forward in exquisite detail by Irina Gureyeva in Russia (e.g. Gureyeva, 2004). I am fortunate to have spent time in the field with each. Their first-hand observations add substantially to our understanding of the wider picture of change, and in these days of high-pressure research targets and costly gadgetry, such quiet but enquiring observation of ferns shows well what can be achieved by pteridologists armed with little more than what the military would call the Mk.1 eyeball, and deductive reasoning to go with it.

FERN RECORDING

CONCLUSIONS: THE CONTINUING RECORDING ROLE FOR PTERIDOLOGISTS

Pteridology has for too long preached mainly to the 'converted'. Yet ferns and fern-allies are potentially valuable, in the short-term as well as the long-term, as sensitive bio-monitors of terrestrial change. This alone is a conspicuous reason why we should continue to apply such strengths critically and more widely. Meanwhile, our fern habitats provide valuable field-laboratories in which to discern incipient stages of change and relate these to the environment, while the innate biological potentials of ferns enable them to act recurringly as rapid-response agents. What we have to do is to read them.

Further, if information on change is to be current, it also needs to be re-checked in the field at intervals as necessary, and thus constantly updated. Such recording will, of course, also inevitably establish further new information about the *field biology* of the plants themselves. This has certainly proved to be the consequence with applied-science interest in *Pteridium*. But to have such a clear use for data from ferns in wide and immediate issues is also an important plank in helping to ensure their forward conservation.

It is therefore up to pteridologists, both amateur and professional, in close co-ordination, to set this importance of recording pteridological data against the wider evolving picture of change, and show that data from ferns has a distinctive, and especially sensitive, recurring role to contribute. The recording of ferns achieved to date, the data emanating from it and the atlases based upon this work, are thus not the end of the story for pteridology. Instead, we should see them as vitally important foundations upon which now to build a sound future. All it needs are pteridologists with time to spend in the field, and the eyes and brains to do this.

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Pinewood bracken (*Pteridium pinetorum*) - holotype clone in Inverness-shire, Scotland, 1983.



PHOTO: CHRIS PAGE

AN EARLY SCOTTISH PTERIDOLOGIST

An ingenious gentleman and an accurate botanist.

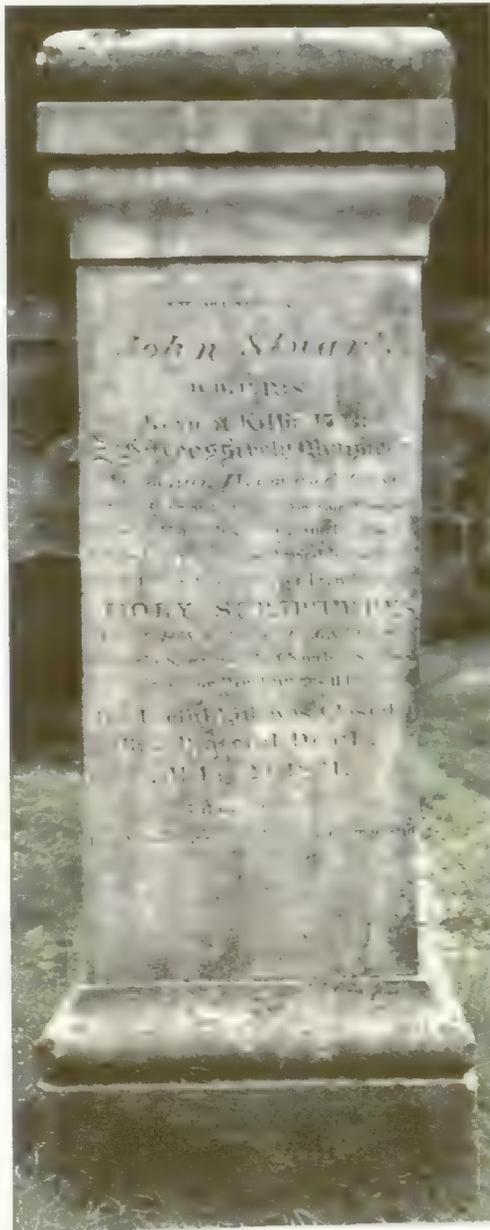
So wrote naturalist and diarist James Robertson in August 1771 after meeting John Stuart, a newly qualified theological student who had yet to be appointed to a charge. In the mid 18th century this young man's knowledge of the Scottish mountain flora was indeed almost without equal, posterity having since credited him with a dozen 'first records' of montane flowering plants in Britain, either solely or in company with others. Although Stuart published extremely little on natural history, a surviving handwritten account of the flora of Schiehallion in Perthshire - which he compiled after a field visit in September 1776 - confirms that ferns were not neglected. When one considers the inadequacy of the plant identification books of the period, the twelve ferns and allies he named was a reasonable total for this not exceptionally productive hill.

The publication of *Flora Scotica* by the Reverend Lightfoot in the following year undoubtedly did much to reinforce John Stuart's

Rev. John Stuart D.D., F.R.S. of Luss (1743-1821)

John Mitchell

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botanical reputation. Understandably, the majority of the records directly attributed to Stuart in this work are of flowering plants, but a number of his cryptogamic finds are also listed, including holly fern *Polystichum lonchitis* from near his home at Killin amongst the Breadalbane Mountains.

After serving briefly at Arrochar and Weem, in July 1777 the now Reverend Stuart moved to what proved to be a permanent post for the rest of his life at Luss Church in Dunbartonshire (the picture is of the old church, demolished in 1874). A conducted tour of the manse garden, which contained a variety of Scottish

arctic-alpines gathered together by the new incumbent, became a must for every scientifically-minded traveller using the military road up the west side of Loch Lomond. From the correspondence of James Edward Smith (Founder and first President of the Linnean Society) it is evident that ferns too were on show, woodsia (*W. alpina?*) and marsh clubmoss *Lycopodiella inundata* being of particular note. Stuart's eldest daughter Elizabeth - who shared her father's passion for botany - would also take those interested to where royal fern *Osmunda regalis* grew wild nearby. Regrettably, no trace of the Reverend John Stuart's plant collection can be found in the manse garden today, but for those who wish to pay their respects to this early fern enthusiast, his burial spot marked by a monumental pillar can be visited in Luss kirkyard to the east of the church.

