

# PTERIDOLOGIST

## *The Fern Magazine*

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**EDITED BY A.E. GREENING**

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Have you caught the fern bug? No, I don't mean that infectious enthusiasm for all things to do with ferns. I am referring to insects and other predators that dare to attack them. This edition has several articles that deal with these natural invaders that love to eat the ferns in our gardens. I was amazed when I learnt about the spread of leaf mining moths in the UK from the article by Roger Golding (page 332). I contacted my local moth group and found that the leaf miner, *Psychoides filicivora*, had been discovered only 6 miles away from my home and were thought to be introduced by a local nursery that sold hardy ferns.

Don't think that growing ferns indoors will save them from predators. They could be under attack from scale insects as Chris Malumphy describes, together with some alarming high quality images (page 306).

If that wasn't enough, Chris also sent in a short note about a fern-feeding moth new to Britain (page 331).

To complete the theme, Steve Lamont, from Sydney, Australia, has written about the snails, slugs, grasshoppers and caterpillars that invade his ferns (page 379). He offers some useful solutions, although there are not many possums in the UK to help reduce the slugs!

Included in this issue are several articles from deceased members, Ken Trewren and Graham Ackers.

Ken's article on *Polypodium* species and hybrids in the Yorkshire Dales was written in 2005 and was intended for publication that year. His widow, Kate, is delighted that his work lives on and hopes that it will inspire others.

Graham, as usual, prepared his articles well ahead of the deadline and I hope he would have approved of the way they have been presented. However, he also fulfilled a vital role within the society as Committee Secretary. There is an appeal on page 381 by Yvonne Golding for members to think about taking on this role. Please consider this - your society needs you.

This issue contains a large article about trials in pot cultivation of Lycopodiums. Very few people have any measure of success with these plants and Jerry Copeland has spent years trying to find the solution. Starting on page 349 is a detailed account of his successes and failures. He admits that this trial is still ongoing and that the perfect solution has so far eluded him. However, by sharing the results of his trials he hopes that others will avoid his mistakes and perhaps pass on their successes to him.

I wish to thank Alison Paul who has helped with the proof reading this year. Her eagle eyes and attention to detail are invaluable for a magazine like this. Would any other members like to offer their services? We are currently running at 84 pages plus covers and it would be helpful to spread the load.

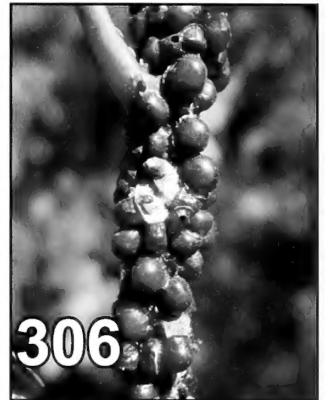
Finally, I hope you enjoy this edition. I know it's a little late this year, this is entirely my fault and I am aiming for a May publication in 2013. Some articles have already been promised for that issue but there is plenty of room for more. If you have any ideas please contact me, I would love to hear from you.

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## Notes for contributors

Ideally we would like contributions on disc or by e-mail, with high resolution images. If this is not possible we will not rule out typed or hand-written copy. In general please follow the style of material in this issue.



# PTERIDOLOGIST 2012

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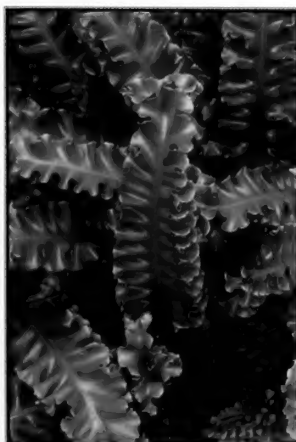


360

*Sphenomeris chinensis*.  
A delicate fern found in  
Yunnan province, China.

Photo: Yvonne Golding

Cover Picture: Front  
*Asplenium scolopendrium* 'Crispum  
Group'  
Photo: John Fielding



Cover Picture: Back  
Based on this image of *Polypodium  
cambricum* 'Richard Kayse'  
Photo: Alec Greening



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

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# Scale insect pests of ornamental ferns grown indoors in Britain

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Scale insects (Hemiptera: Coccoidea) are plant-sap feeding insects, closely related to the aphids, whiteflies and psyllids or jumping plant lice. They are among the most highly specialised of all plant parasites and feed on all parts of the plant including the roots, stems, leaves, buds and fruit. The adult females (Fig. 1. a - d) do not look like typical insects as they retain the immature external morphology at sexual maturity. Adult males, however, resemble small flies but never feed and die shortly after mating, usually within a day or two of emergence.

The number of scale insect species recorded feeding on ferns (pteridophytes) is remarkably low compared with those that feed on flowering plants (angiosperms). Despite this, there are at least 18 species of scale insect, belonging to three families, established in Britain that have been recorded feeding on ornamental ferns grown indoors. The incidence of scale insects on indoor ferns in Britain, however, appears to be low, based on the number of plant pest samples submitted to The Food and Environment Research Agency (Fera) laboratory for identification.

The Fera laboratory receives samples of suspected plant pests mainly from The Plant Health and Seeds Inspectorate (PHSI), but also from public botanical collections, private individuals and other customers. The scale species most frequently found on indoor ferns in Britain is the hemispherical scale (*Saissetia coffeae*) (Figs. 1 & 9). Other species that are relatively common on ferns are the brown soft scale (*Coccus hesperidum*) (Fig. 6), fern scale (*Pinnaspis aspidistrae*) (Fig. 15) and long-tailed mealybug (*Pseudococcus longispinus*) (Fig. 4). The other 14 species of scale insect mentioned below only occur on ferns in Britain sporadically (although they may be common on non-fern hosts). All of the scale insects found on ferns grown indoors in Britain are non-native introductions. This is not surprising as almost all the fern species grown indoors are non-native and exotic scale insect species are regularly dispersed between countries as a consequence of trade and other human activities.

The fern genera most frequently submitted to Fera and harbouring the largest number of scale insect species were *Dicksonia* and *Nephrolepis*. This is largely due to *Dicksonia* being targeted by the PHSI for inspection, while many of the *Nephrolepis* samples came from a single public botanical garden. Many of the samples of infested fern submitted to

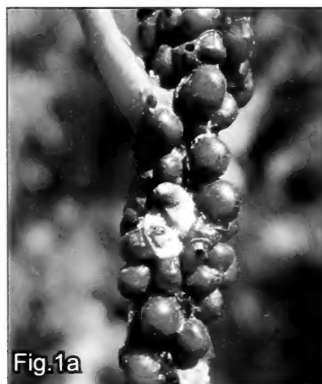


Fig.1a



Fig.1b

Hemispherical scale is the most common scale insect found on ferns grown indoors in Britain.

1a: Close up of adult females.

Photo: C. Malumphy

1b: Infestation on *Davallia*.

Photo: Fera

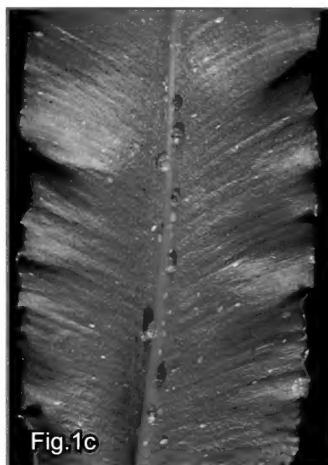


Fig.1c



Fig.1d

Further infestation of hemispherical scale insects.

1c: Infestation on *A. scolopendrium*. 1d: Infestation on *Adiantum*.

Photos: Fera

Fera were simply labelled 'fern', demonstrating how difficult fern identification can be for non-specialists.

Scale insects damage ferns by removing plant sap resulting in reduced plant vigour, chlorosis (yellowing), leaf loss and dieback. Mealybugs and soft scales also excrete honeydew, which contaminates the foliage and serves as a medium for the growth of black sooty moulds, reducing the area of photosynthesis and gas exchange, and lowering the aesthetic value. If left untreated, dense populations of scale insects may cause the death of individual plants.

The purpose of this article is to provide a simple illustrated guide for the identification of scale insects that may be found on ornamental ferns grown indoors in Britain. In most cases positive identification, particularly of the armoured scales, is usually only possible by microscopic examination of a slide-mounted adult female by an expert.

Almost all of the scale insect species listed below are polyphagous; that is, they feed on a wide range of plants. The only exception is New Zealand fern scale (*Fusilaspis phymatodidis*), which feeds almost exclusively on ferns. Only pteridophyte host genera are listed. All of the species are capable of breeding continuously if environmental conditions are favourable, and most are parthenogenetic (females reproduce without sex).

Non-native scale insects are regularly accidentally introduced to Britain with plant trade. Any plant pests that are suspected to be new to Britain should be submitted to the Fera laboratory for identification and risk assessment.

## Pseudococcidae - (mealybugs) Figs. 2-5

Adult female mealybugs are fairly uniform in appearance and can therefore be difficult to identify in the field. They are elongate oval, soft-bodied, distinctly segmented and covered in mealy wax. Some produce conspicuous white wax egg sacks beneath and behind the female's body. They often produce copious quantities of honeydew and are frequently attended by ants. *Planococcus* and *Pseudococcus* species feed on the aerial parts of the plant and are common on the undersides of the fronds and at the growing points, whereas *Rhizoecus* species feed exclusively on the roots.



***Planococcus citri*** - (citrus mealybug) Fig.2

Adult females are elongate oval, greyish, covered in mealy wax, usually with a faint longitudinal dark mark along the back, with 18 pairs of relatively short, stout marginal wax filaments; about 4.0 mm long. Citrus mealybug is very common on indoor plantings throughout Britain.

Pteridophyte host:-  
Blechnaceae: *Blechnum*.

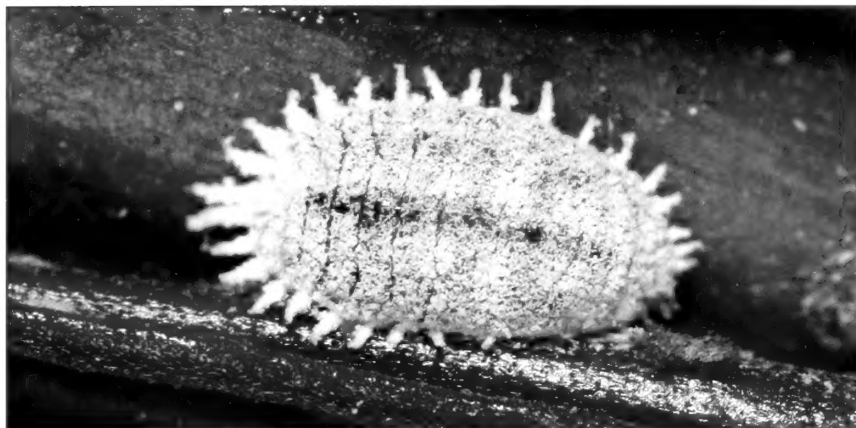


Fig.2. *Planococcus citri* (citrus mealybug)  
Photo: Fera

***Pseudococcus calceolariae*** - (citrophilous mealybug) Fig.3

Adult females are elongate oval, greyish, covered in mealy wax, with paired depressions in two longitudinal rows along the back, with 17 pairs of relatively short, stout marginal wax filaments, the posterior pair being the longest but no longer than a quarter of the body length; about 4.0 mm long. Citrophilous mealybug is rarely recorded in Britain but occurs widely, both outdoors and on indoor plantings.

Pteridophyte host:-  
Polypodiaceae: *Platynerium*.

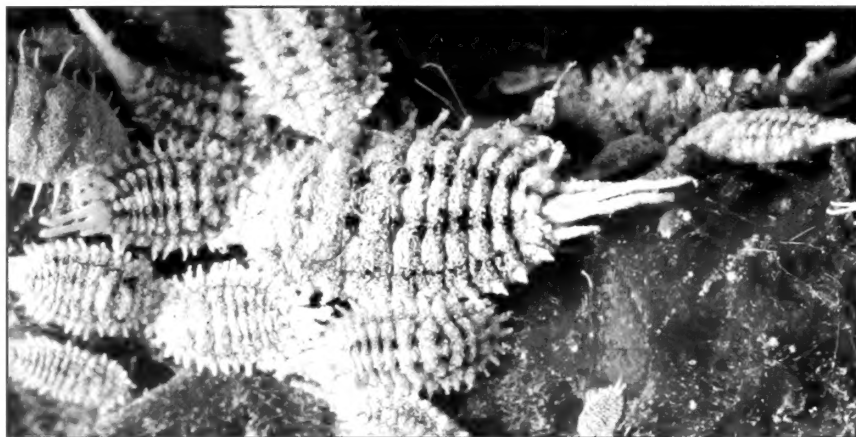


Fig.3. *Pseudococcus calceolariae* (citrophilous mealybug)  
Photo: Fera

***Pseudococcus longispinus*** - (long-tailed mealybug) Fig.4

Adult females are elongate oval, greyish, lightly covered in mealy wax, with 17 pairs of marginal wax filaments, the posterior pair are long and slender, as long as or longer than the body; about 2.5 mm long. Long-tailed mealybug is very common on indoor plantings throughout Britain.

Pteridophyte hosts:-  
Aspleniaceae: *Asplenium*.  
Ceratopteridaceae: *Acrostichum*.  
Dicksoniaceae: *Dicksonia*.  
Cyatheaceae: *Cyathea*.  
Dennstaedtiaceae: *Hypolepis*.  
Dryopteridaceae: *Dryopteris*.  
Lomariopsidaceae: *Nephrolepis*.  
Polypodiaceae: *Drynaria*, *Platynerium*.  
Pteridaceae: *Adiantum*, *Pteris*.

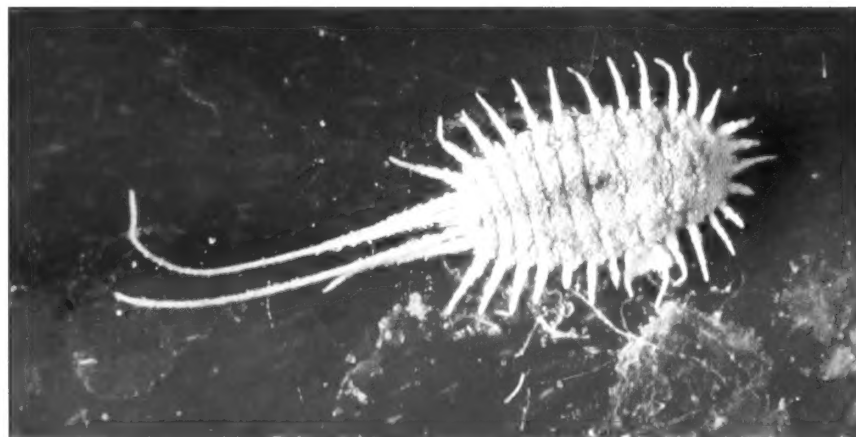


Fig.4. *Pseudococcus longispinus* (long-tailed mealybug)  
Photo: Fera

***Rhizoecus* spp** - (root mealybugs)

Two species of root mealybugs (*R. dianthi* - Pritchard mealybug (Fig.5) and *R. falcifer* - ground mealybug) established in Britain have been recorded feeding on fern roots. They are indistinguishable from one another in life. Adult females are oval, cream coloured; about 2.2 mm long. Root mealybugs are rarely recorded in Britain, although they are likely to be overlooked due to their subterranean nature.

Pteridophyte host:-  
Pteridaceae: *Adiantum*.

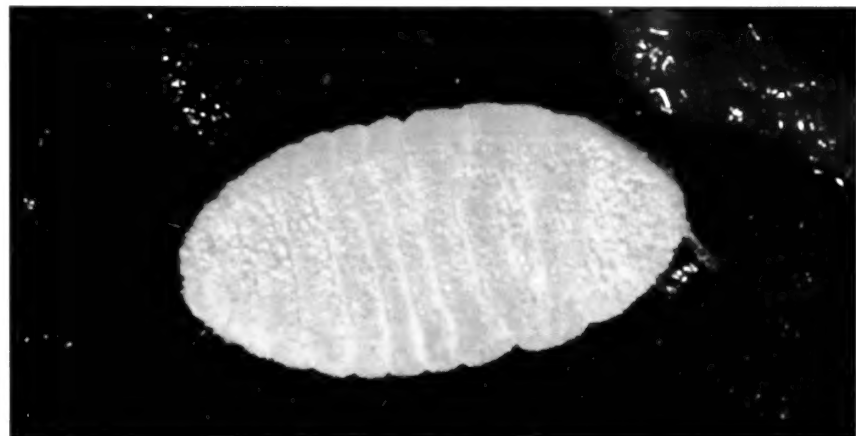


Fig.5. *Rhizoecus dianthi* (Pritchard mealybug)  
Photo: Fera

## Scale insect pests of ornamental ferns grown indoors in Britain

### Coccidae - (soft scales) Figs. 6-9

This is one of the most diverse families of scale insects. Adults vary considerably in appearance with maturity and host plant species. *Coccus*, *Parasaissetia* and *Saissetia* species protect their eggs beneath the scale-like covering of the adult female, whereas *Pulvinaria* species produce large and conspicuous waxy egg sacks. They often produce copious quantities of honeydew and are frequently attended by ants.

#### *Coccus hesperidum* - (brown soft scale) Fig.6

Adult females are oval, flattish, translucent pale yellow to yellowish-brown, often mottled with dark brown spots; about 5.0 mm long. Brown soft scale is one of the most common and widespread scale insects found on indoor ornamental plants in Britain. However, it is not as common on ferns as hemispherical scale. It also occurs widely outdoors on evergreen plants in sheltered situations.

Pteridophyte hosts:-

Aspleniaceae: *Asplenium*.

Blechnaceae: *Blechnum*, *Woodwardia*.

Ceratopteridaceae: *Acrostichum*.

Dryopteridaceae: *Cyrtomium*.

Polypodiaceae: *Platycerium*, *Polypodium*.

Pteridaceae: *Adiantum*.

Selaginellaceae: *Selaginella*.

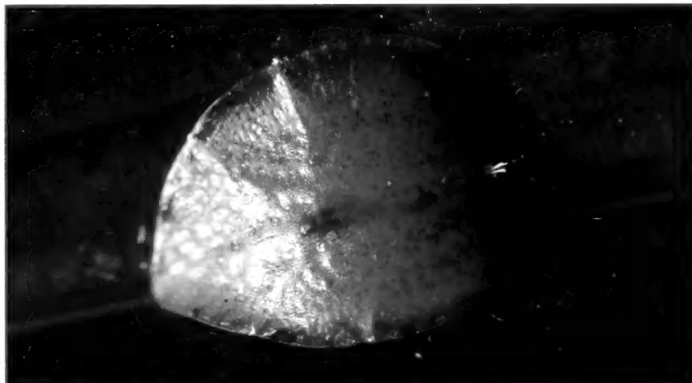


Fig.6. *Coccus hesperidum* (brown soft scale)

Photo: Fera

#### *Parasaissetia nigra* - (nigra scale) Fig.7

Adult females are oval, moderately convex, and brown to shiny black; about 5.5 mm long. Nigra scale is rarely recorded in Britain, being established in a few public botanical collections and occasionally found in private collections. This is a regulated pest (on citrus) in the European Union.

Pteridophyte host:-

Pteridaceae: *Adiantum*.

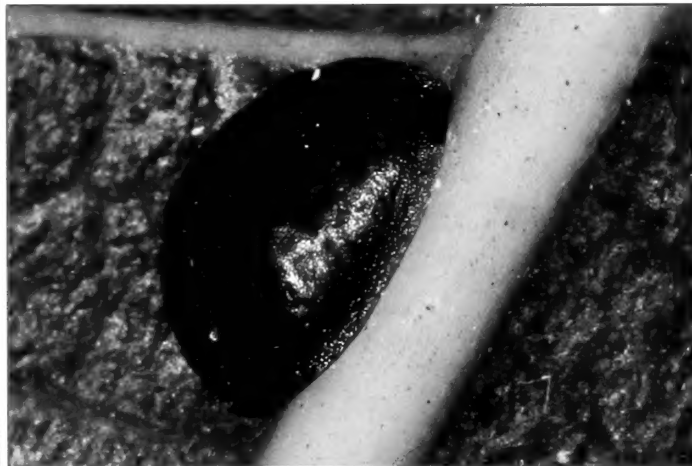


Fig.7. *Parasaissetia nigra* (nigra scale)

Photo: Fera

#### *Pulvinaria floccifera* - (cottony or cushion camellia scale) Fig.8

Adult females are oval, moderately convex, cream to pale brown; about 5.0 mm long. Elongate, parallel-sided egg sacks form behind the female body. Cottony camellia scale occurs outdoors and on indoor plantings throughout Britain.

Pteridophyte host:-

Pteridaceae: *Adiantum*.

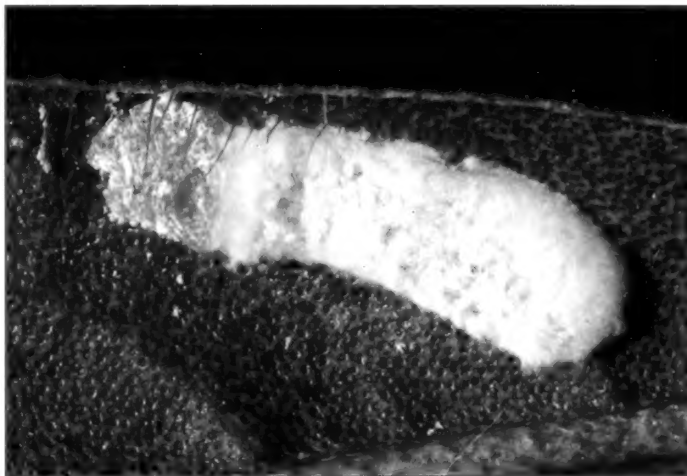


Fig.8. *Pulvinaria floccifera* (cottony camellia scale)

Photo: Fera

#### *Saissetia coffeae* - (hemispherical scale) Figs.1 & 9

Mature adult females are oval, hemispherical, smooth, glossy, yellowish-brown to dark-brown; about 4.5 mm long. The nymphs and young adults have distinct 'H'-shaped ridges on their backs. Adult female *S. coffeae* are similar in appearance to adult *S. oleae*, but are lighter in colour and have a smoother back. They are also similar to adult *P. nigra* but are lighter in colour and much more convex. Hemispherical scale is very common on indoor plantings throughout Britain.

Pteridophyte hosts:-

Aspleniaceae: *Asplenium*.

Blechnaceae: *Blechnum*, *Woodwardia*.

Ceratopteridaceae: *Acrostichum*.

Davalliaceae: *Davallia*.

Dennstaedtiaceae: *Pteridium*.

Dryopteridaceae: *Cyrtomium*, *Polystichum*.

Polypodiaceae: *Phymatosorus*, *Platycerium*, *Polypodium*.

Pteridaceae: *Adiantum*, *Pellaea*, *Pteris*.

Tectariaceae: *Tectaria*.

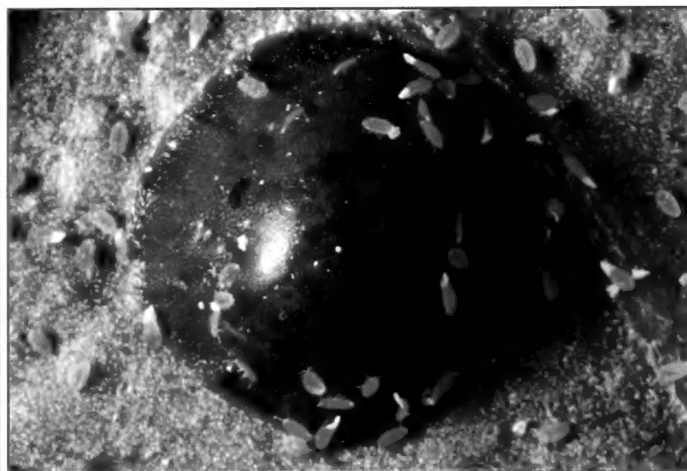


Fig.9. *Saissetia coffeae* (hemispherical scale)

Photo: Fera

## Scale insect pests of ornamental ferns grown indoors in Britain

### *Saissetia oleae* - (black scale) Fig.10

Mature adult females are oval, strongly convex, with a rough surface and 'H'-shaped ridges on the back, dark-brown to grey or black; about 5.0 mm long. Black scale is fairly common on indoor plantings throughout Britain and is occasionally found outdoors in London.

Pteridophyte hosts:-  
Aspleniaceae: *Asplenium*.  
Dennstaedtiaceae: *Pteridium*.  
Pteridaceae: *Adiantum*.



Fig.10. *Saissetia oleae* (black scale)  
Photo: Fera

### Diaspididae - (armoured scales) Figs.11-19

The body of adult female diaspidids is protected by a separate scale-like cover composed of waxy and protein filaments and exuviae (cast skins), which also serves to protect the eggs. Armoured scales, unlike most scale insects, do not excrete honeydew. All of the following species occur on aerial parts of the plant, including both upper and lower surfaces of the foliage, and the stems. Male scale covers of *Abgrallaspis*, *Aspidiotus* and *Hemiberlesia* species resemble those of the adult females although they are smaller and more elongate, whereas the male scale covers of *Fusilaspis*, *Pinnaspis* and *Pseudaulacaspis* species differ completely from the females, being white, felt-like, elongate, and usually with distinct longitudinal ridges.

### *Abgrallaspis cyanophylli* - (cyanophyllum scale) Fig.11

Adult female scales are oval or triangular, flat, white to grey, semi-transparent, with exuviae central, yellow; diameter about 2.3 mm. Cyanophyllum scale is common and widespread on indoor plantings throughout Britain.

Pteridophyte host:-  
Polypodiaceae: *Polypodium*.



Fig.11. *Abgrallaspis cyanophylli* (cyanophyllum scale)  
Photo: Fera

### *Aspidiotus nerii* - (oleander scale) Fig.12

Adult female scales are circular, flat or slightly convex, white to opaque tan, with exuviae central, yellow to light brown; diameter about 2.0 mm. Oleander scale is very common and widespread on indoor plantings, and occasionally occurs outdoors in sheltered situations.

Pteridophyte host:-  
Aspleniaceae: *Asplenium*.

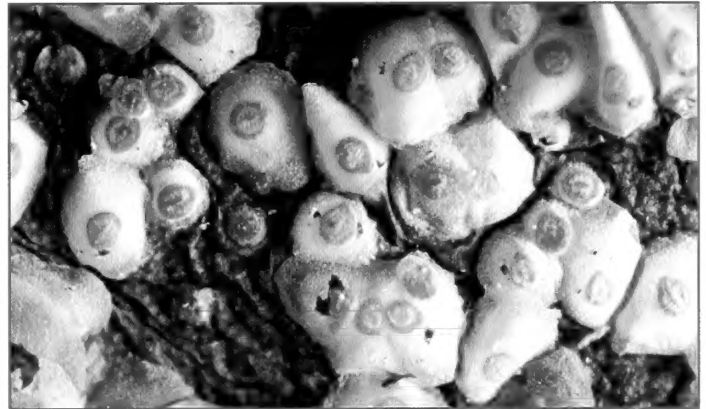


Fig.12. *Aspidiotus nerii* (oleander scale)  
Photo: Fera

### *Fusilaspis phymatodidis* (= *Pseudaulacaspis dubia*) - (New Zealand fern scale) Fig.13

Adult female scales are white to silver-grey, flat, very thin, pyriform; exuviae marginal, golden brown; about 1.5 mm long. Male scales are white, elongate, irregularly oval, flat above, with a longitudinal groove on the underside. This species is native to New Zealand and has been introduced to Fiji. It has only been found breeding at one botanical garden in Britain; large populations were damaging *Dicksonia* plants grown in polytunnels. Its current status in Britain is uncertain and it has not been recorded from anywhere else in Europe.

Pteridophyte hosts:-  
Aspleniaceae: *Asplenium*.  
Blechnaceae: *Blechnum*, *Doodia*, *Woodwardia*.  
Cyatheaceae: *Cyathea*.  
Davalliaceae: *Davallia*.  
Dicksoniaceae: *Dicksonia*.  
Dryopteridaceae: *Polystichum*, *Lastreopsis*.  
Gleicheniaceae: *Gleichenia*, *Sticherus*.  
Hymenophyllaceae: *Hymenophyllum*, *Trichomanes*.  
Marattiaceae: *Marattia*.  
Polypodiaceae: *Grammitis*, *Microsorium*, *Polypodium*.  
Pteridaceae: *Adiantum*, *Pellaea*.  
Tectariaceae: *Arthropteris*.

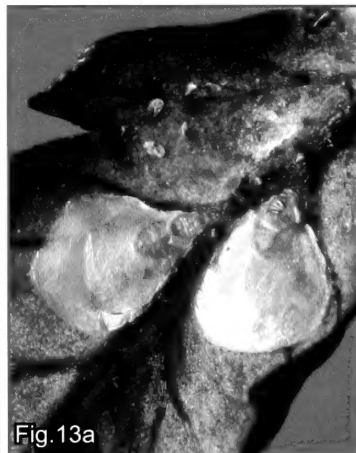


Fig.13a



Fig.13b

Fig.13. *Fusilaspis phymatodidis* (New Zealand fern scale)  
13a: adult females. 13b: infestation on *Dicksonia*. Photos: Fera



***Hemiberlesia lataniae*** - (latania scale) Fig.14

Adult female scales vary in appearance, but are usually oval, strongly convex, and white, light grey to brown, with exuviae subcentral, grey to brown; diameter about 2.0 mm. Latania scale is common and widespread but mainly found in public botanical gardens and rarely in private collections.

Pteridophyte host:-  
Pteridaceae: *Pteris*.

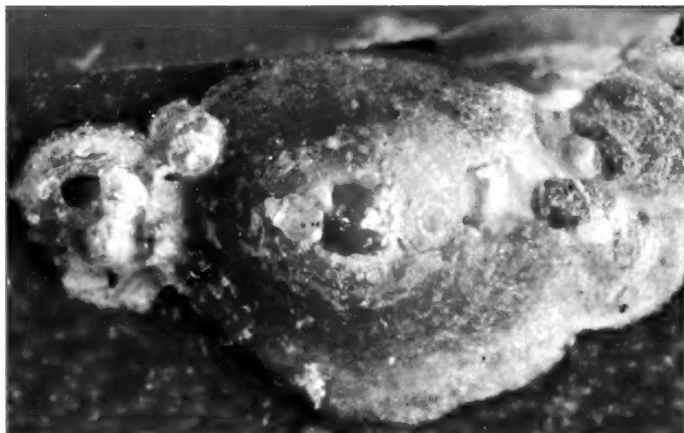


Fig.14. *Hemiberlesia lataniae* (latania scale)  
Photo: Fera

***Pinnaspis aspidistrae*** - (fern scale) Fig.15

Adult female scales are narrow to broadly oyster-shell shaped, light to dark reddish brown, with exuviae marginal, yellowish to brown; length about 2.5 mm. Male covers are white, felted, elongate, with three longitudinal ridges, exuviae marginal, pale yellow. The males often occur in huge numbers forming white patches on the host plants. Fern scale is common and widespread on indoor plantings. It is morphologically very close to *Pinnaspis strachani* and the two species may be synonymous, or be part of a group of sibling species.

Pteridophyte hosts:-  
Anemiaceae: *Anemia*.  
Aspleniaceae: *Asplenium*, *Neottopteris*.  
Blechnaceae: *Blechnum*.  
Davalliaceae: *Davallia*.  
Dryopteridaceae: *Cyrtomium*, *Dryopteris*, *Elaphoglossum*, *Polystichum*.  
Lomariopsidaceae: *Nephrolepis*.  
Polypodiaceae: *Lemmaphyllum*, *Platycerium*, *Polypodium*.  
Pteridaceae: *Adiantum*, *Gymnopteris*, *Pteris*.  
Selaginellaceae: *Selaginella*.



Fig.15a



Fig.15b

Fig.15. *Pinnaspis aspidistrae* (fern scale) 15a: female. 15b: male.  
Photos: Fera

***Pinnaspis buxi*** - (screw-pine scale) Fig.16

Adult female scales are narrow oyster-shell shaped, light brown, with exuviae marginal, yellow brown; length 1.5 mm. Male covers are white, felted, elongate, with three longitudinal ridges; exuviae marginal, pale yellow brown. Generally the male scales are less common and conspicuous than those of *P. aspidistrae* and *P. strachani*. Screw-pine scale is rarely recorded in Britain, being restricted to a small number of public botanical collections.

Pteridophyte host:-  
Pteridaceae: *Adiantum*.

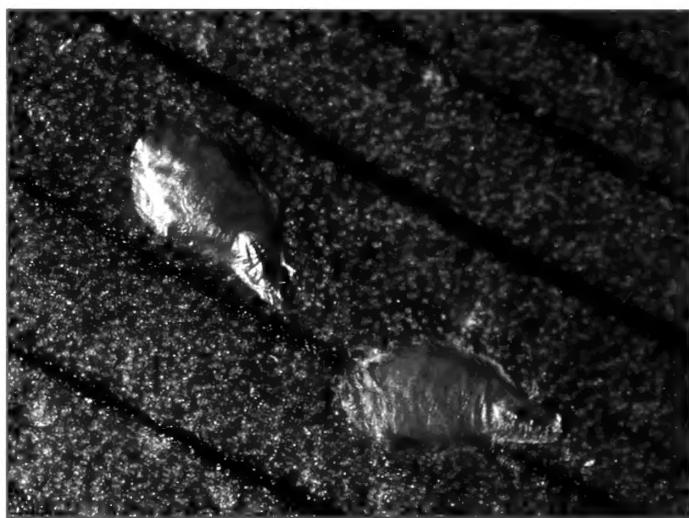


Fig.16. *Pinnaspis buxi* (screw-pine scale)  
Photo: Fera

***Pinnaspis strachani*** - (lesser snow scale) Fig.17

Adult female scales are narrow to broadly oyster-shell shaped, white to light grey, with exuviae marginal, yellow brown; length 2.5 mm. Male scales are white, felted, elongate, with three longitudinal ridges, with exuviae marginal, pale yellow brown. They frequently occur in huge numbers.

Pteridophyte hosts:-  
Aspleniaceae: *Asplenium*.  
Lomariopsidaceae: *Nephrolepis*.  
Polypodiaceae: *Platycerium*.

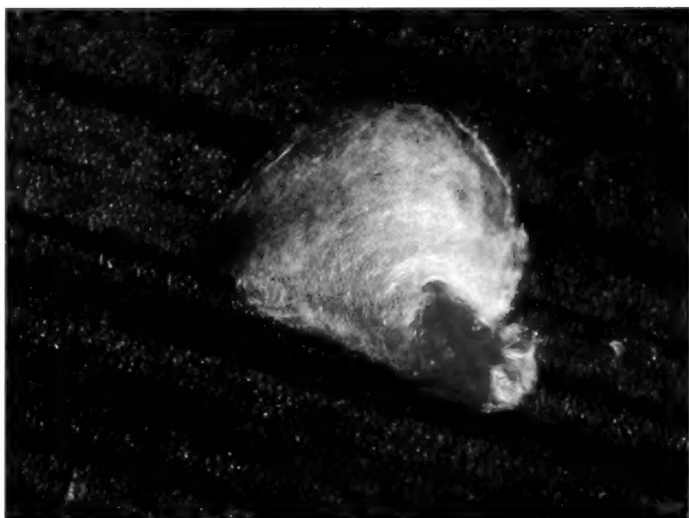


Fig.17. *Pinnaspis strachani* (lesser snow scale)  
Photo: Fera

***Pseudaulacaspis cockerelli*** - (false oleander scale) Fig.18

Adult female scales are flat, white, broadly oyster-shell shaped, with exuviae marginal, yellow to brown; about 3.0 mm long. Male scales are smaller, white, felted, elongate, with or without three longitudinal ridges, with exuviae marginal, pale yellow. Males often occur in huge numbers turning parts of the host white. False oleander scale is currently only known to be established in Britain at a single public botanical collection.

Pteridophyte host:-

Pteridaceae: *Adiantum*.



Fig.18. *Pseudaulacaspis cockerelli* (false oleander scale)  
Photo: Fera

**Control**

Scale insects can be very difficult to control and it is therefore important to carefully check any new plants for scales or evidence of scales, such as honeydew, sooty mould, or waxy deposits, to avoid their accidental introduction to fern collections. If ferns are heavily infested with scale, the most effective control may simply be to destroy the infested plant. However, there are other control options available and general advice is available on the Royal Horticultural Society (RHS) website, which includes information on chemical and non-chemical methods (<http://apps.rhs.org.uk/advice/search/Profile.aspx?pid=224>). Scale insects are often most vulnerable to insecticides when the first-instar (immature stage) or 'crawler' is actively moving around the plant. Placing a sticky band around the stem of an infested plants and monitoring it for the presence of crawlers can help to determine the best time to spray. Chemical insecticides can only be used under the conditions stated on their label and care must be taken as some may be phytotoxic (harmful) to delicate ferns. It is always advisable to test spray part of a fern to see if it is sensitive to the insecticide before wider application.

**Acknowledgements**

The author would like to thank Dominic Eyre of Fera for providing advice on scale control; Andrew Halstead and Andy Salisbury of the RHS for advice and records of scales insects on ferns; and David Crossley of Fera for taking the photographs.

Find more information about scale insects from the following website:

ScaleNet (<http://www.sel.barc.usda.gov/scalenet/query.htm>).

**Special Offer for BPS Members.**

Would you like to become a member of the Royal Horticultural Society?

The British Pteridological Society is an RHS Affiliated Society and this year they have come up with a very special offer for Affiliated Society's Members:-

Join the RHS for a first year at a special Individual member price of £35.70 (usually £51) or Joint – 2 adults at the same address - price of £51.10 (usually £73) You save 30% off a year's membership! Also RHS will donate £5 to BPS!!! Once your membership has been processed, you will also receive a £5 RHS shop/plant centre voucher saving you even more money! This is an easy way for you to enjoy the benefits of RHS cheaply AND help our Society funds!

If you would like to take up this special offer, please e-mail [treasurer@ebps.org.uk](mailto:treasurer@ebps.org.uk) or write to Gill Smith, BPS Treasurer, Rookwood, 1 Prospect Road, Oulton Broad, NR32 3PT. You will need to give me the following information:-

- Name: title, first name, surname,
- Date of birth (Mandatory - sorry!),
- Address with postcode and e-mail address if you have one,  
(If this will be a Joint membership then I need the same details for the second person.)
- Payment can be made by several methods:-
- 1 Direct debit – bank address, sort code, account number and name, needed.
- 2 Cheque – made payable to 'The Royal Horticultural Society'.
- 3 Debit/credit card – usual details needed but I will have to send the form to you to sign.

Option 3 will obviously hold up the procedure whilst posting back and forth.

The forms have to be sent in to the RHS by me as the Treasurer, but you will have a copy which you can use in lieu of the membership card which should be with you within 28 days. Your £5 voucher will be sent separately from the membership card.

Unfortunately this offer is only open to **NEW** members, **NOT** existing members!

I hope many of you will take advantage of this generous offer.