POSTSCRIPT

After entering Luss kirkyard through its attractive lych gate, the first memorial at which many visitors pause to read its inscription is dedicated to Sir James Colquhoun. In December 1873 the local laird lost his life when the boat in which a deer hunting party was returning from one of the Loch Lomond islands was overwhelmed in a storm. Pteridologists are likely to be more drawn by the same stone's basal decoration, but it is far from certain they will come to a firm conclusion as to which species of fern the carvings are meant to represent.



BRITAIN'S NATIVE TREE FERNS

being those
that live on
trees rather
than as trees

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INTRODUCTION

The sight of a well-grown plant of *Dryopteris dilatata* half-way up an oak tree prompted me to think about ferns as epiphytes (Fig. 1). Epiphytes are plants which have no roots in the soil and live above the ground surface, supported by another living plant (Tootill, 1984) but not parasitic upon it. About 30% of pteridophyte species are epiphytic (Ingrouille, 1992; Camus, Jermy & Thomas, 1991) and most fern families are represented.



Figure 1. Broad buckler fern (*Dryopteris dilatata*) as an epiphyte on an oak tree.

Figure 2.
Wilson's filmy fern
(*Hymenophyllum wilsonii*) on the
bole of a small
birch. see Fig. 4



PHOTO: JAMES MERRYWEATHER

Most species in the Hymenophyllaceae, Grammitidaceae, Vittariaceae, Polypodiaceae and Elaphoglossaceae are epiphytic, accounting for more than 80% of all fern epiphytes; almost half the remaining epiphytic species are in the genus *Asplenium* (Dassler & Farrar, 2001). The Polypodiaceae alone contain more than one quarter of all epiphytic fern species with some genera, such as *Microsorium* and *Polypodiopsis*, consisting entirely of epiphytes (Kramer & Green, 1990).

Although rarely stated explicitly, many epiphytic species are obligate epiphytes, not found on any other substrate; for example *Asplenium hypomelas* grows only on tree ferns, and *Hymenophyllum malingii* is almost entirely confined to the New Zealand cedar *Libocedrus bidwillii*. With no access to the nutrient reservoir in the soil, an epiphyte has to obtain its nutrients from the air, rainwater, decaying organic debris trapped on the surface of the supporting plant, and wind-blown dust. It is therefore no surprise that they are typically found in wet forests, particularly in tropical areas (Page, 1979). Some epiphytic species can also be epilithic, growing on rocks; these species are facultative or opportunistic epiphytes.

BRITISH FERN EPIPHYTES

There are at least six species in the British fern flora that are opportunistic epiphytes. The two *Hymenophyllum* species grow on freely draining rock surfaces and lower parts of tree boles in humid locations, particularly in the west of Britain (Fig. 2 left and 4 opposite). *H. wilsonii* is more often epiphytic than *H. tunbrigense* (Page, 1997). The three *Polypodium* species spread over well-drained rocks and walls and also grow epiphytically on rough-barked trees such as

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oak. The calcicolous *P. cambricum* is epiphytic more rarely and locally than is *P. interjectum* (Fig. 3) and the calcifuge *P. vulgare* (Fig. 5 overleaf). *Polypodium* species tolerate drier conditions than *Hymenophyllum* but only grow as epiphytes where moisture is readily available, notably in western Britain. In the wettest habitats, *P. vulgare* is predominantly epiphytic. In drier areas, including south-east Scotland, it is only epiphytic on trees close to water. All five species share the characteristics that they have creeping rhizomes that spread over well-drained surfaces, whether rocks or trees, producing single fronds at intervals along their length.

The only other British species that I have seen growing epiphytically is *Dryopteris dilatata* (but see post-script). It is typically a terrestrial fern in moist but well-drained, more or less acidic, woodland. In moist areas, young plants will develop on porous rock surfaces and hummocks around tree boles, and will reach maturity in pockets of humus in rock-faces, including walls, and on rotting logs and stumps. "In old, undisturbed woodland in areas of high humidity..." it "...frequently becomes epiphytic on rough-barked trees, especially where humus collects at the bases of their branches." (Page, 1997).

Even in the relatively dry climate of south-east Scotland, epiphytic individuals of *D. dilatata* can be found, usually in trees overhanging rivers in ravines. An example of such a location is Roslin Glen (Landranger map 66; NGR 36/276 628), where annual precipitation is typically about 950 mm. Except where there are steep cliffs, both sides of this ravine have been covered in native deciduous woodland for at least 250 years and have many of the plant species characteristic of ancient woodland. *Polypodium vulgare* occurs up to 12 m from the ground, usually growing on forks of large branches of old oak trees that are arching over the river. *D. dilatata* is more common than



Figure 3. Western polypody (*Polypodium interjectum*) on an oak tree in Cornwall.

Polypodium as an epiphyte at this location. It occurs on three times as many trees, all oaks, and there are up to four plants on each tree. The epiphytes occur at 2-12 m above ground level, usually in old wounds created by the loss of large limbs. In one case, a large plant of *D. dilatata* is accompanied by *Vaccinium myrtillis*, confirming the acidic nature of the accumulated humus. In the same area, *D. dilatata* is a prominent component of the ground flora, providing a source of abundant spores, but it is not the only fern species nearby. Of the 15 other species recorded locally, *Athyrium filix-femina*, *Blechnum spicant*, *Dryopteris affinis*, *D. filix-mas* and *Pteridium aquilinum* are also common, but only *P. vulgare* and *D. dilatata* occur as epiphytes.

D. dilatata occurs on trees further up the ravine slope than those with *Polypodium*, up to 100 m from the river and level with the top of the ravine. This indicates that when growing as an epiphyte, *D. dilatata* can establish in less humid conditions than can *Polypodium*.

This idea is reinforced at another site, at Muir O'Dean Wood on the Dalmahoy Estate, (Landranger map 65; NGR 35/152 685) about 15 km NW of Roslin and at the same altitude (115 m asl). Precipitation has been about 1000 mm in recent, unusually wet, years. The wood consists of some 10-15 hectares of mixed, largely deciduous, woodland on a generally level site. Of about 100 oak trees examined, only two had epiphytic plants of *D. dilatata*. One is growing in a very open situation about two metres above ground level on the western edge of the wood (Fig. 1). Although there is a pond ringed with alders within the wood, there is nothing to suggest that this fern is in an unusually humid place; on the contrary, it is on the south side of the trunk, facing away from the wood and often exposed to direct sunlight. The fern is well established in the hollow base of a lost branch and has multiple crowns and is fertile. *D. dilatata*

Figure 4. Epiphytic *Hymenophyllum wilsonii*



PHOTO: JAMES MERRYWEATHER

BRITISH 'TREE FERNS'

dominates the floor of the wood over an area of more than a hectare, the nearest plant being 50 m from the tree; scattered individuals of *A. filix-femina* and *D. affinis* also occur but *P. vulgare* is not present.

THE ECOLOGY OF FERN EPIPHYTES

The successful establishment of plants of *D. dilatata* in these two locations raises interesting questions about the ecology of this species, of other British facultative epiphytes, and of epiphytes in general. It could be argued that there is nothing remarkable about these occurrences. Large numbers of *D. dilatata* spores are in the air around these trees every summer, and if some land on organic detritus caught in crevices, then it is not surprising if some develop. However, the resulting ferns then have to survive the same conditions as an obligate epiphyte, depending on rain water, either directly or running down the trunk, and the accumulation of decaying leaves for most of their mineral nutrition. Moreover, none of the other ferns common in the immediate neighbourhood of the trees are successful at establishing epiphytically, and this is apparently generally true throughout Britain for all other native species apart from *Hymenophyllum* spp. and *Polypodium* spp. (but see Postscript).

True epiphytes are either humus epiphytes or bark epiphytes (Ingrouille, 1992). Humus epiphytes establish in pockets of humus trapped on trees; many of them are opportunistic epiphytes growing equally well in humus trapped among rocks. Bark epiphytes spread over the surface of the tree by means of creeping rhizomes with clinging roots; they have to tolerate even more limited access to water and minerals, having access only to what is trapped in crevices in the bark or among their own fronds. Many of these are highly adapted obligate epiphytes with xeromorphic features such as reduced, leathery or succulent leaves and modified (CAM) photosynthesis to

reduce water loss. Others, like *Asplenium nidus* and *Platycerium* spp., have overlapping upright fronds to trap water and humus.

THE ECOLOGY OF *Dryopteris dilatata* AS AN EPIPHYTE

Dryopteris dilatata is clearly an opportunistic humus epiphyte. Unlike *Polypodium* and *Hymenophyllum*, it rarely establishes in the small crevices of rough bark, except occasionally in a large fork. It seems to need larger amounts of humus, such as can accumulate in hollow branch stumps



PHOTO: JAMES MURRY WEATHER

Figure 5. Common polypody (*Polypodium vulgare*) on oak.

and wounds left by fallen limbs in the lower parts of older, larger trees. This may be because, unlike the other British epiphytes, it does not have an extended branching rhizome but a short stout near-vertical stem or caudex with a crown of fronds at the top and roots towards the base. It requires a deeper substrate for the anchorage necessary to support the shuttlecock of fronds and resist disturbance by wind, although this does not explain why it is epiphytic on oak but not so on adjacent alder, beech and birch trees with similar damage. The humus accumulation then provides a reservoir for water which better enables the fern to withstand short periods without rain. The humus probably creates acidic conditions, which will be suitable for *D. dilatata*

but this does not explain why *Athyrium filix-femina* or *Blechnum spicant*, also present on the adjacent woodland floor, do not establish alongside *D. dilatata*. The ecological requirements of all three species have something in common as indicated by the fact that they are all placed in the 'Sub-Atlantic' group and all are more abundant and more capable of spreading into open habitats in areas of high humidity (Page, 1988). However, it appears that *D. dilatata* possesses some unknown quality lacking in the other terrestrial species that makes an epiphytic existence possible.

The sporophyte has no obvious adaptations to an epiphytic existence but little is known of the ecology of the gametophyte. It is known that most of the variation in fern gametophyte morphology occurs among epiphytes and most epiphytes have long-lived and clone-forming gametophytes (Chiou & Farrar, 1997; Dassler & Farrar, 2001). In the Hymenophyllaceae, Grammitidaceae, Vittariaceae and Elaphoglossaceae, the gametophytes are elongated (ribbon-like, strap-shaped or filamentous), and usually branched. This would probably be an advantage for establishment in a mat of intertwined bryophyte protonemata. The species that have been cultured proved to be unusually slow-growing; this may be a general characteristic. The Hymenophyllaceae and Grammitidaceae produce green spores and together with the Vittariaceae produce dispersible gemmae, but it is not clear whether these are in any way linked to success as an epiphyte. Some members of the Polypodiaceae (such as *Lepisorus thunbergianus*) also have persistent, strap-shaped or ribbon-like clonal gametophytes but most form cordate (heart-shaped) prothalli. However, these may eventually produce more-or-less cordate proliferations from the margin or surface, and "persistent growth and clone formation may be characteristic of the family" (Chiou & Farrar, 1997). It is tempting to conclude that persistent growth and clone formation, if not always elongated growth, of the

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gametophyte are associated with success as an epiphyte. However, in some terrestrial species, senescent cordate prothalli sometimes regenerate new prothalli along the margin. Indeed, Chiou & Farrar (1997) claim that gametophytes of most, perhaps all, fern species are capable of regenerating new prothalli from older ones. Furthermore, there is no evidence that the prothalli of the epiphytic species of *Asplenium* differ significantly from the cordate, relatively short-lived, ones described for terrestrial *Asplenium* species. Clearly, the formation of cordate gametophytes neither precludes nor ensures establishment as an epiphyte.