Gillian Smith - Treasurer



# Familiar Ferns in a Far Flung Paradise

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In the summer of 2011 I was lucky enough to spend 3 months at Laguna Blanca Nature Reserve in Paraguay, South America. Para La Tierra, a not-for-profit conservation organisation, runs a small research station there and took me on as a botanical research intern for the summer. Paraguay is a land locked country in the heart of South America practically untouched by tourism; however agriculture, cattle farming and urban development are an ever present threat to its vast array of ecosystems and habitats.

Nestled in the heart of rural Paraguay, where the locals speak native Guarani, and the nearest form of civilisation is a small village 45 minutes away down dusty red tracks, is a true paradise; a beautiful clear blue lake and bright white beach, surrounded by astounding flora and fauna just waiting to be recorded and studied. (Fig. 1)



Fig.1. The beautiful view of sunrise over the lake which I woke up to most mornings.

Land bordering the reserve has been stripped and burned to create either arable farmland planted with crops such as maize and soya, or pastoral fields filled with grazing cattle or horses. Despite being just a small fragment of natural vegetation only covering around 8km<sup>2</sup>, Laguna Blanca is thus a very important site where native communities cling on amidst a sea of agriculture. Moreover within this small area four major habitats coalesce to form a unique mosaic of cerrado, dry forest, Atlantic forest, and riparian zones comprised of a large 1.47km<sup>2</sup> artisan lake, and small river.

With no mountain chains in the area the entire reserve is very flat at around 150m above sea level, resulting in winds exceeding 22km/h for 14% of the year, furthermore any sudden switches between northerly and southerly winds brings about abrupt shifts in weather, ranging from hot dry air to tropical storms, frosts and even hailstorms. Sitting just below the Tropic of Capricorn, between 23°50 and 23°46S and 56°16 and 56°18W, it is not uncommon for yearly temperatures to reach lows of -5°C in winter, to highs of over 40°C in summer, while the average annual rainfall is around 1250mm (Hacker, et al. 1996: Gauto, et al., 2011: Glatzle and Stosiek, 2006).

After two weeks exploring each habitat within the reserve I had to design my own research project from scratch. Having never travelled in South America before my botanical knowledge of the area was poor; many

of the trees, shrubs and herbs appeared very alien. However the abundance and diversity of enchanting ferns caught my attention straight away, proving relatively familiar in such foreign surroundings. Hence I developed a study which looked at the impacts of environmental factors upon the fern species distribution throughout the reserve.

Three large 1 hectare plots were set up in each habitat type, within which ten 10x10m quadrats were sampled, thus 120 quadrats were surveyed in total. The vegetation of each quadrat was assessed using the DOMIN scale of % vegetation cover, while the primary environmental factors tested for were; soil pH, % soil moisture, % light reaching ground level, soil conductivity and soil salinity. However due to the delayed arrival of the required probes some of the data collection is ongoing, therefore I cannot give you a full account of my results in this article. Nevertheless I can show you some of the amazing ferns that I discovered. With no flora guide specifically for Paraguay, let alone one for its fern species I had to use various keys from neighbouring countries (which were often in Spanish), online databases and local expertise to determine what species I was dealing with.

Covering around 60% of the reserve the cerrado (see Fig. 2) forms the largest habitat area. Patches of extensive grassland, hardy shrubs, and scrubby trees intermingled with large termite mounds, form a savannah type landscape with many of the plants adapted to cope with fire. Large underground root systems allow rapid



Fig.2. Typical cerrado landscape and vegetation



## Familiar Ferns in a Far Flung Paradise

uptake of water when it rains, while fleshy tubers store water and allow some plants to retreat below ground, while many tree species have thick corky bark to protect vital transportation tissues within. Exposed sandy soils with low organic matter content bear the scars of previous fire events, whereby patches of blackened ground are left bare. Thus, without any such capability to withstand such intense fire pressures, lack of moisture and organic material, the cerrado yielded no fern species.

The dry forest, more specifically known as 'semi deciduous mesophytic transitional forest', forms a small elongated habitat totalling around 1km<sup>2</sup> adjacent to the cerrado (Eiten, 1972). Generally the canopy height is around 20m of moderate density, and the understory is often quite patchy, made up from low rambling vines (Fig. 3), and succulents. Where the understory opened out and was not completely dominated by vines or succulents, a few specimens of *Pecluma ptilodon* were found. The fronds stood erect amidst very dry leaf litter, and showed signs of heavy herbivory and damage, demonstrated in Fig. 4.

In comparison, some other *P. ptilodon* plants were found on the margins of the lake and were in much better condition, nevertheless all plants were producing a good amount of fertile fronds. Two epiphytic species were also found in the dry forest, *Microgramma vacciniifolia* and *Pleopeltis pleopeltifolia*. The former has rhizomes that look much like a vine wrapped around the tree trunk and often runs from the forest floor to the upper canopy; furthermore it has highly dimorphic sterile and fertile fronds as shown in Fig. 5. *P. pleopeltifolia*, in comparison, has a very small anchorage network of rhizomes and roots while its finger like fronds grope outwards from the



Fig.5. *Microgramma vacciniifolia* entwined around the trunk of a tree showing both the round sterile fronds, and the fertile much more elongate fronds as well.



Fig.6. Open area where *Adiantum pectinatum* thrived, however the specimen in the foreground shows some yellowy discoloration.



Fig.3. The low network of vines that create patches of dense understory in the dry forest, only where these patches broke up were ferns found.



Fig.4. Damaged fronds of *Pecluma ptilodon* in the dry forest.

trunks. However these two species only occurred in very small numbers along the outer edge of the dry forest nearest to the lake, where the heavy mists and morning dew penetrated through. Again both species were much more healthy and abundant within the riparian zones.

A relatively small fragment of Atlantic forest totalling around 2km<sup>2</sup> extends out southwards from the reserve. Here the forest canopy is higher and much denser than the dry forest with a well developed understory. Unfortunately I could only explore the forest from the ground thus some species that may have been found in the high canopy were probably missed, nevertheless I found a total of seven fern species in this habitat.

Occurring in 60% of all the plots within the Atlantic forest, the most abundant species was *Adiantum pseudotinctum*. This species dominated the ground flora where the forest canopy opened up, thus received slightly higher light levels in comparison to other areas in the forest which experienced deep shade throughout the day. Traditionally this fern is used medicinally by the Guarani people whereby they crush it up and mix it in with 'Yerba mate' to form a strong beverage akin to tea – the taste is rather unique and not for everyone! Another *Adiantum* species found in this habitat was *Adiantum pectinatum*, a very delicate fern with almost transparent fronds. Again this species was only found in more open areas of the forest with enhanced light levels and, in such areas, it occurred in abundance as in Fig. 6. However often the specimens had discoloured yellowish brown



Fig.7. Healthy looking frond of *Pteris denticulata* showing how the fronds grow very close to the ground.

pinnae and I could find very few fertile fronds. *Pteris denticulata* proved to be the most widespread species cropping up in over 70% of all the Atlantic forest plots; however it was always found in much lower densities than *A. pseudotinctum*. The dark green foliage was often sprawling amidst other vegetation leaving the fronds themselves on, or close to, the ground making it difficult to spot shown in Fig. 7. Furthermore many fronds were damaged presumably caused by herbivore activity, and relatively few fertile fronds were found throughout the 3 month study.

Two rather more interesting species found in the Atlantic forest plots were *Thelypteris abrupta* and *Dennstaedtia globulifera* (Fig. 8). The latter species has a growth form similar to bracken with large fronds, up to 1.5m tall, that form a dense canopy and, within a localized area, dominated the ground flora; however it was not well distributed throughout the forest occurring in just 16% of the plots. *T. abrupta* was reasonably widespread found in just over 43% of the plots, generally it was always located within deep shade where the



Fig.8. Typical sori of *Dennstaedtia globulifera* set in 'cup' like structures.



Fig.9. The asexual reproduction method employed by *Thelypteris abrupta*.

soil was damp to touch and the foliage glistened with moisture. Furthermore many of the fronds demonstrated their ability to reproduce asexually whereby small buds are formed on the tips of the mature fronds, and then, when they are big enough, they drop off to form an entire new plant. (Fig. 9)

One of my favourite species within the Atlantic forest was *Lastreopsis effusa* (Fig. 10) due to the big luxuriant

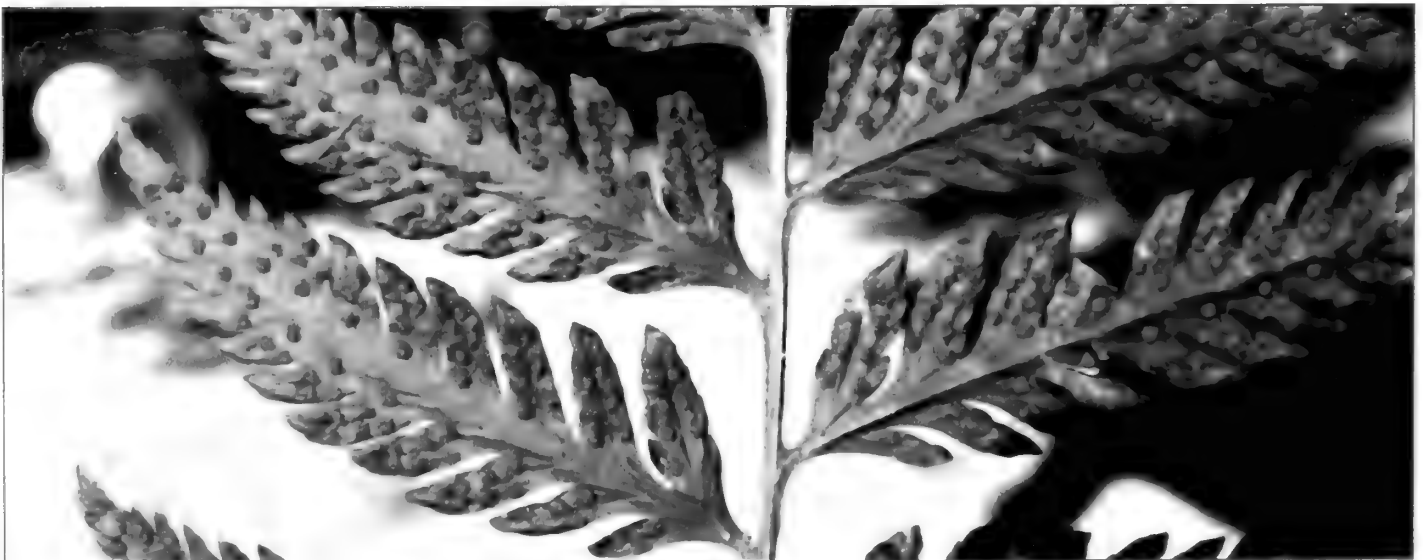


Fig.10. My herbarium press of *Lastreopsis effusa* showing its delicate structure and bright circular sori.

## Familiar Ferns in a Far Flung Paradise

clumps it formed, radiating sunlight wherever it fell on the slightly shiny adaxial surface of the fronds. This was not a common species, only found in 13% of the Atlantic forest plots; those in which it was found had dense canopy cover and a well developed understory creating permanent deep shade conditions. Another species that popped up in just 10% of the plots on very damp dead wood nestled in amongst spongy moss was *Doryopteris concolor*. This delicate little palmate fern has a black stipe and rachis with very small fronds around 8cm across at the largest, thus every inch of the plots had to be thoroughly searched so that no specimens were missed. My muddy knees and elbows efficiently demonstrated my fern dedication by this point!

The final areas surveyed for ferns included the large artisan lake and small accompanying river (Fig. 11) which actually flows out of, rather than into, the lake. This is due to the fact that the lake is ground water fed from the extensive water store within the Guarani Aquifer System which extends underneath 4 countries; Argentina, Brazil, Paraguay and Uruguay (Wendland, et al., 2007). Extensive reed beds flank the lake shore, interspersed with sandy beaches and swathes of gallery forest, technically classed as 'evergreen mesophytic or hydrophytic forest'. Gallery forest usually forms a narrow strip of woodland no wider than 100m alongside water bodies, and have a permanent year round water supply as the water table is very close to the surface. The canopy tends to have a rich epiphytic flora due to rising mists and heavy morning dews, while other abundant plants include Cyperaceae, Poaceae and Juncaceae which form a dense, if somewhat low, understory (Eiten, 1972; Eiten, 1978; Redford and Fonseca, 1986). At Laguna Blanca the gallery forest extends approximately 3km along the lake shore, and flanks either side of the river for around 600m; it was this habitat that generated the highest number of fern species, 16 in total.

Some species actually had their roots and fronds partially submerged, or else on completely saturated ground, such as *Blechnum serrulatum* (Fig.12), *Lindsaea portoricensis* (Fig.13) and *Doryopteris nobilis*. The latter has impressive pale palmate fronds outlined with black venation and was very rare on the reserve, found in only one 10x10m plot although within this there were several individuals complete with fertile fronds. In contrast the other two species were very abundant found in over 30% of all the riparian plots. *L. portoricensis* is a relatively small fern, rarely reaching over 20cm in height, and was often growing intermingled with the surrounding vegetation; however it never failed to catch the eye due to its vibrant bright green fronds that waved at you in the breeze. Similarly *B. serrulatum* also has rather verdant, but singular fronds that stand robust and stiffly erect, hiding opulent burnt orange linear sori underneath. Generally this species was found alongside patches of *Pityrogramma calomelanos* (Fig. 14) providing a stark contrast with the underside of the delicate fronds being a distinctive silvery-grey in colour.



Fig.11. A characteristic section of the river; other areas were often much more closed in and dense with vegetation.



Fig.12. The stiff upright fronds of *Blechnum serrulatum* and, in the top left corner you can just see the bright burnt orange linear sori.

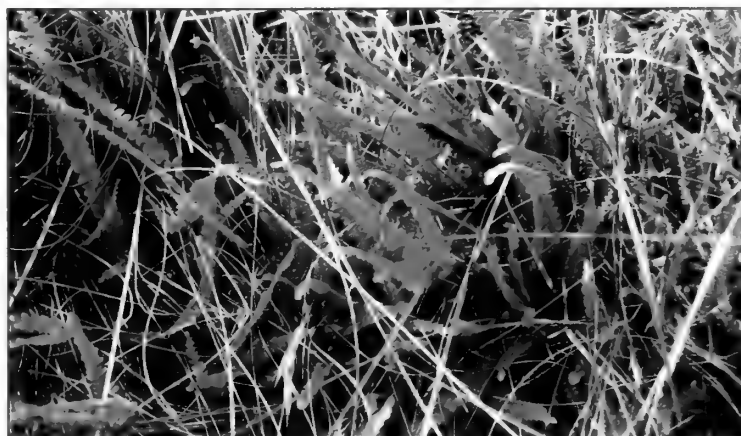


Fig.13. A typical cluster of *Lindsaea portoricensis* fronds amongst grasses and sedges.



Fig.14. A large swathe of *Pityrogramma calomelanos* demonstrating its usual growth form.



## Familiar Ferns in a Far Flung Paradise

Vast clumps of *Thelypteris serrata* also lined the banks of the river, but were set further back in more shaded areas where its large fronds, up to a metre in length (demonstrated in Fig. 15), created dense canopy cover over the river, under which only mosses could grow. Indeed one very abundant clubmoss on the reserve was *Lycopodiella cernua* which stood like miniature Christmas trees along the lake shoreline, and is used in the same way as *A. pseudotinctum* by the Guarani people.

Where the sandy soils became drier and received stochastic inundation, *Dicranopteris flexuosa* occurred with its yellowish-green, elongate fronds protruding proud of the surrounding vegetation as shown in Fig. 16.

*Adiantum serratodentatum* also thrived in these conditions but was much more abundant. The latter species was sometimes found alongside *Pteridium arachnoideum* (Fig. 17) on disturbed ground that had been poached up by horses; it is Paraguay's version of bracken with the same growth form and ability to dominate the local area, often in abundance along roadsides and tracks.

Three tree fern species, *Cyathea microdonta*, *Cyathea lasiosora* and *Trichipteris atrovirens*, were scattered throughout the gallery forest and banks of the



Fig. 15. One large frond belonging to *Thelypteris serrata* so named because of the serrated edges of the pinnae.



Fig. 16. The drooping fronds of *Dicranopteris flexuosa* forming a star shaped explosion of bright green foliage.



Fig. 17. The bracken like growth form of *Pteridium arachnoideum* with many brown dead fronds littering the ground.



Fig. 18. Two tree ferns approximately 1.5m tall on the fringe of the river.

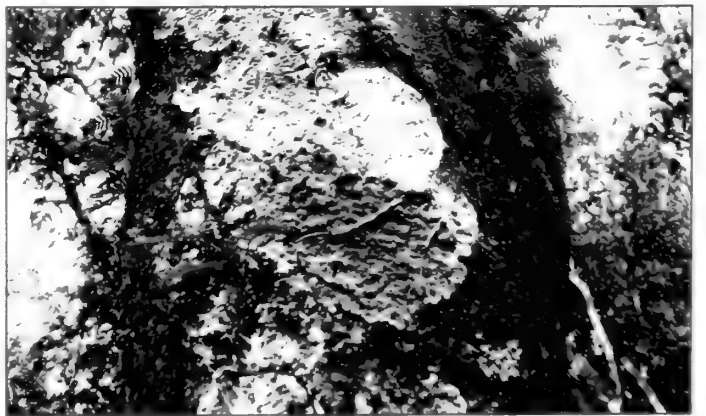


Fig. 19. *Pleopeltis polyodioides* scattered all the way up and around a tree trunk.

## Familiar Ferns in a Far Flung Paradise

river, ranging from 0.5-2m tall. They proved rather tricky to key out as the scales, hairs and spikes on the stipe were some of the main features used to tell them apart. Furthermore most had extensive herbivore damage, nevertheless they created a truly majestic 'lost world' riverine environment as shown in Fig. 18.

In addition to *M. vacciniifolia* and *P. pleopeltifolia*, the gallery forest yielded a third epiphytic species, *Pleopeltis polypodioides*; a very delicate fern that protrudes horizontally outwards from small, vine like roots and rhizomes which anchor it to the trunk. (Fig. 19) When

many individuals occur they can make the tree look fuzzy and furry from a distance, and indeed when looked at more closely under a hand lens, small chestnut hairs can be seen on the adaxial and abaxial surfaces, rachis and stipe.

All in all I had a terrific time exploring the wilds of Paraguay foraging for as many ferns as I could find and I have definitely caught the bug! The data generated from this study is now the main focus of my 3rd year university dissertation project and I hope to publish the results in due course. □

### Acknowledgements:-

I would first of all like to say a massive thank you to Para La Tierra for giving me such an amazing opportunity, for purchasing the vital equipment that I needed to carry out my study, and for gathering the outstanding data required for my project. A second thank you is for Paul Smith and all the help and support he provided along the way. Lastly I have to thank my parents for the best 21st birthday present I could possibly have asked for!

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## Another BPS?

There are plenty of organisations that use the initials BPS. A search on the internet reveals a plethora of 'British' organisations such as:-

- British Psychological Society.
- British Photographic Society.
- British Pharmacological Society.
- British Printing Society.
- British Postmark Society.
- British Parachute School.

Other organisations include:-

- Boston Public Schools.
- Baltimore Philatelic Society.
- Buddhist Publication Society.
- Birmingham Paleontological Society.
- Blackheath Poetry Society.