The gametophytes of the British species of *Hymenophyllum* are typical of the family; they form branching elongate filaments. The gametophytes of British *Polypodium* species are cordate but little other information is available about them; they develop from spores that are the largest in the British fern flora. The cordate gametophytes of *D. dilatata* develop relatively rapidly, producing sporelings in about four months in the greenhouse, and are relatively short-lived, though unfertilised prothalli may live for one to two years. In these respects, *D. dilatata* is not obviously different from other common terrestrial woodland ferns. Nothing that is known about the gametophytes would explain why *D. dilatata* is regularly found as an epiphyte, and the others are not.

THE NEED FOR FURTHER INVESTIGATION

A better understanding requires more observations on the occurrence of *D. dilatata* as an epiphyte throughout Britain: its hosts, its location on the host, and its surrounding habitat, including the presence or absence of epiphytic *Polypodium*. Of equal interest would be reports of other normally terrestrial British species occurring as epiphytic individuals. There is one report (see postscript) of *Polystichum aculeatum* growing epiphytically, despite being known as a species of calcium-rich mineral soils. *Phegopteris*

connectilis and *Gymnocarpium dryopteris* can occur in woodland with *D. dilatata* and *Polypodium* and they have a creeping branched rhizome which would seem to make them potential epiphytes, but do they ever establish on living trees?

Investigations of gametophyte development in *Polypodium* spp. and *Dryopteris dilatata*, and comparisons with non-epiphytic species present in the same woodlands such as *D. affinis*, *D. filix-mas* and *Athyrium filix-femina*, might reveal why *D. dilatata* is capable of an epiphytic existence. This in turn might indicate the factors which prevent exclusively terrestrial species from establishing as an epiphyte and even suggest what it is that prevents the obligate epiphytes found in other climates from establishing on the forest floor.

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EPIPHYTIC FERNS

POSTSCRIPT

James Merryweather

Drafts of Adrian's article increased my awareness of truly epiphytic ferns, as opposed to those that grow on rotting logs and stumps. I have been able to add to his short list of British 'tree ferns'.

Just beyond the last house in the hamlet of Leacanashie (high above the north shore of Loch Carron in the Western Highlands of Scotland, NG8504535590) there are half a dozen mature plants of *Polystichum aculeatum* thriving at an elevation of a couple of metres in the branch angles of a horizontal ash tree.

STOP PRESS Adrian reports that he has recently seen epiphytic *Athyrium filix-femina* in Puck's Glen near Dunoon, Argyll & Bute (NS151841).



WORLD FERNS

SOME FERNS OF THE SANTA MONICA MOUNTAINS

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Figure 1. *Pellaea andromedifolia* (above, left) with *Pentagramma triangularis*

Santa Monica Mountains. These hills only get above 1,500 feet in a few places. Here, however, we see a truer Southern California landscape, for, unaided by sprinklers, these semi-arid hills present a unique eco-system. Rolling dry hilltops and steep canyons of friable, pock-marked sedimentary rocks support a decidedly xerophytic vegetation known as *chaparral*. The dominant shrubs of the hills and ridges are *Ceanothus* spp., *Rhus* (*laurina* and *integrifolia*), and an unidentified



Figure 2. *Selaginella bigelovii*

Los Angeles and its environs are not likely to raise the expectations of a fern lover. Palms, especially the Skyduster (*Washingtonia filifera*), sculpturesque agaves, eucalypts, and many other near-naturalised exotics are there in plenty, but it does not look like fern country. There are, of course, some oases for the pteridologist. The Mildred Matthias Botanical Garden, close to the UCLA campus at Westwood, has an interesting array of (non-indigenous) ferns in its shadier and damper spots; and a wonderful experience is in store at Barbara Joe Hoshizaki's garden near Hollywood. However, it may come as a surprise to learn how easy it is to find a number of beautiful native species within a not-too-distant view of the Paul Getty Museum and the Pacific Coast Highway.

Santa Monica, bounded to the west only by Pacific Ocean beaches and lying slightly out of Los Angeles proper, is an area of 'very desirable properties'. All the gardens are eye-catching, and the juxtaposition of Mexican Spanish, Japanese, East Coast American, and English styles, means that a walk around the immaculately lawned streets offers up-lift for the visiting plantsman. The streets were long-ago planted with a rich variety of very beautiful trees: *Magnolia grandiflora*, Jacarandas, Coral trees, Carob trees, and Canary Island Pines provide a coolness and verdure that is far from native to Southern California and sustained only by a prodigal use of sprinklers. Ferns feature in many gardens, but the range of species grown is boringly pre-dictable, and generally consists only of *Nephrolepis cordifolia*, *Asplenium bulbiferum*, and the ubiquitous, though always impressive, *Cyathea cooperi*. It seems a pity that, given the climate and the apparent lack of serious restrictions on water usage, more exciting fern gardening is not in evidence.

Rising from the Pacific coast and creating an inviting backdrop to the north of the city are the

species of *Arctostaphylos*. This genus is generously represented in Southern California and the species hybridize freely (Munz, 1974). On the more gentle upper slopes of the canyons a frequent and unmistakable plant is *Yucca whipplei* subsp. *intermedia*. It has rosettes of needle-sharp leaves which, when mature, support one absolutely enormous flower spike. Alas, I have never been in these hills at the time of flowering but the dead flower-spikes remain aloft long after the mother plant has withered away and often top nine feet in height. A variety of smaller plants cling on the rocky canyon walls lower down, but most dramatic among these is the Chalk Lettuce (*Dudleya pulverulenta*), a *Sempervivum*-like succulent the size of cabbage covered with a vivid white bloom.

On the dry undulating ridges ferns are almost non-existent, and it is only on the way down the canyon slopes that they begin to appear. The first to be noticed, growing well out into the sun, is *Pellaea andromedifolia* (Fig. 1). The common name of this species is Coffee Fern on account of the coffee bean-shaped pinnule segments. Some clumps of this plant are quite dense and may be a yard across. With tripinnate fronds on which all the segments are stalked *P. andromedifolia* rather resembles a miniature acacia thicket. It almost always grows in among other low scrub, and one assumes that in this way its slender stipes receive support and its rhizome some shade. In moister and shadier conditions I have found plants of this fern with much larger pinnule segments; so much larger, in fact, that for some time I believed I had found some other *Pellaea* species. *Pellaea mucronata* is also said to occur commonly in these hills, but I only saw it on one occasion.