The list goes on and on, however, I was amused by the Barbados Postal Service when I saw this sign on a recent holiday. I had visions of paper aeroplanes made from envelopes flying all round the island! (AEG)



# A Field Guide to the Flora of South Georgia. By Deidre Galbraith. South Georgia Heritage Trust, 2011.

The appearance of popular field guides to sub-Antarctic islands is of considerable interest to fern growers because they feature species that grow in far south latitudes. Potentially, therefore, we should be able to grow these in our temperate gardens at similar northerly latitudes. South Georgia, a UK Overseas Territory, is located at 54°S, 1390 kms. east-south-east of the Falkland Islands. However, although at the same latitude as northern England, without the benefit of Gulf Stream warming it experiences a much harsher climate. Indeed, we learn that South Georgia's coastal zones have a mean monthly annual temperature range of about 0°C to 4°C, but with extreme ranges of about -19°C to 23.5°C for short periods! The island's flora is confined to these lower levels, with higher elevations being permanently snow and ice covered.

This, the first popular flora of this fascinating island (Fig.1), is a most attractive publication produced by WildGuides and features stunningly good photographs. Preliminary accounts of the island's physical, historical and zonal aspects are followed by a description of the vegetation, of which there are 25 native vascular plant species – 5 grasses, 3 rushes, 1 sedge, 9 dicotyledons, 6 ferns and 1 clubmoss (*Lycopodium magellanicum*). This flora is derived mainly from Tierra del Fuego, Patagonia, and the Falkland Islands, but

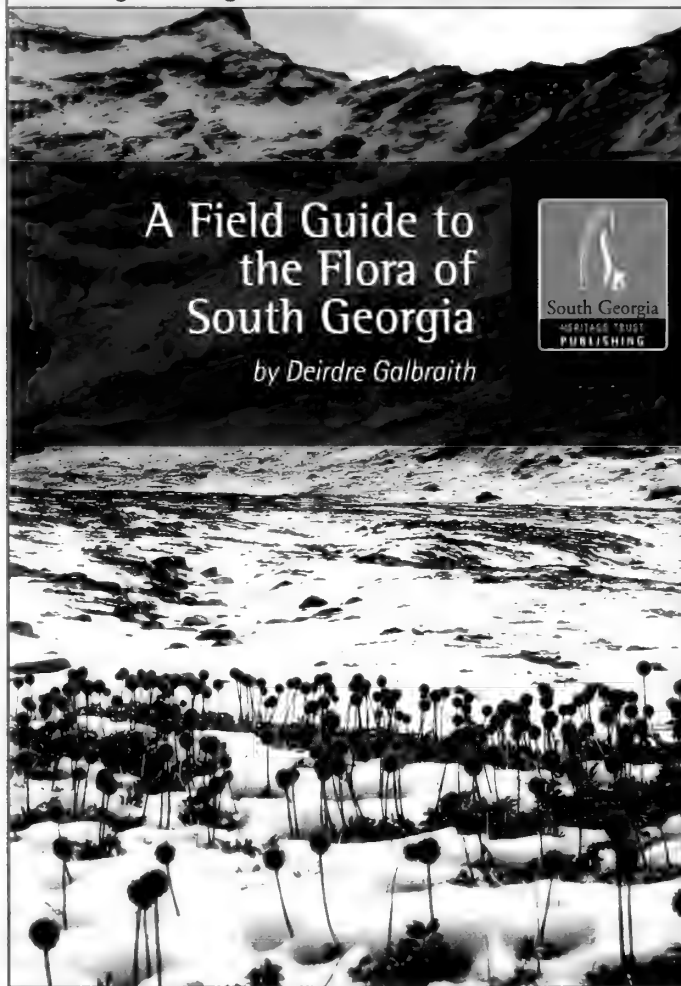


Fig. 1. The book cover

Shield-fern *Polystichum mohrioides*

Locally common



Plants consist of dense clusters of rigid, upright, bright green leathery fronds up to 25 cm (10 in) long. The pinnae (multi-divided leaflets arising from both sides of the frond stem) are crowded, overlapping, slightly waxy and distinctly toothed nearer the base of the fronds. As the new fronds unfurl they have a crozier shape. The underside of the pinnae is covered with clusters of brown spores. The living foliage is usually surrounded by the dead fronds of previous years.



WHERE TO FIND: Usually found at the junction of screes and rock faces and on dry hillsides and stable scree, especially on north-facing slopes. Most common on the north side of the island.

ALTITUDE: 15–305 m (50–1,000 ft).

19

Fig. 2. The *Polystichum mohrioides* species description page from the book.

these larger land masses have rather larger floras (see for example Moore, 1983 and Broughton & McAdam, 2003).

The cosmopolitan *Cystopteris fragilis* (in one of its forms presumably) is locally frequent and often cultivated in UK gardens. *Blechnum penna-marina* has a very wide circum-Antarctic distribution, although it is apparently very local in South Georgia; cultivated widely, too easily sometimes! *Hymenophyllum falklandicum* is an inconspicuous filmy with very small delicate bipinnate fronds, locally frequent, but unknown in cultivation. *Grammitis poeppigiana* is a tiny fern, rare in South Georgia, and probably not cultivated. Bearing in mind the cultivation difficulties with adder's tongue ferns, *Ophioglossum crotalophoroides*, infrequent in South Georgia, is likewise probably not in cultivation.

Perhaps the most horticulturally interesting South Georgian native fern is *Polystichum mohrioides*. A photograph of this species in its native habitat is shown in Fig.2, which also serves to show the layout used for the species treatments in the book. This is a rather beautiful fern, closely resembling the north-west American species *P. lemmonii* (which in the past has also been called *P. mohrioides*). Mickel, 1994 has a



## A Field Guide to the Flora of South Georgia.

good picture of the plant in a pot, and describes its ease of cultivation as “moderate”, recommending its more frequent use in the rock garden. Olsen, 2007, under its synonym *P. plicatum*, also recommends rock garden type culture in partial shade with good drainage. Plants under the name of *Polystichum mohrioides* have been offered in the trade in Britain by about half a dozen nurseries, but whether they were actually this species is uncertain. One of these nurseries, World of Ferns has offered the plant once (in their 2008/9 catalogue) under the name *Polystichum plicatum*. I acquired one of these plants in 2008 but have so far not plucked up the courage to plant it out of doors (Fig.3). There is some taxonomic confusion over this species, as Moore’s 1983 illustration of his *P. andinum* seems to be this taxon, to which he provides the synonym of *P. mohrioides* var. *plicatum*. Moore also describes *P. mohrioides* as a separate taxon, which is clearly something different! However, polystichum expert David Barrington has advised me that *Polystichum mohrioides* is the best name to use for this taxon for the time being.

The book concludes with briefer treatments of the naturalised aliens and some notes on biosecurity (i.e. measures to prevent the influx of further aliens). South Georgia is perhaps most famous for its part in Shackleton’s rescue of his Antarctic-stranded crew, its sealing and whaling history and its impressive fauna. Nevertheless, this splendid little book adds another dimension to its natural history, and is a delight to peruse, even though we may never visit its featured destination! □

Graham Ackers



Fig. 3. *Polystichum mohrioides* in the author’s collection acquired from World of Ferns as *P. plicatum*.

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## The British Pteridological Society at Shows.

BPS members have been exhibiting and winning prizes at the Southport Flower Show on a regular basis since 1928 and from time to time in the past we have had a presence at other major shows including The Manchester Flower Show; The Liverpool Garden Festival; Malvern Spring Show; Birmingham BBC Gardeners World and Chelsea. In 2009 we decided to raise the profile of the BPS once again by exhibiting at major shows on a regular basis (with some success!) starting with RHS Tatton Park Flower Show. In 2010 we travelled to BBC Gardener’s World in Birmingham and in 2011 headed north for the RCHS Gardening Scotland in Edinburgh. This year, apart from Southport, we are taking a rest from shows though in October we will have a presence at all four RHS Gardens namely Harlow Carr in Yorkshire; Hyde Hall in Essex; Rosemoor in Devon and Wisley in Surrey. In future years we hope to exhibit at Hampton Court, Harrogate, Malvern and at some point, again at Tatton Park.

Whereas this is enormous fun and is very rewarding, both in terms of gaining new members and winning prizes, such events take a lot of planning and require quite a large team of people. We feel sure that there might be members amongst our readership that would be interested in being involved with helping at major shows or be prepared to have a small stand at their local show. We are even

thinking that maybe we should set up a special Shows Sub-Committee to co-ordinate these efforts.

If you are interested in being involved with shows, at any level, then please get in touch.

Yvonne Golding: Secretary@eBPS.org.uk



The British Pteridological Society stand at Gardening Scotland. Left to right : Frank Katzer, Bridget Laue, Alison Evans.

## Survivors.

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It would not be a surprise, for reasons that are sadly all too obvious, if following the 2010/2011 winter the *Pteridologist* gets a plethora of articles on the subject of hardiness, but I just wish to mention the matter of losses quite quickly and then move on to something more interesting. Where I garden, about half way up the east coast in Lincolnshire, we probably have a climate at least as harsh as that enjoyed by the average member, so that remarks on hardiness in this locality should be of some use to most fern growers living in the British Isles.

I often struggle with plants that many growers in England, Wales and Western Scotland find quite hardy, especially many of the foreign species. So, when last winter the BBC declared us to be the most cut off village in England, (and even tried to send reporters in a vain attempt get here), it provided a really first class hardiness test for a number of the foreign species. Naturally, my tree ferns were heavily hit despite my having kept them successfully for ten or more years, without any losses, under exactly the same conditions. Until last winter they had wintered very well for me in a poly-tunnel house, coming through without any extra protection Yet despite the losses of the 2010/2011 winter I still have no plans to increase the insulation given, not least because it is hard to imagine that anything could really be better than two or three hundred cubic metres of air trapped inside a polythene bubble. Instead, in future years, I shall simply add a small free standing heater as an extra precaution in really cold weather.

Ironically, the one *Dicksonia antarctica* which did survive was the only one planted out in the garden; and it survived despite the fact that this was the first year I had decided to risk overwintering it without any protection. This was interesting in three ways: firstly, it has been grown outside for some twenty years, which means that it should be quite well adjusted to the local climate; secondly, since it does not yet have a trunk it was completely covered in snow; and thirdly being a spore grown plant, it may not suffer from the 'jet lag' effect from the change of seasons that results when these plants are rapidly moved to the opposite hemisphere. Which of these is the most important factor, however, I can barely begin to guess at.

Happily, quite a few other exotic species also survived the winter well, including, most gratifyingly, both the Maidenheads commonly grown, *Adiantum aleuticum* and *A. venustum*, as well as *Dryopteris cycadina*, *Athyrium otophorum* and several *Osmundas*. One thing that was noticeable was that almost no ferns proved to be evergreen; nearly all *Polystichums*, and *Polypodiums*, both exotic and native, lost their fronds, as did *Asplenium trichomanes* and even *A. scolopendrium* types. Yet all of them emerged in the spring, apparently without a serious check, the *Polypodiums* even seeming to come a little earlier than usual.

It was also pleasant to see the return of plants like *Dryopteris uniformis* (Fig.1), which grows very well for me in what seems to be the commonly cultivated form, with the slight cresting at the fronds' edges. What is really



Fig. 1. *Dryopteris uniformis* showing the cresting

surprising about this fern, however, is how hard it can be to market, despite the fact that it is bold, strong growing, hardy, adaptable and attractive, which should surely be more than enough to sell it, not to mention that it has the seeming advantage of being a little bit different from the average fern. I say this because, although I am sure most BPS members will be familiar with it, and regard it as part of the general range, it seems quite new to most of the general gardeners I encounter.

The main surprise, however, lies in the resistance on the part of the gardening public to buying many ferns like *D. uniformis*, which continues to mystify me completely. Gardening literature is full of demands for nurseries to provide a greater diversity of plants. Most gardeners profess to be in search of something that differs a little from the normal and many customers will tell me that they are visiting my nursery precisely because they want to find something a bit unusual. Yet these same people eventually leave quite happily carrying a basket filled with *D. filix-mas*, *Asplenium scolopendrium* and *Matteuccia struthiopteris*, even when less common ferns, much better suited to their needs, have been pointed out to them at their own request. I know it is almost certainly the case that to many general gardeners ferns on the whole may still, even in the twenty first century, count as something scarily different from common garden plants; but can it really be the case that there are degrees of 'different' and if there are, what is the downside to 'different' when you are buying plants for your garden?

It is true that there is a growing trend, which started five or six years ago, perhaps on the back of the popular wild-flower meadow fashion, to value ever more the British native plants in the garden. In many ways I think that is a wonderful thing. However, even when they are only buying collections of exotics, many gardeners still show a sad lack of adventure.

I would very much like to persuade the world to give *D. cystolepidota* (Fig.2) a try, since it suffers in part from being very similar to *D. erythrosora* and people do seem to prefer a familiar name. Indeed, Martin Rickard, in the



Fig. 2. *Dryopteris cystolepidota*

only reference work I own which actually mentions it, says that it is probably part of the *D. erythrosora* complex, so it cannot be too different. My experience of growing it began several years ago when I requested it from the spore exchange out of curiosity. Though I have only grown it for a short while, it seems to be quite distinct in several important ways, perhaps the best of which is that it seems to be a lot hardier and more tolerant of a wider range of conditions than the common type. However, the really great thing about *D. cystolepidota* to my mind is the colour; the main feature that most people will surely favour in plants of the *D. erythrosora* complex. While the typical *D. erythrosora* seems often to have pale uninteresting green leaves, those of *D. cystolepidota*, in my garden at least, always seem to be a good strong olive green and the new growth is not the normal, and to my eye slightly sickly, orange-red, fading to dull copper, but a really good cherry red, fading to a charming pink as the growth matures. It certainly is a truly lovely and distinct plant.

Another little jewel that will perhaps never gain the appreciation that it deserves is *D. buschiana* (Fig.3), which is a great shame because it really is in many ways a wonderful garden fern. The problem with *D. buschiana* is that it is very similar to several other species, simply being a fern of the *D. filix-mas* or *D. affinis* type. In other words, just a plain upright bipinnate male fern lookalike, so it seems very unlikely that it will ever make much impression on the general gardening public. Neither will



Fig. 3. *Dryopteris buschiana*

it earn a nursery much money, since the special qualities which make it stand out are really quite subtle.

There are, I have no doubt, quite a few people who will still wonder if the existence of another pseudo male fern, is really all that great a benefit to the fern world. However, having grown it in my garden now for several years, I have to fly the flag with enthusiasm for *D. buschiana*, not only because it now proves to be very hardy, but also because it is just a little bit special.

We all know that *D. filix-mas* is a first class garden plant, quite attractive, easy to grow and with few failings, but I suspect that most fern growers would say that *D. affinis* is arguably in many ways just a tiny bit better, and certainly the one to grow if you do not have space for both. Some of the subspecies, especially if selected carefully, are just that little bit stronger-growing; just a little glossier; a little taller; more even in form; leafier and, in so many subtle ways, just one notch better for the garden than *D. filix-mas*, though it may take a very discerning grower to appreciate the difference. The best way I could perhaps describe *D. buschiana*, is to say that it takes the whole business another notch upwards again, being a plant with the true appearance of nobility. It simply has the look of being an extremely well formed, healthy, beautifully proportioned fern, that is a delight to behold and has a very long season.

In habit my own plants, are perhaps a little shorter than most of the *D. affinis* growing nearby, but they make a tighter, denser, more compact and a better proportioned clump. It is one of the ferns which I tend to notice with pleasure every time I walk round the garden, especially because its fresh bright green always catches the best of whatever light is available. Another advantage is that it seemingly gives few problems in cultivation, happily growing without much help in my chalky loam. So, if you have not tried it already, why not give it a go and even if you have tried it, why not go down the garden and give it a second look. I am sure you will discern some of the same qualities I do.

No, of course it will never grab the attention of visitors like *Athyrium nipponicum* 'Pictum', (Fig.4) but I am sure that in its own unobtrusive way it raises the overall standard of the garden. It really does justify the space it occupies, even if it is only ever truly enjoyed by the gardener who planted it. □



Fig. 4. *Athyrium nipponicum* 'Pictum'



# The Dead of Winter? Keeping Tree Ferns Alive in the U.K.

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Two of the coldest winters of the century ravaged this country in 2009 and 2010. Hundreds of thousands of much-loved plants met a cruel death, and tree ferns were no exception. Yet *Dicksonia antarctica* (Fig.1), with its Jurassic Park overtones is, I believe, the easiest of the tree ferns to keep outdoors in the U.K.



Fig. 1. *Dicksonia antarctica*, December 2010

The beautiful specimen you see here was one of two in my North Yorkshire garden, photographed in December 2010, but it was crippled by the severity of the frosts later in the winter. Not, perhaps, in vain; it has furthered my stumbling research into how best to keep them alive. I'll tell you what I've tried, how I got on and what I've learned. It's been written of me that I ask questions of plant physiology that only laboratory tests can determine. Guilty as charged, but there is another way. Alan Titchmarsh wrote a book that will give you a clue. He called it "Trowel and Error". I hope you'll learn from the many errors I made. Incidentally, when he signed my copy I told him that it was a forking good read. His chuckle is quite delightful. While on the subject of books, I heartily commend the book *The Plantfinders Guide to Hardy Ferns*, by Martin Rickard. It is particularly informative on tree ferns, and I wish now that I'd read it more diligently.

First, I'll cover some basics. A tree fern has a trunk consisting of an inner rhizome, which is little thicker than your arm, surrounded by old leaf stems, roots and fibre. It features vascular tissue within a complex "shell" about as

tough as a coconut's. It can hold over 100 ft of fern aloft and it takes some sawing through, believe me. The roots and fibres around it also have coconut similarities, being much like coconut matting. Protruding from the matting of the upper trunk are the remains of the frond stalks of previous years, gradually disintegrating. The lower root fibres are elongated and grow into the ground, helping both to anchor the plant and supply nutrition. I don't think that they provide all the food or water needs of a tall fern; in the wild this is supplemented by the rain dripping off the forest leaves above, absorbed by the fronds and directed by them into the funnel-like apex, which obligingly leaks its contents to the upper root fibres around the rhizome. I have read dire warnings of rot if the apex is left full of water, especially in winter. In my experience this is quite impossible - it simply isn't watertight.

They love shade, warmth and moisture. These conditions produce massive fronds. Differ from those ideals and the fronds will be smaller, less lush and thirstier. My garden faces southeast and mine live with little shade. I use timed irrigation via a pipe about as thick as a T/V aerial cable, running up the back of the trunk, secured with fine wire and terminating in an elbow and an adjustable, dripping nozzle. This is usually turned off if there's an "r" in the month. Even in shady locations, the plants will thank you for a daily soaking of the trunk during dry spells. If this isn't possible, perhaps because you're away, then consider wrapping the wetted trunk in clingfilm or some such. When you can't see droplets within it's too dry and you should water it from the top. I'd like to thank Professor Wardlaw for this suggestion, and for all his unfailing help since I first approached him.

When you first plant your tree fern, plant it as shallowly as you dare – you've paid for it by the foot, so don't bury money. If it's a newly imported, unrooted plant, a couple of inches does me! I knock a couple of road pins, obtainable from builders' merchants, into the ground alongside the trunk and secure it with black cable ties until the subsequent spring. Buy a dozen road pins while you're at it, for they're the most useful, "invisible" stakes of all. What's a road pin? It's one of those hardened steel rods with bent-over tops that you see hammered into tarmac, with conspicuous tape threaded between them. A fern bought with roots won't need the pins, for it shouldn't blow over if you plant it, firm the surrounding soil and then soak it to consolidate the texture. They're amazing plants to watch in a gale – the fronds thrash about in a most fearsome manner, but all is usually intact when the wind drops.

Don't expect typical growth or behaviour in the first year, for until there are enough roots, which grow mainly in winter, it will sulk. If you buy a tree fern grown in sheltered conditions, most of the existing fronds will probably scorch if exposed to unfiltered sun. Fortunately, those that develop afterwards will adapt quite successfully.