The other surprise encountered fully in the sun on earthy banks, and very dry earth at that, is *Selaginella bigelovii* (Fig. 2). Not prepared to find a *Selaginella* in such a situation, I consistently ignored this one



Figure 3. *Dryopteris arguta*

throughout several hikes in the Santa Monicas. It looks for all the world like a tiny half dried-up heather, and its wiry, grey-brown dead growth certainly lends credence to this impression.

Climbing lower down into the canyons, but avoiding the cliffs, in areas where the soil is a bit damper under overhanging rocks, at the base of boulders, or tucked away among low growing shrubs such as wild *Ribes americana* is *Pentagramma triangularis* (syn. *Pityrogramma triangularis* Fig. 1). In places, this fern is quite abundant. Depending on the time of year, its geranium-like (pentagonal) frond is curled up in desiccation, and at such times involuntarily reveals the beautiful yellowy-silver underside - though this is usually obscured by dehisced brown sporangia on the old fertile fronds. Some plants are much more robust, and the upper surface of the frond can be a chocolate-brown colour. Such fronds so resemble the photograph in Lellinger (1985: Plate 181) of *Notholaena californica* that I thought for a short while that I had come upon that species. However, the positioning of the sporangia is a total give-away, for in *Notholaena* there is a marginal false indusium tracing the periphery of the frond, while in *Pentagramma* the sporangia are scattered over the entire underside of the frond. Wherever mature plants of *P. triangularis* are found, inspection usually reveals dozens of minute sporelings scattered about.

The canyon floors are usually flat and there is generally some moisture in evidence. There may even be a streambed retaining occasional pools of muddy water. One assumes that these are residues of those somewhat rare times when it really rains and the canyon bottom carries a flash flood. Numerous (natural) ditches lead into the main stream beds and these too must sometimes serve as emergency water-courses. On the canyon floors there are trees as well as shrubs, the largest and most attractive being the Big-Leaf Maple (*Acer macrophyllum*). A tall and doubtless very invasive grass, the so-called Giant Wildrye (*Elymus condensatus*) is abundant here. On the banks, well out of the direct line of the torrents when they come, is *Dryopteris arguta* (Fig. 3). This is a relatively large fern with bipinnate fronds that often reach three feet in length. When the fronds first unroll, they have the golden-green colour of young

Lime leaves, but later the brightness is muted and the fronds have a decidedly dull hue - just like the colour shifts seen in our own *Athyrium filix-femina*. *D. arguta* is unlike any *Dryopteris* I am familiar with in Britain in that the rhizome is seldom fully erect and tends to grow at an angle, giving the plant a slightly lop-sided appearance. The rhizome also spreads underground so that where this fern grows well it can give rise to a colony of quite widely separated crowns; each crown however supports only three to five fronds.

Adiantum jordanii (Fig. 4) is occasionally found on the banks of the ditches referred to earlier. It also grows among boulders in fairly deep shade. This beautiful fern greatly resembles *A. capillus-veneris*, though the frond segments are more rounded, i.e., they are less cut into than in that species. The stalks of the ultimate segments are also longer in *A. jordanii*. I only encountered one place, a gully, where this was the dominant fern. This particular habitat seemed to be permanently very moist - as was evidenced by the dense growth of mosses. Here, *Adiantum jordanii* was really quite luxuriant with fronds up to 15 inches in length. It was in this same niche that the larger-leaved form of *Pellaea andromedifolia* mentioned earlier was growing.

The tops of the steep banks, where roots of trees and boulders are exposed, seems to be a niche especially favoured by the Californian Polypody (*Polypodium californicum* Fig. 5 overleaf), though I have also found it growing on flat ledges on the canyon walls, where it is sometimes almost buried in the fallen leaves that get trapped there. Like British polypodies, this one also forms extensive and dense colonies. *Polypodium californicum* is generally rather similar to *P. cambricum*. Thus, the frond is relatively wide, pinnatifid, and the pinnae are quite widely separated with the lowest ones inturned. On larger fronds the edges of the pinnae are serrated and often have a gently undulating profile. With their relatively thin, delicate texture and matt finish there could never be any confusion with the leathery, somewhat glossy fronds of *P. scoleri*, the other common polypody of California. But the range of the latter stops further north and it doesn't seem to occur in the Santa Monicas.



Figure 4. *Adiantum jordanii*

There is at least one other charming little fern that grows in these hills, and I was fortunate enough to find a site where it was very abundant. I say fortunate because the Californian Lace Fern (*Aspidotis californicum* Fig. 6) seems to be rather restricted in its distribution. Lellinger (1985: 148) says of the genus *Aspidotis*: "The Lace Ferns grow in rock crevices or on talus slopes from British Columbia to Southern California. The plants, which are restricted to selenium-bearing (ultramafic) rocks and soils, are difficult to maintain". The broad and shallow gully where I found it was certainly cut into a quite distinct type of rock, a pinkish conglomerate with a coarse, gritty matrix, though whether selenium was present in it I could not say. Certainly this site suited *Aspidotis*, for I had only seen small isolated individual plants on other occasions. However, it was a site that obviously also suited a number of the other species I have mentioned, namely *Pentagramma triangularis*, *Pellaea andromedifolia*, and *Polypodium californicum*, for they were all flourishing there. At a superficial glance *Aspidotis californicum* looks something like *Cryptogramma crista* and something like a small-fronded *Asplenium adiantum-nigrum*, but this has to be qualified by adding that it is really very distinct from both. The similarity to *Cryptogramma* is that most mature plants consist of many short fronds thrusting up through a tangle of dead stipes of previous growth. Old fronds are quite dark-coloured, and the undersides are covered with sporangia, but the continuously produced emerging new fronds are a very bright green indeed.