I've read that during the growing season you should feed the plants with very weak (no more than half normal strength) liquid fertiliser. I seldom do, because I once burnt the embryo fronds through using a too-strong mixture, and I've yet to find a really effective method (suggestions, please) because the wretched stuff runs down the outer trunk and waters the surrounding weeds. I do both feed

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the plants and insulate the crowns in autumn, by filling the apex cavity with fallen leaves. By all means do it at other times, but emerging fronds tend to push them out in a way that reminds me of house-proud moles flicking out unwanted debris with their waffling noses.

Tired fronds can be pruned away throughout the year, to taste. In mild winters the newer fronds may stay green – or greenish – but if the trunk or ground becomes frozen or dry (because the air is crisp) they'll rapidly dehydrate, browning and shrivelling well before the frond tissues have a chance to be directly damaged by the frost. I'm sure that I get sideways looks from the neighbours when, admittedly rarely, I suddenly spot fronds withering in December and throw a bowl of water over the top (The hosepipe was frozen!). Don't worry if you do lose the fronds; it can happen in Australia too. If the naked trunk offends you after you've removed fronds bereft of charm, just disguise it. I use plastic ivy, but perhaps I have no taste. You could affix grimacing masks and make your own totem pole, perhaps?

Winter protection is the key factor in the life or immediate death of these plants, and we all became complacent with a succession of relatively mild winters, didn't we? My son, who lives near the east coast, pushed his luck for several years with just leaves in the apex. Some use polystyrene, straw structures, or fleece around the trunk, perhaps toned down and kept more wind resistant with a covering of black weed-suppressing mat and/or sacking. My tree ferns are so visible from indoors that I've always sought inconspicuous protection. For some years I successfully used outdoor Christmas tree lights under fleece, covered in sacking. These were switched on during really cold weather. My philosophy was, and is, that while insulation buys time, sufficient heating buys unlimited time – imagine your own life without any form of winter heating. I'll now add that it must be reliable, for tree fern heating that fails unseen, reassures with a confidence that's totally misplaced.

Winter 2009 was cruel enough. A *Cyathea dealbata* had faded previously, over several years, quite unable to adapt to even mild winters. I was really upset when my hitherto happy *Cyathea cooperi* (that I'd reared from its childhood), *Dicksonia fibrosa* and *Dicksonia squarrosa* all succumbed. For the latter it was a rare cause of death, for just a day or two of dehydration is often enough to see one of those gorgeous creatures off. My *Dicksonia antarctica* fared little better, for as I've just hinted, the Christmas lights guarding my ferns failed that winter. How silly was that – the lights weren't going to fail in summer, were they? To make matters worse, concealing them under all that fleece and sacking made quite sure that I didn't have a clue that they'd packed up. It was all so utterly predictable and avoidable, but mild winters had become the norm and I was unforgivably complacent. Experience is a hard teacher; she gives the test first and the lesson afterwards. Instead, please do learn from my mistakes!

2010

When late April came it was clear that *D. antarctica* was the only survivor, but it produced weak, sickly crosiers. There was worse to come; I had removed all the protection in April, lured by optimism and vanity. There then followed a prolonged cold snap in May. Fate decreed that I was away on holiday at precisely the wrong time. I returned, relaxed and happy, to be greeted by the awful sight of soft, once emerging crosiers, transformed into a slimy, bubbling fermentation of green soup. I scooped it all out for fear of rot, but when nothing whatsoever had happened by late June. My wife and I were heart-broken.

We dug it up, said our farewells, and laid it aside. It took very little persuasion to buy another, which I'll call No. 2 to avoid confusion. It's the one in Fig.1. (and many others, actually). I planted No. 2 in the vacant hole left by No. 1. (I do hope you're keeping up – there's an exam at the end!).

The Law of Grass (better known as Sod's Law) then decided to tease. A mere 3 days later, No.1 threw up a fat crosier, quickly followed by another. I found a suitable spot and it was hastily replanted. (it's the left hand one in this photo (Fig.2.) of both ferns, taken just 2 months later).



Fig.2. Aerial view of the 2 *Dicksonia antarctica*, July 2010

It was time to take a leaf from Fagin's book and think things out again. In retrospect I didn't do that very well...

I had read that the main part of a tree fern needing winter protection is the meristem (the green bud tissue from which new fronds grow. I decided to heat that area alone (huge mistake!) inside the root fibres, using them for both insulation and camouflage. Not only would the heat go exactly where it was needed, I reasoned, but the virtual invisibility would allow me to leave it in place all year, saving work. Since that method didn't work, as you'll see shortly, I won't belabour how it was done. All that now follows is, however, totally relevant.

You could use soil-heating cable, I suppose, but it's expensive and uses a potentially lethal 240 volts. I used a Dennerle 12-volt transformer with its discreet, tough-as-nuts, flexible 10 watt waterproof heating element, sold by their U.K. agent Harrogate Aquatics. The kit costs about £50 and is intended to promote slight under-gravel circulation in posh fish tanks. The transformer was positioned indoors, and the 12-volt flex was extended as necessary outdoors. I used ordinary, black "indoor" lighting flex. If your garden is a long way from electricity, a 12-volt car battery could be used. One of, say, 60 ampere-hours should give  $60 \times 12/10 = 172$  hours of continuous protection before recharging becomes necessary.

Don't then do what I did. I wasted a happy hour or two drilling and feeding this cable in a spiral between the rhizome and its fibrous overcoat (Fig.3). Protecting just the top foot or so of trunk, I left the excess cable dangling for use when the fern was larger and I'd amassed more patience, then connected the element to the cable leading to the transformer, dabbed some brown emulsion paint on any bits and pieces that were still obtrusive, and awaited winter and the big switch on during frosty weather.

Then I recalled last May, and realised that the vagaries of the English weather can make fools of us all. I bought a frost thermostat on Ebay and a couple of LED indicator lights from Maplin. More complex, but it was smug to look out in winter and see a subtle amber light reassuring me



Fig. 3. Drilling the trunk prior to threading the heating cable.

that power was right there at the tree fern, awaiting the thermostat's call to action. It was even smugger to see the red light on in a frost, symbolising that life-saving warmth. To do that, read on.

There are 2 types of frost thermostats; those for use with plug-in heaters and those for use with central heating systems. The latter type contains a tiny shunt heater, which heats the bi-metallic trip making the thermostat cut out early. Why? Because if it were to cut out at the correct room temperature the radiators, still full of very hot water, would continue to pump out unwanted heat for quite a time. Such a thermostat would produce gross errors if used with electrical heaters, besides being totally unsuitable for low voltage applications. You can easily modify one, by cutting though one of the wires to the shunt heater, but you must then re-calibrate it. How? Totally immerse it in a jug of partly melted ice cubes for a while and then rotate the dial to and fro to determine the make and break points. Exactly at a make point, stop. You must then mark and use the dial at that position – do dry it out thoroughly before use! I tied the thermostat to the back of the trunk, securely dry inside an inverted black doggy poo bag, so that it was a foot or so above ground.

I used Maplin 12v L.E.D. panel lights. NO3BB/EVP is amber and NO0BB /EVP is red, but there are many colours to choose from. Many L.E.D.s need a series resistor and/or a blocking diode to work properly, and are polarity sensitive. These worked straight from the pack, whichever way round I connected them. Robust, featuring decent tags with holes in to thread the wire through before soldering, they were just the right brightness to be seen only if I looked for them. The amber was connected across the thermostat live and neutral terminals, to reassure me that power was available at the thermostat; the red was connected, like the heating cable, across the switched live and the neutral terminals to indicate that the thermostat was sending heat to the element. The wires to the indicators were encouraged around the side of the trunk towards the front, so I could see them from the house. It was all very subtle, unless one braved the elements and toddled outside. Then all the godwattery behind the trunk stood out like a dog's tail (sic). I planned to remove this in summer, together with the supply cable (lest irascible people, more muscular or compensation-minded than I, should perchance trip over it after downing a couple of my lagers).

No. 2 tree fern, being rootless, predictably produced no new fronds during the rest of the year. The leaves of both ferns were so browned by late December that I removed them.

2011

Come spring, it was clear that several of my native ferns had been crippled by the intense cold. Some died, some partly recovered and some fully recovered later.

Tree fern No. 1 threw its first flush in May. The fronds were no larger than last year's and were a pleasing fresh green. They remained a fresh green, which was pretty but wrong. It also mimicked the previous year's behaviour of No. 2, throwing out no subsequent fronds.

No. 2 produced a ring of chubby green crosiers in May, which barely peeked out then just sat there. One by one they very, very slowly hardened and, by the end of June, most had slowly turned brown and woody despite irrigation. I tried the clingfilm trick, potted it up and hid it, maintaining irrigation. We were open to the public for charity and a stump would have been unacceptable. It was replaced with a new specimen – No. 3. Now the plot really thickens. By late September I concluded it was dead and removed the clingfilm. I was amazed to see strong root growth from the top quarter of its 4-foot trunk! The tip of each root was white and I could almost see them moving (Fig.4).



Fig. 4. *Dicksonia antarctica* No. 2 after removal of the clingfilm. Note the strong root growth.

Carefully examining the apex, I could neither see nor feel any signs of life. In the interests of future generations of tree ferns in Britain I decided to dissect (vivisect?) this terribly crippled fern. Taking a power saw, I cut vertically downwards, but couldn't quite follow the gentle curve of the trunk. I stopped after a couple of feet, then cut horizontally through. Quite a lot of clear sap came out. I rinsed that and the debris away and photographed the two halves, with a ruler. When I submitted an earlier version of this article to your editor, he asked if I knew where the meristem actually was. I didn't, but I do now and so does everyone else that's still awake and trembling with suppressed excitement. Wake up at the back!

I got several shocks. Firstly, the meristem is that hard plateau that, when I poke my finger down an apex, is mostly beyond reach but sometimes not, presumably after it has had an upwards-growing spurt. I'd assumed that crosiers unfurled from its middle, but I now understand that these grow from the rim but curl inwards, where there is room to climb out. The left hand section shows a tiny but complete crosier and one that is deformed, without a tip. I didn't probe beyond the hair that grows upward from the meristem, because this organism was obviously not clinically dead when I cut it in half, and I have heard rumours of tree fern grafts and the like and I suffered some





Fig. 5. The bisected stem of *D. antarctica* No. 2. showing the position of the meristem.

indecision. Turning my attention to the other half, I gave her a peck on the cheek and looked at the remaining half of the segmented fern. I did probe the hair of this one, but all I found was a couple of deformed croziers that broke off when disturbed. I thought that one half of the segment would appear to be a mirror image of the other, but just the thickness of a saw blade made them totally dissimilar (as you can see in Fig.5).

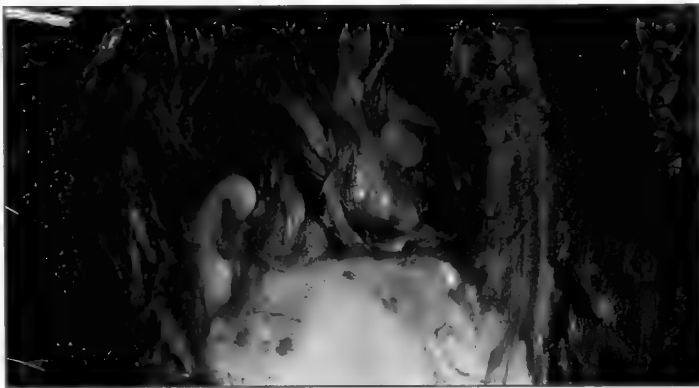


Fig. 6. Detail of the left hand meristem showing developing croziers

I recalled that several of my hardy terrestrial ferns had been crippled this spring, and that some had recovered. With guilt but little real hope, I clamped the two halves back together using cable ties, and popped the resulting

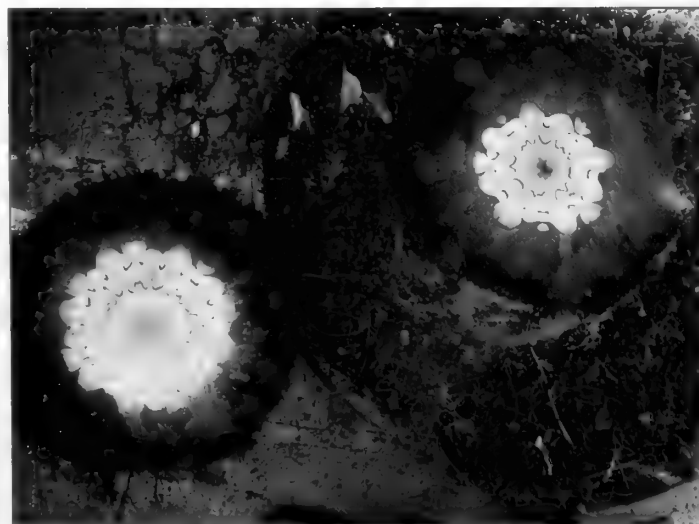


Fig. 7. Cross sections of the trunk.

Frankenstein's monster in a pot of seed and cutting compost, with those new roots now able to reach nutrition instead of being suspended aloft trying to find sustenance in water alone.

I then cut the trunk off, just above ground level. No sap flowed from the cut as the saw went through lifeless tissue. The cross-section was very beautiful, (Fig.7) in a kaleidoscopic sort of way. The cross section of the rhizome was much smaller nearer the ground (the one on the right), and I marvelled at how it could hold a large specimen aloft.

Just the sections of my four-footer are extremely heavy, and probably capable of producing a broken foot if dropped carelessly.

While clearing up the next day I looked at the top sections and was surprised to see that a reddish sap had oozed from the top, at the junctions between the upper leaf bases and the rhizome, forming blobs about the size of peas. Sadly, I later found the photographs of these were most disappointing. I could also see signs of shrinkage in the centre portions so, rather belatedly, I secured the two halves together with cable ties, planted them (now it) in a pot of seed and potting compost and moved it to a frost-free environment.

Fern No. 3, an unrooted specimen from my usual nursery, was planted in June. Sadly, during the winter that nursery had lost all their tree ferns (and evergreens) kept in their usual unheated polytunnel. Happily for me, they had decided to import more. Purchased with its new flush just inches long, the croziers grew into magnificent fronds reminiscent of those in the first picture of this article. Am I worried that no new fronds were produced during the growing season? Well, no actually, because this one has yet to experience a frost and it has yet to grow its winter roots.

Today, just 2 days after my vivisection (and writing the above) I found another 2 pieces of the jigsaw. I noticed that the trunk of No.1 had a dead look about it when compared with No. 3. It was more of a greyish colour than the chestnut tint of No. 3, and moss was growing all over it. I then spotted that that wasn't quite true; part of No. 1 was still chestnut-tinted. Covering about a fifth of the diameter at ground level the segment extended upwards, gradually tapering to a point 39 inches above ground level. At that point was a mushy area of about 2 square inches, which I had noticed all season without attaching any significance to it. I suddenly realised that I recognised the colour of that reddish area – oxidised sap, which I had seen for the first time just 2 days before! I also realised that none of my tree ferns had grown the usual 2 inches in height this year, usually visible because of the lighter brown hairs surrounding that new growth.

Those last 2 jigsaw bits gave me a glimpse of the bigger picture. I now think frost had killed most of the roots, and possibly the rhizome within. The only parts saved were those I'd heated (apart from that freak segment). Tree ferns won't grow fronds for long without healthy roots able to find nourishment. That's probably why an un-trunked version doesn't grow properly in its first season (most root growth occurs in winter) and why crippled specimens will behave in a similar way.

What have I done about that? Well, in October I wound the cable around No. 1 so that there are more coils around the meristem, but the entire trunk receives some heating. I then wrapped some spare shed roofing felt around the trunk, securing it with cable ties. Pouring seed and potting compost in from the top, I covered the elongated "plant pot" with bin liner and wrapped desert camouflage netting around that. It's amazing how that stuff, with the glimpse

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of the black behind it, takes on the texture of a tree fern's trunk. I then put the power on 24/7, without a thermostat. The idea of that is to extend the season so that some nourishment will reach the starved meristem before it thinks winter has arrived. I hope to learn something, even if subsequently it goes to the tip, or maybe I saw off the top and start anew with a 1-foot baby. If I learn anything at all it will have been worthwhile.

By late November I was delighted to see that the fronds had turned a healthy, dark green. No.3, meanwhile,

has had its heating coil wrapped around it and extended to ground level. It was then wrapped with floss, bin liner and netting (no clingfilm or compost) and the thermostat was set for frost protection. Both ferns have leaves stuffed in their apexes, and when everything goes white I'll stuff some white floss above that. I now face this winter with what I hope isn't misplaced confidence.

It's now time to submit this epistle, your editor tells me. If you can't wait a year to know how I got on, then email me at [mikefletcher@waitrose.com](mailto:mikefletcher@waitrose.com)



Fig. 8. Preparing for winter, heating coil wrapped around the trunk which is then covered with roofing felt and potting compost poured down the gap.



Fig. 9. The final covering of desert camouflage netting disguising the insulation.

## *Asplenium adiantum-nigrum* var. *geordii* ?

Fern images can crop up in the most unlikely places. One has only to read Sarah Whittingham's new book 'Fern Fever' to realise that the Victorians loved embellishing objects with fern images. (see review on page 359)

Modern examples are few and far between, unless you happen to live in New Zealand where one of the national emblems is *Cyathea dealbata*, the silver tree fern, which is also adopted by the national rugby team the 'All Blacks'. The emblem is used on a vast range of merchandise, but as far as I am aware they have not got round to using it as a pattern on the top of a cup of coffee. If ever they do, can some reader please send me an image? Yvonne Golding, our general secretary, sent in the picture below and commented that it looked like some sort of *Asplenium*.



"I was returning from visiting Moorbank Botanic Garden in Newcastle. My head was full of ferns I saw growing there but I was desperate for coffee so stopped at Washington Services and had a flat white. The nice Geordie\* said he was supposed to do Fleur de Lyses but they always came out fern-like. I told him not to worry and carry on!"

\* For the benefit of our overseas readers a 'Geordie' is a term used to describe a person from the Tyneside region of the north east of England, and especially Newcastle-upon-Tyne where the accent and dialect is especially strong.

Left: The *Asplenium*-like decoration - it's almost a shame to drink it.

Right:  
The Fleur de Lyses pattern that the barista was aiming for. Personally I think he just liked doing fern patterns!  
(AEG)



# Samuel Salt. Snapshots of a Victorian Fern Enthusiast.

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It does appear to be a fact that, in this country, where there are large old houses and extensive grounds, there are gardens which feature ferns to a greater or less extent. Lesser houses and smaller grounds are more likely to have never had them, or lost the ferns in the passage of time for a whole variety of different reasons. In 1998 we bought a "lesser house", with a good sized garden, where previous owners had lived long and changed little. That was fortuitous, otherwise the jigsaw pieces would not have been there, and we would not have been able to put them back together again, revealing both the ferns, and the history of a significant occupant.

When we moved to "Gateside" (Fig.4), we had noted from the start that our garden was dominated by ferns in various places, especially an *Osmunda regalis* in the entrance area. We assumed that the garden had once belonged to a Victorian fern enthusiast, but thought no more of it.

When, after much intensive house renovation work, there was time for wildlife interests, ferns still came well down the pecking order - after birds, bumblebees and butterflies.

We noted that if we cleared a bit of ground in the wooded parts of our garden, it wasn't long before tiny ferns appeared. These looked interesting, but difficult to identify. Many of the mature ferns elsewhere were definitely a bit odd, but we didn't realise that they were special cultivars. Our interest grew only slowly.

We searched for historical facts on our old house's previous occupants, and built lists from old parish records - the first entry in 1706, and then 19th century census records. But without the intervention of serendipity, that would have been it - a sterile list of names, dates, and nondescript occupations.

Eventually, a chance search on the Internet for "Gateside" produced records in one of the National Archives, in Nottingham. Here they held a collection of papers on S Salt - we already knew that he had been a resident in the late 19th century. This is the essence of the archive entry. It was a revelation to us:

Bound with letters, Mar 1893 - Jun 1894, between S Salt (86 yrs) of Gateside, Silecroft, Cumb (copy letters), and E J Lowe, FRS, Shirenewton Hall, Chepstowe (Mon), author of the New British Fern Book. Gives details of ferns collected by Salt, mostly in Furness & Ulverston Lancs area, including new variety (1864) named after him.

"I have more dried fronds than would fill a wheelbarrow and many are ruined with insects and age."

There are two fern illustration sheets in the above collection, both drawn by one of his daughters. (Figs.1 & 2.)

Ernest Joseph Lowe (referred to in citations as E.J. Lowe) was a prominent Victorian scientist. He was a renowned botanist and published papers on a wide variety of subjects, including those of a meteorological, astronomical and zoological interest. He was a real Victorian polymath. His interest in ferns encompassed not simply the study of them, but painting them as well. Lowe's most noted work was "*Ferns: British and Exotic*", and consisted of eight illustrated volumes, published in 1856.

The National Archive records refer to the 1864 document as a memo, but it is in fact a newspaper cutting, as follows:



Figs.1 (above) & 2. (below)

Illustrations of *Polypodium vulgare* 'Saltii' in the National Archives at Nottingham. They appear to represent an increasing divergence of the form from the normal in the examples shown in Figs 5 to 8





**NEW FERNS** - We extract the following from the remarks of Mr. Moore, in the *Gardener's Chronicle*:- "The admirers and collectors of the varieties of British ferns will no doubt be glad to make acquaintance with the subjoined budget novelties, all of which have lately come to our knowledge. The first is a variety of the common Polypody, which we call *Saltii*, the distinguishing feature being the abbreviation of a portion of the segments after a manner which has become so thoroughly familiarised in the *Frizelliae* form of the Lady Fern. The whole frond, however, is not in this case affected, but about one-third either at or near the apex, the abbreviated segments being rounded and toothed, and the more normal portions somewhat eroso-sinuate and irregularly toothed. This was found near Bootle, in Cumberland, by Mr Salt, of Ulverston, and is the first indication among Polypodiums of a form of variation already familiar in the Lady Fern and *Blechnum*."

I was passed the following e-mail by Martin Rickard -

There was a cultivar of *Polypodium vulgare* called '*Saltii*', named by Moore. It was a form with the top half of the frond caudate, i.e. very narrow. There is a sheet with two fronds in the Moore herbarium at Kew. The attached image (Fig.3) has a label: "Found by me on a hedge cop (?top?) near Bootle Cumberland, and I have the roots of all I found. S.Salt, 1864."

The "Mr. Moore" referred to above was Thomas Moore, the famous botanist and fern expert of the Victorian age, who was a key player in a period which became known for its so-called "pteridomania". We don't know how Salt made contact with Moore, and have no hint of any correspondence, but there must have been some.

We now had interesting information about one previous occupants of our house, and using the national population census archives, and the 1864 reference, traced him through time. It became clear that he moved around in his work as a "Railway Manager" in the middle part of the 19th century, from Shrewsbury, to Liverpool, and eventually to Ardwick, which in the 1850s was changing from a village into a pleasant and wealthy suburb of Manchester. Salt was here in 1851, with a wife and three daughters, and a servant. He moved away from Ardwick before it was altered forever by industrialisation, and then a decline into one of the city's worst areas of deprivation. So while he doesn't appear in a census again until 1871 (we know not why), we do know that he was living in Ulverston (in the Furness district of Lancashire, now part of Cumbria) by 1864 at the latest. We assumed that he must have retired by then, and the 1871 census logs him as living on income from "houses and dividends", with only 2 daughters, but no wife or servant. His new address was 20 Queen Street, Ulverston, a substantial Georgian-style three-storey town house in the centre of the town, with a drive-through archway to the rear stables, big enough for a horse and carriage, but probably no garden.

The implication of a substantial private income to support his albeit reduced family, is that he had become relatively wealthy from his time in Manchester. He eventually moved to Gateside, a remotely situated house in SW Cumbria, maybe as early as 1875. By 1881, he was entirely alone, except for a housekeeper and a servant.

Whilst the above information contains bare facts, plus some conjecture, it still reveals little about the man, and why he was interested in ferns. He would have had a busy and stressful life as a "Railway Manager", and a family life, living in a suburb of Manchester - there seems little likelihood that he had any time for ferns. In fact, further exploration of the facts in connection with "S Salt Esq" revealed a man who was busy outside the office as well as in.

Salt probably started his life employed in canal transport, and moved on to railways as a new career opportunity, and he published various technical books. Once such book, which we have a modern copy of, has the illuminating title of:

*"Statistics and calculations essentially necessary to persons connected with railways or canals: containing a variety of information not to be found elsewhere"*.

It is difficult to image a person, clearly involved in the minutiae of transport costs and product statistics, would become interested in the natural world, and become focused on ferns. But he undoubtedly did, because he had a fern variety named after him by Moore.



Fig. 3. *Polypodium vulgare* '*Saltii*' at Kew  
(photo Martin Rickard)

## Samuel Salt - Snapshots of a Victorian Fern Enthusiast

We know that he was a railway manager from the census, but a chance information search on the internet led to revelations that took some moments before the penny dropped. Salt was the Goods Manager at Manchester, for the London and North Western Railway Company, which later expanded to become the LMS - one of the top four rail companies in the UK. In the 1840s there was a period known in financial circles as "railway mania", when massive railway network expansion took place, huge investments were made in railway schemes, and dubious financial transactions took place. This was the era to make money, or lose it, and railways were the major players in the industrial scene in England at that time. By the 1850s, much tighter financial controls and accounting practices had been adopted. The general manager at L&NWR was Captain Mark Huish and he had a significant role in the revolution that affected the world of accountancy at the time, and his methods must have permeated the company. However in 1856, Samuel Salt was forced to resign over allegations of "irregularities" at the company.

An exploration of the company's motive in wanting to remove Mr. Salt reveals a far from simple situation, and is beyond the scope of this article. It is worth stating that it seems to have been part of a thorough purge on the L&NWR, including Captain Huish, following the dismissal and arrest of the Chief Auditor, Thomas Goalen, who was transported to Australia for 14 years in April 1854. A newspaper article about the various unfounded accusations made against Mr. Salt was published in October 1856. It appears that Mr. Salt was unpopular with the directors - for speaking his mind. However, his undoing was that Salt used one of the company's staff to help manage his garden! The men were often idle for long spells outside of the busy morning and night period, and Salt had used him regularly in these slack times. Salt himself had publicly professed his dislike of idleness, at a company railway festival in January 1854.

The situation was, therefore, that Salt had to leave his high-powered job, at the age of 47. Because of the manner of his dismissal, finding a replacement job would have been difficult, and he was effectively unemployable. Why he moved to Ulverston, we do not know. But another of life's major pivotal moments had already occurred, which the census did not reveal to us. His wife died in tragic circumstances in 1854. The death certificate reveals that she died after "2 days of convulsions", described as "epileptic". Given the limited medical understanding of that era, and the fact that epileptic fits are of a short duration, there must have been some other external cause for such an unpleasant death. It seems likely that this dreadful event would have had a serious impact on the whole family.

I have surmised that Salt left Manchester in the next year or two, and may have been in transit, between houses, and so missed the 1861 census. However, there is still no clue as to why Salt became so interested in ferns, though his interest in gardening has been revealed. A study of his town house in Ulverston and the surroundings provides a plausible explanation. Only about a ¼ mile from his house there is an area called The Gill. Here, Gill Banks Beck enters the town, emerging from a narrow, steep sided valley, small limestone crags, trees, and plentiful ferns.

Pteridologist 5.5. 2012

Given the recent trauma in Salt's life, he cannot have been a happy man. His life had up till that point been a busy and high-powered one, involved in the fine details of competitive transport costs, the management of staff, and the income and expenditure of a major Victorian company. It does not seem far-fetched that the arithmetic complexity and symmetry of his accountancy work had an obvious parallel with the mathematical structure of ferns. Compare the simple rachis and pinna of a Common Polypody to simple accounting, with matching pairs of numbers on either side of a central line. Compare the complexity of a Lady Fern to the process of drilling-down into the individual items of expenditure in that column. It may seem rather fanciful, but this is how I suggest that Salt became interested in ferns - it was a replacement for his work. It gave his mind a displacement therapy to counter his grief, and it appealed to his intellect.



Fig. 4. Gateside at the turn of the century.  
(From the archives of Bill Myers, with permission)

As to the ferns he collected in huge quantities, his "mania" seems to have typified the Victorian style of excess, with little thought of the longer-term potential for damage. The "Saltii" fern was obviously collected by using the railway, since Bootle is an isolated village in west Cumbria, and access by road would have created considerable difficulties. This was an era when new rail routes were just being opened up, such as Lakeside - Haverthwaite, Broughton - Coniston, rail access to Arnside and Silverdale, and from Carnforth he could get to Windermere.

Whilst we are not aware of any details of the undoubted correspondence between Salt and Moore, we do have photocopies of several illuminating personal letters that passed between Salt and Lowe in 1893. Lowe refers to the *Polypodium* specimen that he had, which was dying due to a weevil that had got into the root. Lowe liked it so much, he wanted to know if Salt had any more to replace it. Salt replied, openly admitting that, at 86, he was forgetting the names of ferns, but still remembered the forms. (I think he was doing rather well, actually!)

The following is another intriguing entry in a letter from Salt to Lowe:

*Scolopendrium Saltii* is a new strap shaped variety and much noticed by Mr Moore.

We know absolutely nothing about this variety, and it would appear to be lost - though we have numerous strange variations of *scolopendrium* in our garden!

Unsurprisingly, we also have various varieties of *Polypodium* in the garden, as well as a large amount of other species, with the inevitable strange cultivars

that have already been of some interest to various BPS members. I am not asserting any *Polypodium* identification is conclusive, and there are almost certainly many hybrids, but from my examination of the ferns, I suggest that there are almost no Common Polypody, but variations on the Western and Southern forms. Interestingly, some of the small number of Southern Polypody have rather longer, more wispy, apices than one would expect in this species (Fig 5), and some discrete clumps of Western Polypody, not normally noted for having long thin apices, have this trait as well (Fig.6,7). There is also one unusually large Polypody which has some elements of all three species, plus two much smaller central fronds that have only 5 equal pinna - two pointing diagonally downwards, two pointing sideways, and one long apex (Fig.8). I suspect it is simply another hybrid - there are very few sori on the undersides, and none look mature.



Fig. 5. *Polypodium*, possibly *cambricum*, with long wispy apex.



Fig. 6. *Polypodium*, possibly *interjectum*, with long wispy apex

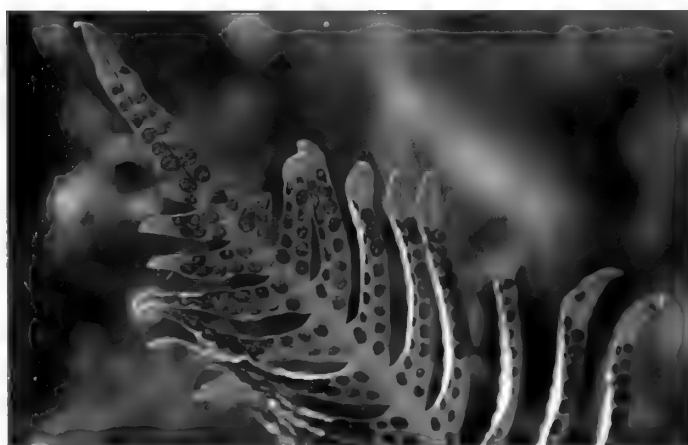


Fig. 7. *Polypodium*, possibly *interjectum* - a typical underside view.

One more aspect to Salt's life has not been mentioned – his interest in books. Apart from writing a few technical ones, he was known in the L&NWR for promoting an educational interest amongst the staff, and had established a large company library, stacked with some 900 books, purchased by Salt himself. He claimed that this was unique: for a private individual to make such an outlay for this purpose – the education of the working man. Salt himself later established a substantial library at Gateside, and it was auctioned at Sotheby, Wilkinson & Hodge (now known simply as Sotheby's) over 3 days in December 1899. This was a significant library collection, with over 1000 catalogue items (some multiple), covering natural history (including books on ferns by E.J. Lowe), science, voyages and travels, poetry and fiction, topography, biography, and sporting books. It is apparent that he owned some valuable items, including rare books and first editions. He was clearly a man of many facets, with a wide-ranging interest in the world; he was even a bit of a philanthropist.

As I type this article, I am aware that I may be sitting in almost the exact spot where a notable Victorian had once been sitting; who had been in contact with the outstanding fern expert of his day; and then later corresponded with a famous Victorian scientist. It gives a strong historic connection to the here and now - perhaps even a strange tingling sensation in the back of the neck! □



Fig. 8. *Polypodium* with 5 equal pinna. Note that the stipe is just visible in the centre, before being obscured by the cut in the sheet of paper

#### Acknowledgements :-

I wish to thank Nottinghamshire Archives for permission to use extracts from their archive material, (Reference DD/MI/127) and allowing the use of images for the illustrations in Figs. 1 and 2.

Martin Rickard for Fig. 3 taken at the Kew herbarium.

Bill Myers for permission to use Fig. 4.





## New faces at the Spore Exchange

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As we'll be taking responsibility for the Spore Exchange from this summer we would like to introduce ourselves and provide information for members to make the transition from Matt Busby to ourselves as smooth as possible.

Most important is our address, as the generous members who donate the spores should, from now onwards, be sending them to us rather than to Matt who has been running the Spore Exchange for the past four years. Although there will be the usual reminder in the autumn mailing, we understand from Matt that many spores are received during the late summer and we are keen that as many of these as possible should come straight to us. So, when you see ripe spores on any interesting ferns later this year, please collect them and send to the address at the head of this article.

We hope to receive as many donations as possible - members generosity in this regard is greatly appreciated. Donors get extra choices and, provided you order promptly, your order will receive preferential handling. As in previous years, we are happy to receive them cleaned or as a piece of fertile frond.

Earlier in the year we visited Matt to learn what will be involved and were delighted to find that successive Spore Exchange Organisers have developed an excellent process. So now it's up to us to match the high standard of the past. We'll do our very best to provide just the same service as in previous years.

We are ourselves very new to growing from spores and also relative newcomers to the BPS, only joining in 2005. Our love of ferns, however, goes back much further than that, and our plants database shows that serious collecting started with orders from Mrs Marston's nursery near Driffild, East Yorkshire, back in 1987. From then on we were hooked and our collection grew but at this stage was just that, accumulating specimens for the garden.

We have a fairly large, shady, garden in a high rainfall area of South Wales and ferns were both easy to grow and a part of the natural flora. Despite that, we only started to learn identification and more about their biology when we began to join the BPS field trips. This has increased our interest hugely and introduced us to growing from spores. We started to do this as soon as we joined but our inexperience shows as we have recorded only three successes from our first twenty packets. At that rate we would hardly be as enthusiastic about the exchange as we've become but we're delighted to say that things have improved, and by 2008 we had sixteen successes. 2010 saw us donating for the first time, and so it goes on.

We're looking forward to making contact with all of you who donate or order spores and we hope our story will encourage new members to try obtaining plants this way. All you need is patience! □

### FOOTNOTE

*Musotima nitidalis* - a fern-feeding moth new to Britain

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The majority of fern species grown by fern enthusiasts in Britain are non-native, and it is inevitable that occasionally, non-native pests are accidentally introduced along with their host plants. One recent example to look out for is the micro-moth *Musotima nitidalis* (Fig. 1), which is assigned to the family *Crambidae*. It occurs throughout much of Australia and New Zealand, and is suspected to have been accidentally introduced into Britain with the import of tree ferns from Australasia. It has only been found twice in Britain, in 2009 (Hampshire) and 2011 (West Sussex), and has not been recorded from anywhere else in Europe. The caterpillars of this species feed on various *Polypodiophyta* species, including *Adiantum* spp., *Histiopteris incisiva* and *Pteridium esculentum*. They are pale green with an almost transparent skin, and feed within folded fronds held together by strands of white silk. Pupation also takes place in a folded frond. The adult moths of this species have a wingspan of 2.5 cm, and are rather distinctive (Fig. 1). Their forewings are an orange-brown with various white markings outlined in dark brown or black. The hind wings are mainly white, with brown margins. Adults are attracted to lights in the evening. The caterpillars are unlikely to cause any significant damage to fern collections in Britain, and are not considered an economic pest species in their native range. □



Fig. 1. The adult moth of *Musotima nitidalis*.

Wingspan about 2.5 cm

Photo © Nick Monaghan, [lifeunseen.com](http://lifeunseen.com)

# Leaf-mining moths in Britain

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Ferns in general appear to have fewer insect predators than angiosperms, and only a few of these cause significant problems for fern growers in this country. Among these, fungus gnats, scale insects and vine weevils are familiar to many. But what causes those unsightly blotches and mounds of soral material on the underside of fronds? I first noticed these on the fronds of *Dryopteris* species in my garden several years ago (Fig.1).

By the summer of 2011 it was obvious on a wide variety of ferns, not just *Dryopteris* (Fig.2). I was annoyed enough to investigate more closely. I knew they were caused by the larvae of a moth - Anthony Pigott posted a message on this subject on the Fern Forum back in 2009. In fact, I learned there are two closely related species in this country: *Psychoides filicivora* (Fern Smut Moth) and *Psychoides verhuella* (Hartstongue Fern Smut Moth).



Fig. 1. *Psychoides filicivora* damage and cases on *Dryopteris* sp.



Fig. 2. *P. filicivora* damage and cases on *Asplenium scolopendrium*

The moth genus *Psychoides* belongs to the Tineidae family of micro-moths, among which is also the well-known Clothes Moth, *Tineola bisselliella*. There are currently four species of *Psychoides* known. *P. verhuella* is a native species, found in Britain, Ireland and much of mainland Europe. *P. filicivora* has a curious provenance. First discovered in Ireland in 1909, and in mainland Britain in 1940, it is thought to have been introduced to the British Isles on imported ferns. Most sources quote the opinion that it probably arrived on ferns from somewhere in the far east. In the 1990s, however, it was found in Madeira, where it behaves as an apparently native species in undisturbed laurel forest habitats. In the absence of any confirmed reports from anywhere else in the world it has been proposed that it is an endemic Madeiran species imported to the British Islands on ferns from there.