The only other fern met with - and that only infrequently - was the Western Bracken, the Californian variety of an all-too-familiar fern that is virtually pan-global in its occurrence. *Pteridium aquilinum* var. *pubescens* is indeed, as its name suggests, a hairy form of bracken; the rachis is covered with hairs that are quite soft to the touch.

The Santa Monica Mountains provide a popular and easily accessed recreational area. The ferns discussed in this article can be seen on three shortish hikes centred on Trippett Ranch, above Topanga Canyon. For the hiker there is an excellent guide to the range (McCauly, 1984), written by a keen naturalist who in his descriptions of the various hikes and trails often tells the reader where ferns (species not stated) and other plants and animals are likely to be found. At the back of the book one of the appendices lists fern species that might be encountered. Among those listed is *Woodwardia fimbriata*. It would have been very exciting to discover this one too, but so far I have not been lucky.

REFERENCES

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- Munz P. A. (1974). *A Flora of Southern California*. University of California Press, Berkeley, Los Angeles, London.



Figure 5a, b. *Polypodium californicum*

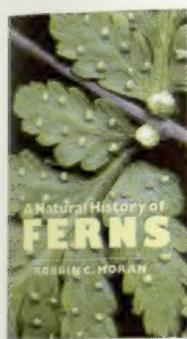


Figure 6. *Aspidotis californicum*

COMING SOON FROM BPS SPECIAL PUBLICATIONS: *New Atlas of Ferns and Allied Plants of Britain & Ireland*, eds. A.C. Wardlaw & A. Leonard, 100 pp, due 1st October 2005 [contact: mail@andrew-leonard.co.uk for pre-publication offer at £8.00 inc. p&p, overseas extra].
Also soon: the late Jimmy Dyce's *Polystichum* book, completed by Robert Sykes et al.

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A Natural History of Ferns



by Robbin C. Moran (2004). (Foreword by Oliver Sacks). Timber Press, Portland & Cambridge. Pp 301. ISBN 0-88192-667-1 hbk. £22.50 full price (but currently £13.99 from Amazon).

This is an elegantly written and consistently fascinating book by the Curator of Ferns at New York Botanical Garden. Robbin Moran is one of those rarities in the scientific world who can write entertainingly and also explain the complexities of his subject in simple terms without being patronising. As such he has produced an intelligent introduction to ferns for the enjoyment of both the amateur enthusiast and the professional pteridologist, no mean achievement in itself.

He does not give a guide to fern identification nor does he specifically cover British ferns. His aim is, rather, as he explains in his preface, to examine the biology of ferns, "...how they grow and develop, reproduce and disperse, adapt and evolve...how they interact with their environment," [and] "how they affect the lives of people."

The book is divided into six sections covering such subjects as 'The Life Cycle of Ferns', 'Adaptations by Ferns', 'Ferns and People', etc., each consisting of half a dozen short chapters. This is pteridology in biteable chunks and makes for easy reading with something of interest for the fern enthusiast in every chapter. Did you know, for example, that a single frond of *Dryopteris carthusiana* produces upwards of seven million spores? No wonder ferns are such successful survivors, or that horsetails, seed plants, and ferns themselves are more closely related to one another than any of them is to that other group of so-called fern allies, the clubmosses. Quite how dangerous bracken is I will leave you to find out for yourself.

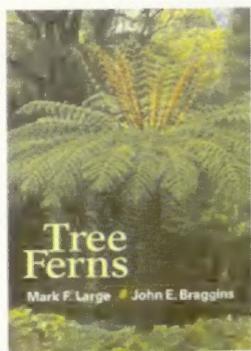
Moran devotes a chapter to the disproportionately large number of ferns (many endemic) of the Robinson Crusoe islands (more correctly Archipéago Juan Fernández) where Alexander Selkirk, on whom Crusoe is based, was stranded for four years. Some of these ferns originated in Australia, Tasmania and New Zealand, a quite remarkable story of spore dispersal. Native to Juan Fernández are *Lophosoria quadripinnata* and *Thyrsopteris elegans*, which, although taxonomical tongue-twisters, are among the most beautiful ferns on the planet. Incidentally the *Lophosoria* survives outside at the Royal Botanic Garden Edinburgh and hardiness trials are beginning on the *Thyrsopteris*. (see page 99)

Another chapter explores the mechanism that creates the spiral of fern fiddleheads or crosiers. This is a Cartesian rather than an Archimedean spiral, but of course you knew that. He discusses how several species, not only our own *Trichomanes speciosum*, survive and grow vegetatively, perhaps for centuries, in their gametophyte form without developing sporophytes, even when artificially given favourable conditions to do so. He explains that rice production in China and Vietnam is dependent on one fern, *Azolla*, while another, *Salvinia*, nearly destroyed the economies of several tropical countries. But I must not give too much away.

The chapters are self-contained but they could be read in any order. The book is lavishly illustrated with colour plates, black and white photographs, and lots of line drawings and explanatory diagrams. I only have one small quibble: the editing or proof reading is occasionally remiss. It is *Woodwardia*, not *Woodsia*, *orientalis*, *Loch Fyne* not *Loch Tyne*, bracken shoots are not commonly, if ever, eaten in Britain, and on several occasions a word, luckily usually inconsequential, is missing from the text. The quirkiest example of this appears on the dust jacket where Oliver Sack's praise for the book is misquoted as "...stimulating, enthralling, a beautiful companion for any fern." So give this book to your favourite fern as a companion – but read and enjoy it for yourself first.

Frank McGavigan

Tree ferns



by Mark F. Large and John E. Braggins. Published by Timber Press. 2004. Pp 359 including 131 col. Plates on 60 pp. Price £29.99.

Of the many hundred books written about ferns I cannot recall ever seeing a single volume purely on tree ferns. There have been local accounts published as separates, e.g. Holttum's *Flora Malesiana* 1963 and Scott's *Tree ferns of the Himalaya* 1874, but no worldwide monographs. Now, at long last this hole in the literature is addressed. This, together with the current popularity of tree ferns as garden plants, will guarantee a lot of interest in this book.