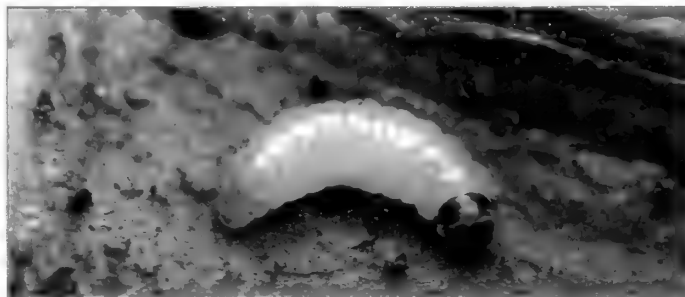


Fig. 3. *Psychoides filicivora*, larva



Fig. 4. *Psychoides filicivora*, adult

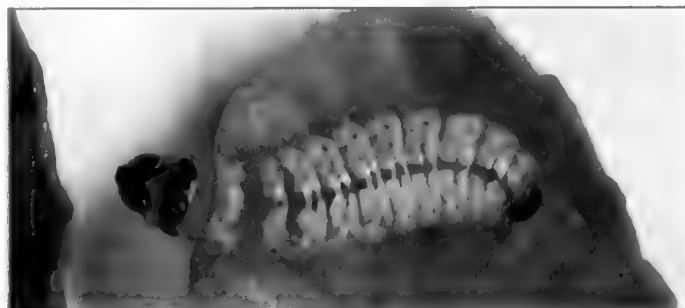


Fig. 5. *Psychoides verhuella*, larva

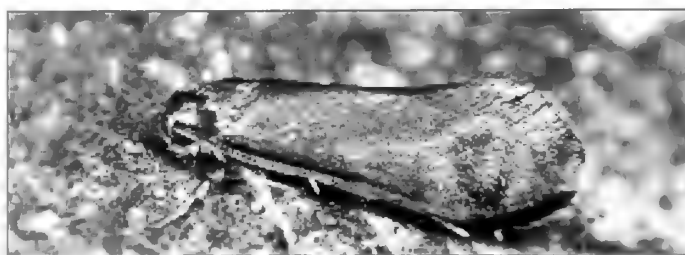


Fig. 6. *Psychoides verhuella*, adult



Fig. 7. Distribution of *Psychooides verhuella* according to the NBN Gateway. (see references)

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The two other species known are *P. phaedrospora* from Japan and *P. gosari*, recently described from South Korea.

*Psychooides* are generally referred to as leaf miners and the feeding behaviour of the two species in Britain is essentially similar. The larvae feed on the tissue of the frond, making broad, shallow excavations between the upper and lower surfaces. Once sori have developed they use the sporangia to build protective covers or cases, mounding them up into a heap bound together and lined with silk. These cases are not permanently fixed in place – the larvae move them around as they feed in different areas, and also use them as protection when they moult between instars (Fig. 9). When feeding beneath these protective covers they no longer need to excavate between layers of tissue but, as it were, ‘open-cast mine’ the leaf. The remaining tissue in the mined areas eventually dies, resulting in brown patches, which may become quite extensive. When feeding on species with longitudinal sori such as *Asplenium scolopendrium*, the larvae also can be found using the excavated soral area as resting places. It appears that once spores develop they also eat these. Eventually the larvae pupate beneath the protection of the cases.

At the larval stage *P. verhuella* (Fig. 5) is pale greenish-white or cream with a black or very dark brown head and prothoracic shield (upper part of segment behind the head), with a darker anal patch. *P. filicivora* (Fig. 3) is also pale greenish-white or cream but has a brown head and prothoracic shield and no darker anal patch. The shade of brown varies from very pale to quite dark so care needs to be taken to distinguish specimens with very dark brown heads. Both have some spiny hairs but those of *P. verhuella* are much more noticeable (high magnification needed). Larvae of both species grow to a maximum of around 3mm.

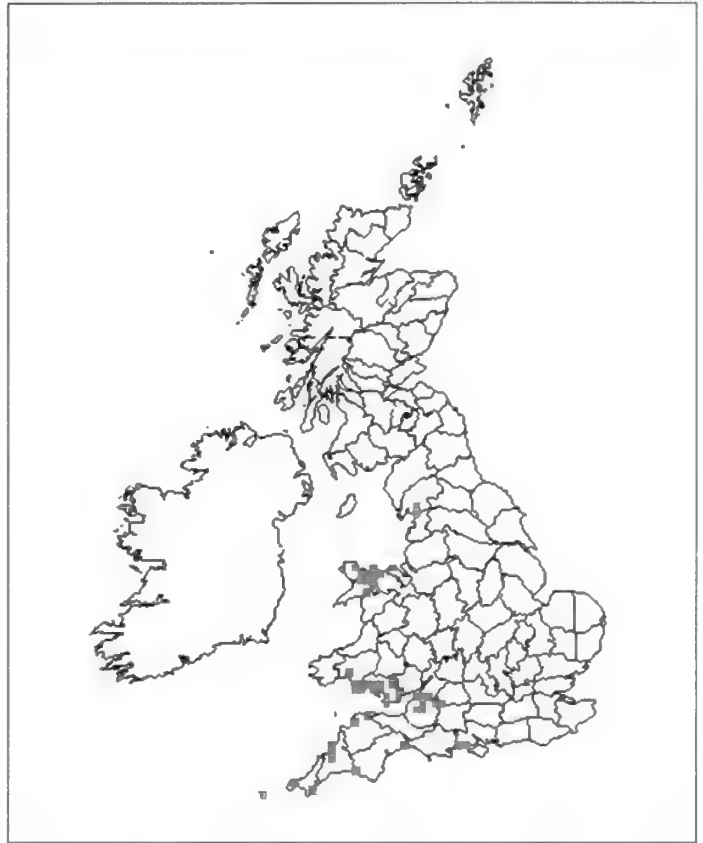


Fig. 8. Distribution of *Psychooides filicivora* according to the NBN Gateway. (see references)

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Adults of *P. verhuella* are a fairly uniform dark grey-brown with a purple sheen (Fig. 6). *P. filicivora* is dark grey-brown with a distinct light patch on the back (Fig. 4). Both species grow to around 6mm long with a wingspan of up to 12mm.

The distribution maps for the two British species on the NBN Gateway site (Figs. 7 & 8) show a marked south-westerly distribution for both species. *P. filicivora* shows a particularly strong coastal distribution, which is usually attributed to a susceptibility to cold, due to its presumed Asian origin. The proposed Madeiran origin also fits well with that idea. However, a quick search of the web shows many records for both moths outside the official distribution map, and anecdotal evidence from other fern growers suggests one or both of these to be quite widespread. It seems that *P. filicivora* in particular may be spreading, and the cold winters of 2009-10 and 2010-11 may not in fact have had much effect on their numbers.

The larvae of both species appear to be active in milder periods throughout the year. *P. filicivora* is known to have no natural diapause (dormant period) and may have several generations throughout the year; presumably the milder western and coastal districts would provide the most favourable places for early colonisation. The adult moths are also on the wing (mostly by day) in mild periods throughout the year, although there is a peak in spring to early summer. *P. verhuella* is thought to have a more limited adult period, primarily in June-July with perhaps another short period late in the year. The larval stage is usually described as April to May, but there are accounts of active larvae in February, presumably having overwintered in a dormant state, and material sent to me from South Wales in November was alive and active.



## Leaf-mining moths in Britain

The food plants of the two species show an interesting contrast. *P. verhuella* appears to live primarily on *Asplenium* species, with only a very few reports of it being found on other ferns. *P. filicivora* has been found on a wide range of fern species and genera, and is often found on *Dryopteris* and *Polystichum*, although *Asplenium scolopendrium* also seems to be a favourite. The wider range of food species presumably gives it an advantage in finding new areas to colonise as well as extending its feeding period throughout the year. Feeding on wintergreen *Asplenium* species (and Polypodies in the case of *P. filicivora*) is obviously useful in allowing both species to make the most of a long growing season and possibly enabling multiple generations in a year.

So to what extent do these moths pose problems for fern growers? It appears that both species are on the increase, although that could in part be due to better recognition and recording. I have not so far seen any reports of *P. verhuella*, as a rather scarce native species, appearing in gardens. It seems that the introduced species *P. filicivora* is the one that is usually associated with cultivated fern collections, including glass-houses and as such becomes a legitimate target for control measures. Anthony Pigott appears to have had success in controlling *P. filicivora* by spraying with Provado early in the season when the first sign of infestation becomes apparent. Provado is one of the trade names of Imidacloprid, which has recently been linked in some studies with toxicity to bees. I would therefore suggest it is used with caution, if at all. For those not wishing to use chemical methods, cutting off and burning affected fronds is probably the best plan. □



Fig. 19 *P. filicivora* larva resting in case between instars

### Acknowledgements:-

Thanks to Anthony Pigott for information and advice at an early stage of this investigation. Thanks also to Brian and Sue Dockerill for courageously hunting down *Psychoides verhuella* larvae on my behalf and to Kevin Tuck, Curator of Microlepidoptera at the Natural History Museum, for pointing me in the direction of more sources of information including the Madeira connection.

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Food plants of <i>Psychoides filicivora</i> in my garden	
<i>Asplenium scolopendrium</i>	<i>Polypodium cambricum</i>
<i>Athyrium otophorum</i> var. <i>okanum</i>	<i>Polypodium interjectum</i>
<i>Dryopteris affinis</i>	<i>Polypodium vulgare</i>
<i>Dryopteris borrieri</i>	<i>Polypodium x font-queri</i>
<i>Dryopteris cambrensis</i>	<i>Polypodium x mantoniae</i>
<i>Dryopteris cycadina</i>	<i>Polypodium x shivasiae</i>
<i>Dryopteris expansa</i>	<i>Polystichum acrostichoides</i>
<i>Dryopteris filix-mas</i>	<i>Polystichum aculeatum</i>
<i>Dryopteris kuratae</i>	<i>Polystichum lonchitis</i>
<i>Dryopteris remota</i>	<i>Polystichum neolobatum</i>
<i>Oreopteris limbosperma</i>	<i>Polystichum polyblepharum</i>
<i>Phegopteris decursive-pinnata</i>	<i>Polystichum setiferum</i> (and cultivars)

Food plants of <i>P. filicivora</i> and <i>P. verhuella</i> , according to literature and web sources	
<i>Psychoides filicivora</i>	<i>Psychoides verhuella</i>
<i>Asplenium adiantum-nigrum</i>	<i>Asplenium adiantum-nigrum</i>
<i>Asplenium ceterach</i>	<i>Asplenium ceterach</i>
<i>Asplenium marinum</i>	<i>Asplenium ruta-muraria</i>
<i>Asplenium ruta-muraria</i>	<i>Asplenium scolopendrium</i>
<i>Asplenium scolopendrium</i>	<i>Asplenium trichomanes</i>
<i>Asplenium trichomanes</i>	<i>Asplenium viride</i>
<i>Dryopteris affinis</i> aggregate	<i>Dryopteris filix-mas</i>
<i>Dryopteris dilatata</i>	<i>Polystichum aculeatum</i> (possibly)
<i>Dryopteris filix-mas</i>	<i>Polystichum setiferum</i>
<i>Polypodium vulgare</i>	<i>Pteridium aquilinum</i>
<i>Polystichum setiferum</i>	

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**UK Moths:** <http://ukmoths.org.uk>  
**British Leafminers home page:** <http://www.leafmines.co.uk>  
**The leaf and stem mines of British flies and other insects:** <http://www.ukflymines.co.uk>  
**Leafminers of Europe:** <http://www.bladmineerders.nl>  
**Global Taxonomic Database of Tineidae (Lepidoptera):** <http://www.nhm.ac.uk/research-curation/research/projects/tineidae>  
**National Biodiversity Network:** <http://www.nbn.org.uk>  
 The information used here was sourced through the NBN Gateway website and included the following resources:-  
 Bristol Regional Environmental Records Centre: BRERC February 2011  
 Countryside Council for Wales: Welsh Invertebrate Database (WID)  
 Cumbria Biodiversity Data Centre: Cumbria Biodiversity Data Centre. Lepidoptera Observation Records. Pre-2010 for Cumbria  
 Environmental Records Centre for Cornwall and the Isles of Scilly: Lepidoptera species distribution dataset from 1981 to 2008 for Cornwall and the Isles of Scilly  
 Natural England: Invertebrate Site Register - England  
 South East Wales Biodiversity Records Centre: CCW Regional Data : South East Wales Non-sensitive Species Records, Microlepidoptera of Glamorgan  
 Wiltshire and Swindon Biological Records Centre: Wiltshire & Swindon Incidental Species Records  
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 Biodiversity Information Service for Powys and Brecon Beacons National Park: CCW Regional Data : Mid-Wales, excluding vascular plants & bryophytes  
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 Suffolk Biological Records Centre: Suffolk Biological Records Centre (SBRC) dataset  
 Worcestershire Biological Records Centre: WBRC Species data for Worcestershire collated by species group  
 Accessed 17 June 2012. The data providers and NBN Trust bear no responsibility for the further analysis or interpretation of this material, data and/or information.

## Book Review

### Ferns of Southern Africa. A Comprehensive Guide.

NR Crouch, RR Klopper, JE Burrows & SM Burrows 2011.

ISBN: 978-1770079106

Hardback 776pp Published by Struik Nature, Cape Town. Price £40 aprox.

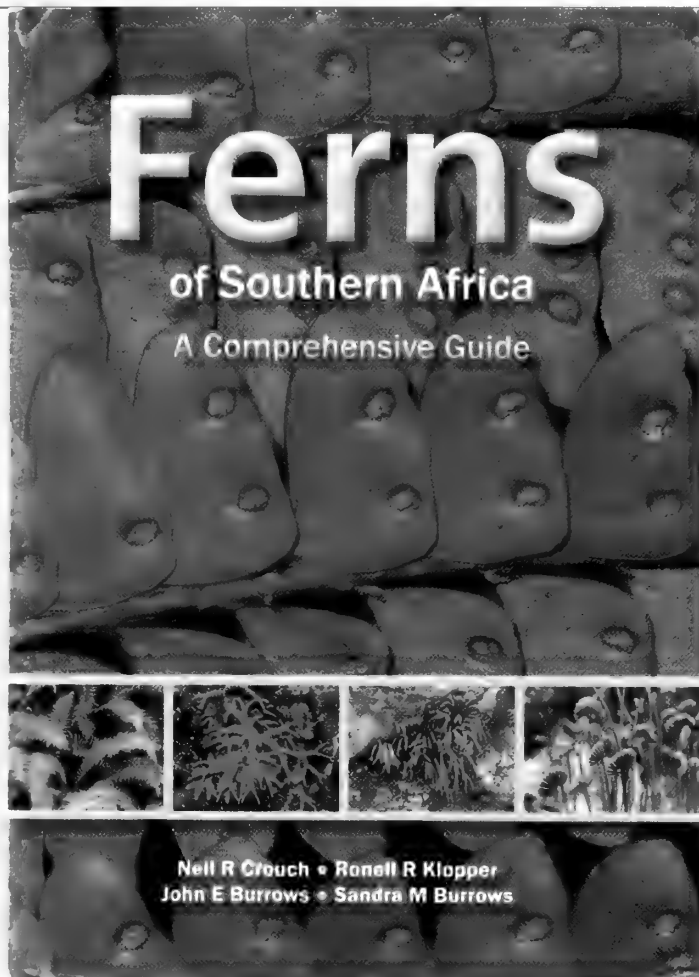
This beautifully produced book landed on my doorstep a few weeks prior to the recent BPS trip to South Africa. My impatience to get started was only fuelled further whilst browsing through the book. South Africa hosts a marvellous and rich flora of which pteridophytes form only a small part. Even so, over 300 species are currently recognised from the country. In this new field guide the pteridophytes of Botswana, Lesotho, Namibia and Swaziland are all fully covered and those of Zimbabwe and southern Mozambique that occur further south are also included. I was particularly keen to try the guide out in the field and test the back cover assertion that 'it will enable quick and sure identification of all 321 ferns'. I am pleased to report that apart from a couple of minor exceptions this proved to be correct for the ferns I saw on the trip.

Following the introductory pages the keys to the families are found. The circumscription of pteridophyte families seems to be reaching a consensus recently however producing familial key will never be straight forward. The solution provided by the authors is a form of multi-access key combined with thumbnail drawings which sounds complicated but I tried it on several species and found it fairly simple to use. My only criticism is that some of the drawings are too simplified and I found a couple slightly misleading.

Entering the main part of the book, the genera and species are keyed out under each family heading with help of useful thumbnail photos. I would have preferred the species keys to be placed at the start of each generic account as I found that I had to keep flipping back many pages in large families when trying to identify a particular fern. Each species account occupies 2 pages and is illustrated with small but very clear photos showing habitat, habit and close up views of rhizome, frond, scales and sori details. The species descriptions are brief but clear with key characters highlighted. Small tables giving comparative characters of similar species are a very useful innovation. Names and taxonomy are commendably up to date e.g. in *Hymenophyllaceae*, *Polypodiaceae* and *Ptisana* segregated from *Marattia*. Small but clear distribution maps for each species also proved very helpful.

Using the guide in the field is the real test and I found that the keys worked extremely well and combined with the descriptions and illustrations most ferns were readily identified. For example I saw many species of *Asplenium* and all apart from one odd plant were quite easily identified. Another potentially difficult group is *Ophioglossum*, with many species occurring in South Africa. I saw 3 species and managed to identify them to my satisfaction using a combination of the keys, descriptions, illustrations and maps. *Cheilanthes* is another large genus well represented in South Africa that can be confusing. Although only seeing relatively few species they were clearly identified using the keys and descriptions.

The only real problems that perplexed me and others occurred in *Polystichum* and the *Dryopteris inaequalis* aggregate. The former required close attention to rhizome type and details of scales, pinnule teeth and indusia.



This was fairly straightforward if sufficient care was taken although the character 'basal basicopic arista of each pinnule folded in over the upper lamina surface' in species such as *P. sinense* and *P. transvaalense* may be apparent in herbarium specimens, however in living plants the arista is directed upwards from the lamina. This gives a slightly bristly texture to the frond compared to the other species. Identification only proved difficult when we encountered a mixed population of 3 species and probable hybrids in Golden Gate National Park. Research into hybrids is clearly needed as not many are recorded for the region.

*Dryopteris inaequalis* has recently been split into 3 species that seem to be clearly separated using microscopic characters. The distribution maps indicated that 2 species, *D. lewalleana* and *D. pentheri* occurred in the areas visited however the field characters were difficult to interpret and too inconsistent to reliably identify the species seen.

In summary this is a wonderful book full of beautiful photos. It collates a vast amount of information in a way that is very attractive but also easily accessible and usable to the reader. It is reasonably priced and a soft cover version is now available that may be more practical in the field. The authors have been very successful in their aim of producing a portable and reliable field guide and both professional and amateur pteridologists should be very thankful for their efforts. □

Tim Pyner

# Stem dichotomy in *Cyathea australis*, an arborescent Australian tree fern



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*Cyathea australis* is a distinctive robust tree fern widely distributed in eastern Australia from central Queensland south to southern Tasmania and west to the South Australian-Victorian border (Fig. 1). The species is cold tolerant, living as long as 3 to 4 centuries (Mueck et al. 1996) and growing to 12 - 15 metres in height and 40 centimetres in diameter (Duncan & Isaac 1986, Bostock 1998). In Queensland, the species is predominantly found at altitudes above 500 metres ('Herbrecks', Queensland Herbarium specimen database, 2011).

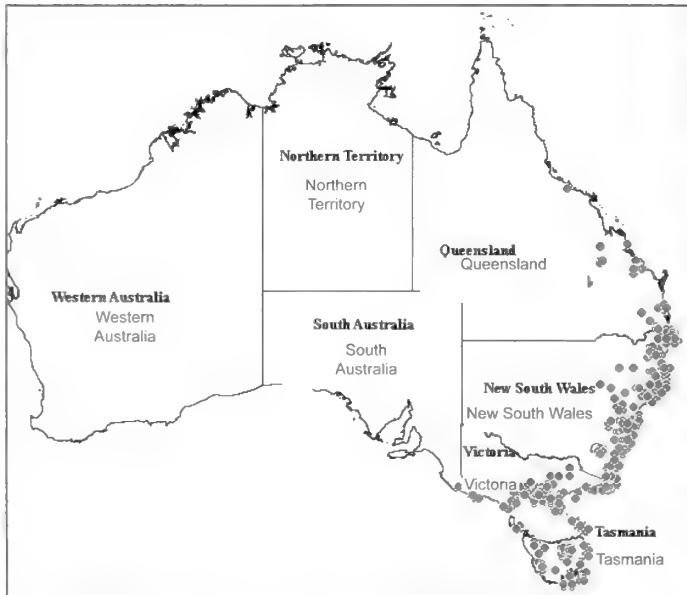


Fig. 1. Distribution of *Cyathea australis* (excluding Norfolk Island).  
©Australia's Virtual Herbarium.