For the gardener there is much valuable advice on all manner of cultural issues. I was particularly pleased to see watering into the crown discouraged by at least three mentions in the text – an opinion with which I wholeheartedly agree. Advice on pests and diseases is sound, as are the notes on feeding and propagation. Advice on frost protection is brief, but probably not a problem commonly encountered by our antipodean authors. They do suggest but do not stress protecting the apical region in winter, to me this is essential in frosty areas. I am pleased to see a minimum size of 1 m of trunk for frost prone areas. My limit was always 2 feet but the idea is the same, lift the crown above ground frosts to give it some ventilation. I am fascinated to note the reference to side shoots occurring on *Dicksonia antarctica*, I have never seen any other than splitting stems or sporelings becoming established on the sides of the trunks.

The vast bulk of the book is an annotated list of several hundred species of tree-fern. I believe the list includes all of the species commonly in cultivation, although it is easy to find obscure names not included, e.g. *Cyathea compta*, *C. oblongata*. Maybe these are included in the book under their synonyms? Some cultivars are mentioned as are quite a lot of hybrids, but surprisingly the classic *Dicksonia x lathamii* in Birmingham Botanical Gardens is omitted. This plant has been tissue cultured and several plants were raised at Kew so it could now be more widely cultivated, I know one plant went to Australia. Inclusions in the huge species list are sometimes odd. *Osmunda regalis*, admittedly

with a stout rootstock, is there, as is *Calcutta dubia* from Australia which has a creeping rhizome. Exclusion also seems a little erratic. For example the wonderful *Blechnum magellanicum* is illustrated with two excellent photographs, yet it does not merit more than a passing reference in the *Blechnum* introduction as "having a trunk".

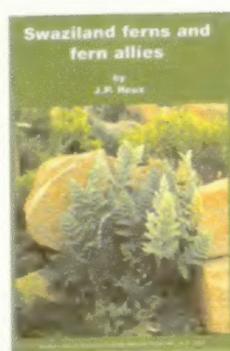
I am a little disappointed that the two forms of *Dicksonia lanata* are kept as one species. If molecular evidence suggests the two forms are marginally isolated, they are therefore different on the molecular level. They are certainly as different as chalk and cheese on the morphological level. I will always take some convincing that these two are the same species, rather than *D. lanata* (prostrate) and *D. hispida* (erect). Both are illustrated on page 212.

The photographs are superb. Tree ferns are notoriously difficult subjects, yet here we have many diagnostically helpful yet beautiful illustrations. The shot of *Cyathea dealbata* on the dust wrapper was well chosen. What a fantastic specimen!

Overall this book has many good features. However, I find myself asking who are the target readers? As a scientific monograph it is lacking in many ways. For example synonyms are rarely given, there is no key to species, although this would be a life's work with a genus like *Cyathea* with 400-600 species, and technical data are rarely given. As a gardener's reference book the information on cultivation is very useful, but the descriptions in the A-Z section are rarely helpful for determining species or cultivars. The answer is probably that this book will appeal to everyone with an interest in tree ferns, largely thanks to the photographs. It is a useful and inexpensive start along the road to a much-needed worldwide botanical monograph.

Martin Rickard

Swaziland Ferns and Fern Allies



by JP Roux, 2003. Southern African Botanical Diversity Network Report No. 19. SABONET, Pretoria.

It seems hard to believe that the fine publication by John and Sandra Burrows (Southern African ferns and fern allies) was published 14 years ago. Although it is a large tome, it has accompanied me to both Mauritius and South Africa, and I refer to it frequently. The Burrows' work covers a large area (including Swaziland), and is hardly a field guide, so a more focused and smaller regional work for this area is to be welcomed. The present work has resulted from more extensive field work in Swaziland since Burrows, as a result of which a number of new species have been added to the Swaziland flora. J P Roux is one of the staff at the Compton Herbarium, Kirstenbosch, and I have one other work by him, *Cape Peninsula Ferns*, 1979. Although a little out of date, that work (which has been remaindered for several years) is also a useful local flora, including as it does helpful and accurate drawings of each species described.

The present work contains similar excellent drawings, accompanied by highly detailed

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descriptions of each species. These descriptions are lengthy and technical, perhaps thereby being a little daunting to the non-specialist. For example, Burrows takes 120+ words to describe *Cyathea dregei*, whilst Roux uses 350+.

The respective authors describe the sori of this species thus:

"Sori round, cup-shaped, with the sporangia rather like many little eggs in an egg-cup, borne in two rows along each side of the costule, up to 10 sori per lobe" (Burrows).

"Sori up to 9 pairs per segment, circular, often confluent at maturity, at a vein fork or inframedially on an acroscopic vein branch; receptacle raised, paraphysate, paraphyses simple, pluricellular, uniseriate, apical cell not differentiated; sporangium short-stalked, simple, laterally attached, capsule obtriangular in lateral view, annulus complete, with (17-)19(-20) indurated annulus cells; indusium inferior, cupiliform, surrounding receptacle base. Spores 16 per sporangium, brown, tetrahedral, trilete, papillate, exospore (38-)40.5(-44) µm in equatorial diameter." (Roux).

The book runs to 241 pages, and is very attractively produced in laminated paper covers adorned by a beautiful colour photograph of *Cheilanthes eckloniana*. The introduction describes the Swaziland topography, geology, climate, vegetation, and conservation issues. The taxonomy section (the bulk of the work) starts with a key to families, and families containing more than one species in Swaziland have their own keys to genera and species. As well as describing the morphology, the species accounts include comprehensive synonymies, vernacular names, ecology, distribution (with distribution maps within Swaziland), and uses, and are supported at the end of the book by a key to abbreviations used and a glossary.

My only criticism of the book is the way the species descriptions seem to run into each other, as a result of using the same typeface for the species name and the sub-headings within the species descriptions.

I imagine this work will be highly valuable to professional taxonomists and ecologists, and fern enthusiasts botanising in the area would not wish to be without a copy.

The work can be obtained from Sabonet Co-ordinator, c/o National Botanical Institute, Private Bag X101, Pretoria 001, South Africa; e-mail: info@sabonet.org. No charge was made for the copy sent to me. The aims of the Southern African Botanical Diversity Network (SABONET) programme are to strengthen the level of botanical expertise, expand and improve herbarium and botanic garden collections, and foster closer collaborative links among botanists in the southern African subcontinent. Publications produced to support their aims are on a variety of herbarium and wild plant topics, only one other being about ferns (Conspectus of southern African Pteridophyta. Report No. 13. J P Roux. 2001).

Graham Ackers

Oaxaca Journal



by Oliver Sacks, 2002. National Geographic, Washington D.C. Pp. xv, 159. 21 x 14.5 cm. ISBN 0-7922-6521-1. Hardback £12.99.

Oliver Sacks, the world famous professor of clinical neurology, is a true fern lover, an active member of the New York Chapter of

the American Fern Society as well as a member of the BPS. Anyone who has seen his film "Awakenings" or read any of his other books will know that he is a true gentle man with a wonderful skill with words. In this book he describes his time spent on a fern tour of Oaxaca in Mexico under the leadership of John Mickel, the authority on Mexican ferns.

To be honest, ferns do not dominate the book. It is a travelogue interspersed with numerous asides about ferns, early Mesoamerican settlements, local markets, anything else of interest, as well as the other people on the tour. In particular I had to chuckle at the description of Robbin Moran, Curator of ferns at the New York Botanical Garden: "a shy unassuming man with horn-rimmed glasses who looks like a post-doc in his late twenties or thirties". I have the pleasure of knowing Robbin and I think you would know him anywhere from that! Barbara Joe Hoshizaki and her husband Takashi were also in the group of 30. What a gathering. It all adds to the frustration I feel at not being there.

Ferns seen and discussed are numerous, and there are quite a few illustrated by the author's sketches. There is also a map of the area visited. Really I feel I cannot do the text justice in a short review. This is a book for reading. I think virtually all members of our society would enjoy it, especially those who have attended BPS field meetings and recognize all the little nuances that go to make field meetings, be they in England or Mexico, so enjoyable.

Martin Rickard

All Ferns of the World

ALL FERNS OF THE WORLD
ON CD-ROM



created by Dr Michael Hassler and Brian Swale. 2001/2002. Available from Brian Swale, 140, Panorama Road, Christchurch 8008, New Zealand. Price NZ\$70 plus NZ\$4 for post & packing. You can contact the author by email: bj@caverock.net.nz

A CD-ROM does not automatically attract my attention, indeed this one sat unopened by my computer for several months. It was a gift, and I guess I mumbled thank you when it was given to me. Eventually I decided to open it and had quite a surprise! It is one of the most extraordinary documents I can ever remember seeing.

Almost every fern species and hybrid in the world is listed (a total of 12,838 and 501 respectively). Each entry includes the author of each name with details of its first publication, all synonymous names, again with full publication details, and worldwide distribution. If printed out it would apparently take around 400 pages of A4 paper. It is a mammoth compilation. In addition there is a full list of the genera of the world arranged in families, and an incredible list of references, in excess of 400 by my rough reckoning - I did not count them.

As well as being a fascinating reference I have already found the CD-ROM useful. I found a dwarf ophioglossum in the Canaries. Was it *O. lusitanicum* or *O. polyphyllum*? I did not know, and could not find a good modern illustration of *O. polyphyllum*. Just to complicate matters the name used to be applied to *O. azoricum*. *World of ferns* came to the rescue. Listed under *O. polyphyllum* were all

the countries where it grows. One was South Africa and there in John Burrow's wonderful book on South African ferns was a splendid photo of *O. polyphyllum*. My plant in the Azores was quite different and therefore confirmed as *O. lusitanicum*.

Some of the information on the CD-ROM is available free of charge on the internet (www.homepages.caverock.net.nz/~bj/fern) but the main species list is not included.

In correspondence, Brian Swale has informed me there are, not surprisingly, some errors. The most important omission is a block of American cheilanthoids. Why they were left out is a mystery to the authors but it will be put right in the next edition. Appended after the main lists is a lengthy set of data from Barbara Parris, correcting and adding data, mainly on *Grammitis* and related genera.

In conclusion I think most pteridologists would value this CD-ROM, even gardeners who like to know the correct name of their plants (species only, not cultivars). NZ\$74 is about £28, a fraction of the cost of that other classic reference source, *Index Filicum*.

Martin Rickard

AIDGAP Key to Common Ferns



by James Merryweather, 2005. Illustrated by Carol Roberts. Field Studies Council. ISBN 1 85153 290 0. £2.50 incl. p&p (special offer: £2 from BPS merchandise)

This key consists of eight fold-out pages in full colour. One side is occupied by a wealth of information including a brief introduction and keys to identify the majority of the British species of ferns. The reverse side has single fronds of all the ferns that are described.

The keys are similar to the more expanded AIDGAP Fern Guide with some new wording to accommodate the condensed format. The omission of the least common and most inaccessible ferns makes for a more manageable number although the compilation of such a list is always subjective. A distinct bias is observed in the detailed treatment of *Dryopteris affinis* but the overall impression is of an attractive production which should achieve its purpose of encouraging people to make an attempt to identify ferns.

A friend who was present when I took my copy out of its envelope seized it off me and was keen to have one to put up on the wall (and hopefully take out in the field). I suggested two copies would be useful and as the price is so moderate it would be a good plan to keep a field copy that could be replaced if necessary. Some of the drawings are more instantly recognisable than others, and the scale beside each frond often suggests a smaller frond than is usually the case. There is little space to indicate the size range by the pictures but this at least is given in the key.

A few useful references refer to other books and the comprehensive AIDGAP key (this card does not cover Equisetum or fern allies - next project but one - ed.). The BPS benefits by the inclusion of a small panel with the aims of the Society and contact details. This card will be a very attractive introduction to ferns and we should all buy some to give to our friends.

Heather McHaffie

THE BRITISH PTERIDOLOGICAL SOCIETY

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