Generally this species forms single, erect, straight trunks topped with gradually abrading skirts of dead fronds. As described by Holttum (1963), the "vascular system [is] a hollow cylinder [filled with pith] with gaps corresponding with leaf bases, in some cases small medullary bundles also present; a cylinder of very hard sclerenchyma, with gaps at leaf-bases, present both inside and outside the vascular cylinder...". This rigid core is surrounded by a densely packed layer of adventitious roots and persistent stipe bases up to 10 cm or more thick (Figs. 2, 3 and 5). Individuals in areas where fire is rarely experienced are often much larger in diameter than those whose protective layer has been thinned or removed by one or more fire events. Plants that succumb to bush fires or other causes can remain standing for more than 10 years (based on direct observation of a dead plant in PB's garden in Brisbane).



Fig. 2. Persistent roots and stipe bases surround the rigid vascular core.



Fig. 3. LK investigating a multi-stemmed *C. australis*



Fig. 4. Paired vascular cylinders surrounded by burned root mass on section cut from dead treefern



## Stem dichotomy in *Cyathea australis*, an arborescent Australian tree fern

A population of multi-stemmed *C. australis* was observed by LK while bushwalking on the Great Dividing Range in southeast Queensland during the year 2000. Realising this was unusual, he discussed the phenomenon with PB and placed a photo in State of the Environment Queensland 2003 (DERM undated). Since then, the authors have visited the site near Mt Cordeaux in the Main Range National Park on a number of occasions, making detailed observations in 2006 and 2008.

While we are aware of the existence of small numbers of multi-stemmed *C. australis* at a few other locations in southeast Queensland, our investigation is limited to the Mt Cordeaux population of approximately 90 branched individuals. These plants are distributed within an area measuring about 350 by 110 metres on a gradually descending, westerly trending ridge at an altitude of 1100 metres. They are situated in a tall open eucalypt forest, subject to moderately frequent bush fires (Fig. 9), adjacent to a microphyll (closed canopy) fern forest.

The ferns in question exhibit dichotomous branching of their stems. In all other respects, the plants in this population do not appear to differ significantly from their unbranched neighbours (based on observations by PB of living and dried specimens).

We examined 46 plants in 2006, counting the number of stems, and measuring their height, the heights at which they branched, and their "circumference" at chest height. We also collected a sample from a dead individual to examine the branching process (Figs. 4 and 6). We subsequently systematically photographed 90 plants (78 living and 12 dead) in 2008, counting the number of stems, estimating their height and noting their location with a GPS.

There was a large degree of variation in the variables we measured. The number of stems ranged from 2 to more than 12, overall height ranged from 50 centimetres to 10 metres, circumference ranged from 57 centimetres to 221 centimetres (considerably more than the norm), and the first branching point ranged in height from 10 centimetres to 3 metres above ground level.

Overall, 36% of the ferns had 2 stems, 27% had 3 stems, 27% had 4 to 6 stems, 6% had 7 to 9 stems, and 6% had 10 or more stems. There was a positive relationship between the



Fig. 5. Crown and fronds of typical *Cyathea australis* in the Mt Cordeaux population

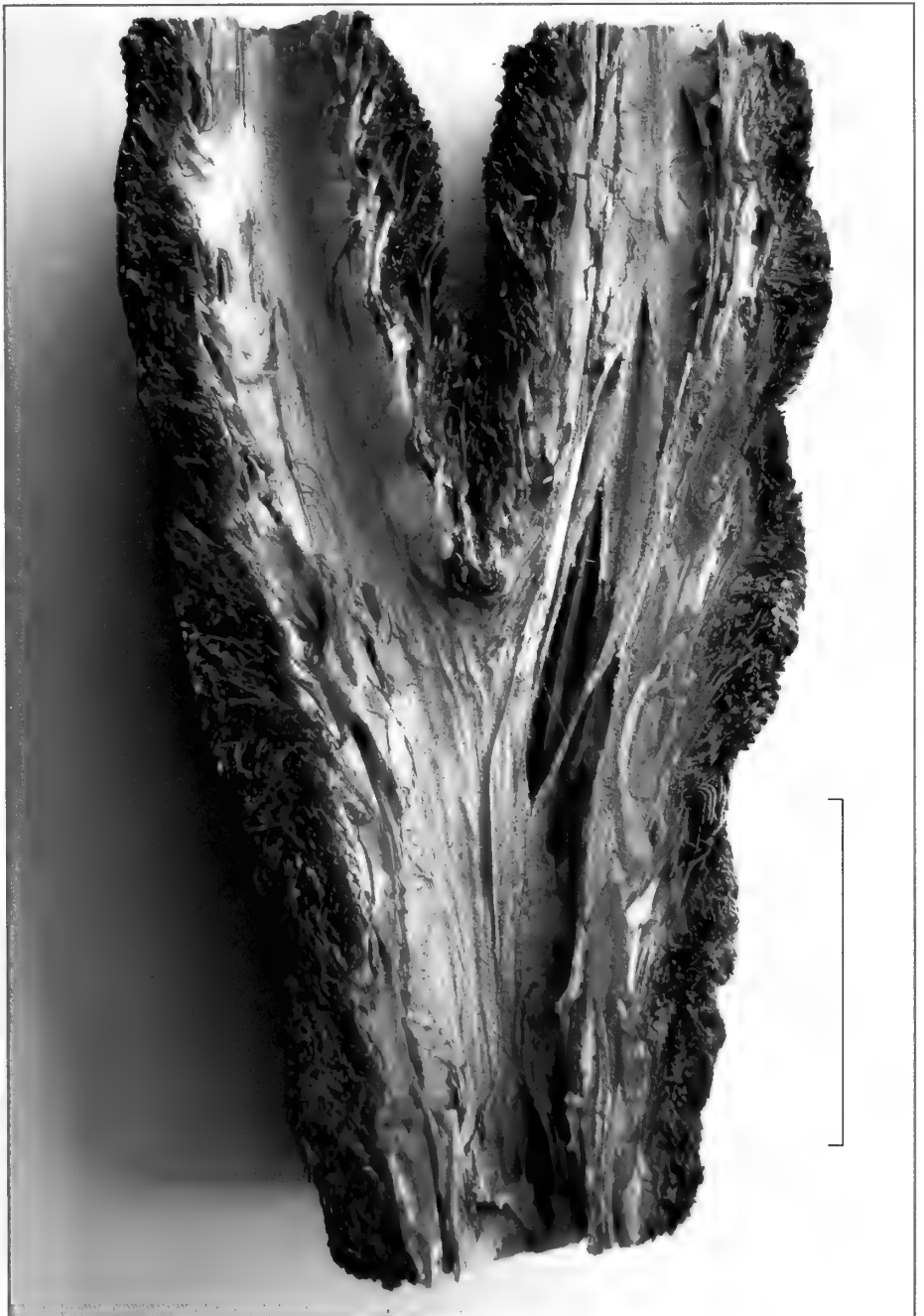


Fig. 6. Longitudinal section of trunk section in Fig. 4. Scale bar = 10 cm.

## Stem dichotomy in *Cyathea australis*, an arborescent Australian tree fern

number of stems and circumference ( $r = 0.7$ ), and a negative relationship between the number of stems and overall height ( $r = -0.3$ ). While 50% of the ferns with 2 stems, 46% of ferns with 3 stems and 33% of ferns with 4



Fig. 7. Treefern no. 2008-29, with Dan Johnston (ANPSA Fern Study Group treasurer & editor) holding the tag. This fern was 4 m tall, with 7 living crowns.

stems were over 4 metres high, only 5% of the ferns with more than 4 stems were over 4 metres high. This may be a consequence of the process of division interrupting normal vertical growth or perhaps some other factor is at play which limits the maximum height these plants can achieve.

Although the developmental process has not been investigated, it seems reasonable to assume that the apical initial cell divides (abnormally) into two separate initial cells. Each cell subsequently resumes normal function, cutting off cells which produce the various tissues, forming paired vascular trunks which take the shape of a rounded Y (Figs. 4, 6 and 7). These pairs of trunks then tend to grow in unison (they are, after all, clones!), until such time as one trunk branches again. Some plants show multiple branches seemingly from a single point—we think these might have occurred when a number of dichotomous branching events took place over a very small time scale thus vertically compressing the branching pattern.

Now for some speculation. The wide range of plant heights indicates that the phenomenon is ongoing and not

the result of a single event. We believe that the branching characteristic is a consequence of a degree of genetic variation from the norm, given that the phenomenon is localised—the vast majority of *C. australis* are single-stemmed regardless of environmental influence. The question that follows is whether an environmental stimulus is required to trigger stem division.

We suspect that fire may trigger the branching in this population. There were obvious signs of fire on most of the eucalypt trees in the vicinity and virtually all branched plants showed some signs of being burnt at some stage. One advantage of the branching might be to provide a much greater degree of insulation for some of the trunks and hence enhance the survival of such individuals. In plants with a large number of trunks, the body of the plant generally consisted of a tightly packed mass of trunks (Fig. 8) with a more or less inverted cone or perhaps a wine goblet-like shape. Trunks in the centre of the bunch would be well protected from fire, assuming outer trunks could withstand the blaze.

Alternatively, could there be an advantage also in the huge increase in frond number and area, and consequent increase in chlorophyll activity? This would have to be balanced against the increased water loss from the vastly greater number of fronds. Whether water is a limiting factor is uncertain. *Cyathea australis* probably sources most of its water and perhaps much of



Fig. 8. PDB and Queensland National Parks ranger Kirsten O'Mealy at fern 2006-03, which was 5 m tall with 9 tightly packed trunks totalling 2.1 m diameter.

its nutrient from the adventitious roots that surround the vascular core; each additional trunk, although ultimately supported at the very base on a single trunk, would generate, and then be supplied by, its own local set of roots.

We would appreciate hearing from readers who have knowledge of other species of *Cyathea* (in the broad sense) which habitually or occasionally form dichotomously branching trunks. Our literature searches did not reveal many at all. A few papers by J.C. Schoute, dating from the early 20th century (written in German) reveal his discoveries and analyses of branching and arboreally budding *Cyathea* plants particularly from Java.

Schoute was more interested in the production and arrangement of leaves, but he dissected many branched trunks during his investigations. Some of his illustrated branching patterns seem to be non-dichotomous but others are very similar in appearance to the branched forms of *C. australis*. In one paper, he details a robust stem base held in "Museum No. 2", RBG Kew (Schoute 1906), which was labelled as *Alsophila australis* (the earlier name for *Cyathea australis*), and which contained

a branched stem that may have been of the sort we have been studying. Unfortunately Schoute did not indicate the origin of that stem section, and we have not yet attempted to determine if it is still present at Kew. Schoute was also probably the first to speculate that dichotomous branching might be caused by injury (Schoute 1914).

Michael Garrett (1996) mentions that multiple crowns have been recorded for *Cyathea marcescens* and *Dicksonia antarctica* in Tasmania. He reports that the occurrence in *Dicksonia* seems to be mostly from multiple plants growing together, except in one peculiar population where "top growth" consists of hundreds of individual crowns. Such plants were sterile.

We did hear from a Victorian fern enthusiast who sent a photograph of a plant from "a valley of branched *Dicksonia antarctica* plants" near Mt Buller in Victoria. We have also located a few branched examples of *Cyathea australis* on the Springbrook Plateau to the west of the Gold Coast in southern Queensland, and a couple in Gibraltar Range National Park, east of Glen Innes in northern New South Wales.

Future developments: watch this space.

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Fig. 9. Heading home through the open eucalypt forest near Mt Cordeaux.



# Mrs Puffer's Marsh Fern

Graham Ackers



Sometime around July 1901, a Mrs. J. J. Puffer was out walking in the region of the historic town of Sudbury in Middlesex County, eastern Massachusetts when she noticed a group of ferns which caught her eye. She wrote as follows –

“The whole group, consisting of many plants crowded closely together, occupy a space of some five or six feet in length by two in width, and are growing by the side of a stone wall on the slope of land near a meadow, but they are quite above the water line. They are almost without exception either forked or tufted. The longest fronds grew up into a bush and were erect, but most of them lie upon each other so they are broken and torn by contact. They are exposed to the full sun all day.”

Mrs. Puffer had come across a crested variety of the Marsh Fern, which was described a year later (Eaton, 1902), and from which paper the above account is reproduced. Eaton named the fern *Nephrodium Thelypteris* forma *Pufferae* in honour of the discoverer. He described the rachis as forking 1/8 to 1/2 of its length, the divisions often again forked, pinnae cristate for the outer third into 2-5 crowded, spreading, overlapping divisions. The two fronds designated as the type are shown in Fig. 1, a herbarium sheet at Harvard University's Gray Herbarium.

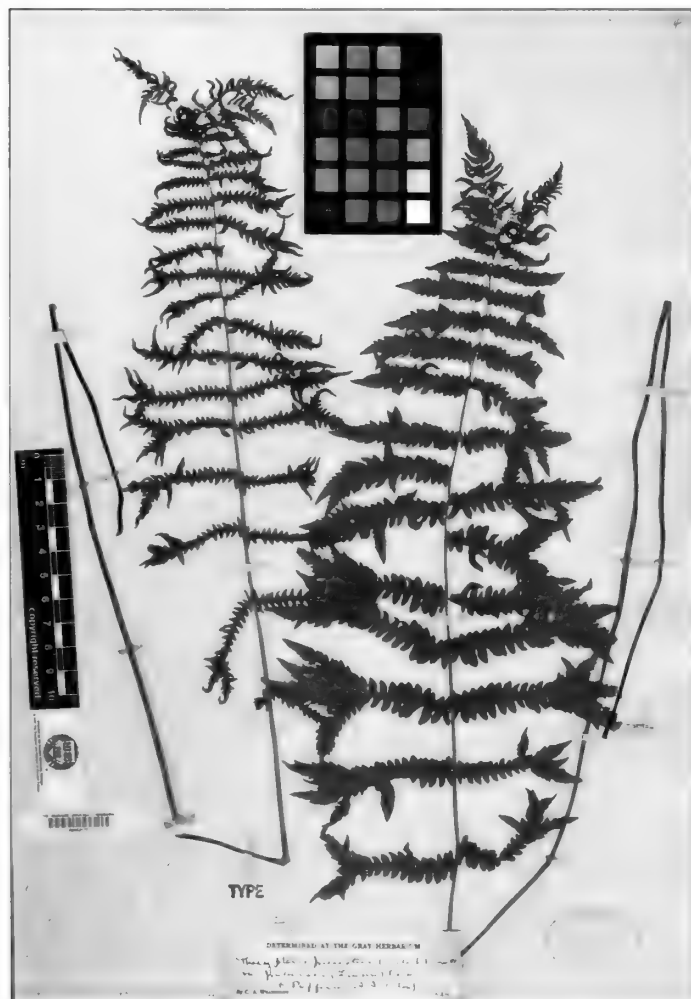


Fig 1. Type specimen of the Crested Marsh Fern, *Thelypteris palustris* var. *pubescens* f. *pufferae*.  
© Harvard University Herbaria (00022172).

The degree of terminal cresting on these fronds is clearly at the lower end of Eaton's measurements. In her first collection, Mrs Puffer omitted to collect any fertile fronds, but at Eaton's suggestion she returned and did procure some, one of which is the left-most frond on the herbarium sheet.

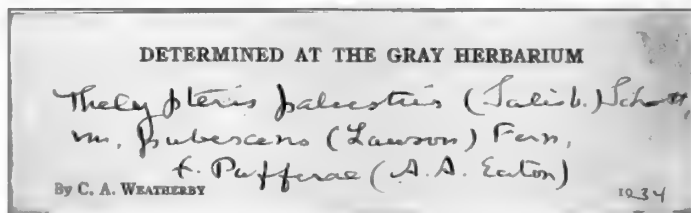


Fig 1a. Detail from Fig. 1 of the Determinativ slip from C.A. Weatherby dated 1934

In Fig 1a it is possible to read on the sheet that in 1934, C. A. Weatherby determined the name to be *Thelypteris palustris* var. *pubescens* f. *Pufferae*. The Marsh Fern in eastern North America is somewhat hairy, and so given the variety “*pubescens*”. Our European form, however, is virtually glaucous, and strictly speaking should be named *Thelypteris palustris* var. *palustris*, but in practice the name is rarely written in full. The rank of “forma” (abbreviation “f.”) is almost the lowest in the nomenclatural hierarchy (there is a “subforma”!), and is only occasionally used these days (e.g. in *Cyclamen*) – however its use was much commoner in the first half of the 20th century. In the past, the north American Marsh Fern has been given a total of five varietal names and five forma names (see; Broun 1938, Gruber 1940, Reed 1968 and Weatherby 1936), but none of these (“*pufferae*” included) is mentioned in the standard *Flora of North America* (Smith, A. R. 1993).

Incidentally, the author of the paper should not be confused with D. C. Eaton (1834-1895), who wrote the celebrated *Ferns of North America*, 1877-1880 with its fine coloured plates. Alvah Augustus Eaton (1865-1908) was born and bred in Massachusetts and was a farmer, then a teacher, finally a florist. A self-taught botanist, he was a member of the Linnaean Fern Chapter, which became the American Fern Society, and was a frequent contributor to the *Fern Bulletin*, the precursor of the *American Fern Journal*. He served as Secretary of the American Fern Society for two years, as President for one year, and later formed and curated their herbarium (<http://www.huh.harvard.edu/libraries/archives/EATON.html>, accessed December 2011).

Now let's return to the Crested Marsh Fern story. In the final sentence of his paper, Eaton says “Mr. C. T. Druery informs me that this is a very interesting variety, inasmuch as it is the first break this species is known to have made”. This shows that Druery and Eaton were in touch, which might have been the source of a piece of rhizome of this Marsh Fern having been acquired by Druery, referred to in an article mainly about polypods (Druery, 1910a), and it is worth reproducing that part of his article in full –

“Incidentally, I may mention that some years ago, a polydactylous *Lastrea palustris* was found in the United States by Mrs. Puffer, and a piece of rhizome was very kindly supplied to me. I have now a large pan of it, polydactylous throughout. Fortunately, as soon as it was well established, one small, very fertile frond appeared, the only one it has produced, and seizing the opportunity, I have raised a batch, most of

**Mrs Puffer's Marsh Fern**

which are replicas of the parent. A few appear to have reverted, but two or three are beautifully and heavily crested with fine bunch tassels and very hand-some, though small as yet".

In his contemporary publication (Druery, 1910b), he again points out that no Marsh Fern variety has been found in Britain, and again refers to his propagation successes with the original American material (which he calls "L[astrea] t[helypteris] polydactyla"), including "some very promising

grandiceps forms". The name Grandiceps has been written on an RHS herbarium sheet found in "Druery's Press Cuttings" (see Ackers, 2008) which is almost certainly a frond from his propagation of the American material (Fig. 2).

In Fig 2a we see an enlargement of Martin Rickard's Determinavit slip on the sheet, which identifies it as "Pufferae" if it is American material.

Because of the presence of hairs (under magnification), I can vouch for its American origin. However, this propagated frond is far superior to the wild form, being attractively narrow and more symmetrical with a fine crest. Because of this, we now consider it to be a separate taxon to the wild plants, and should have the name intended by Druery, thus *Thelypteris palustris* var. *pubescens* 'Grandiceps' Druery, and an additional Determinavit slip has accordingly now been added to the RHS herbarium sheet.

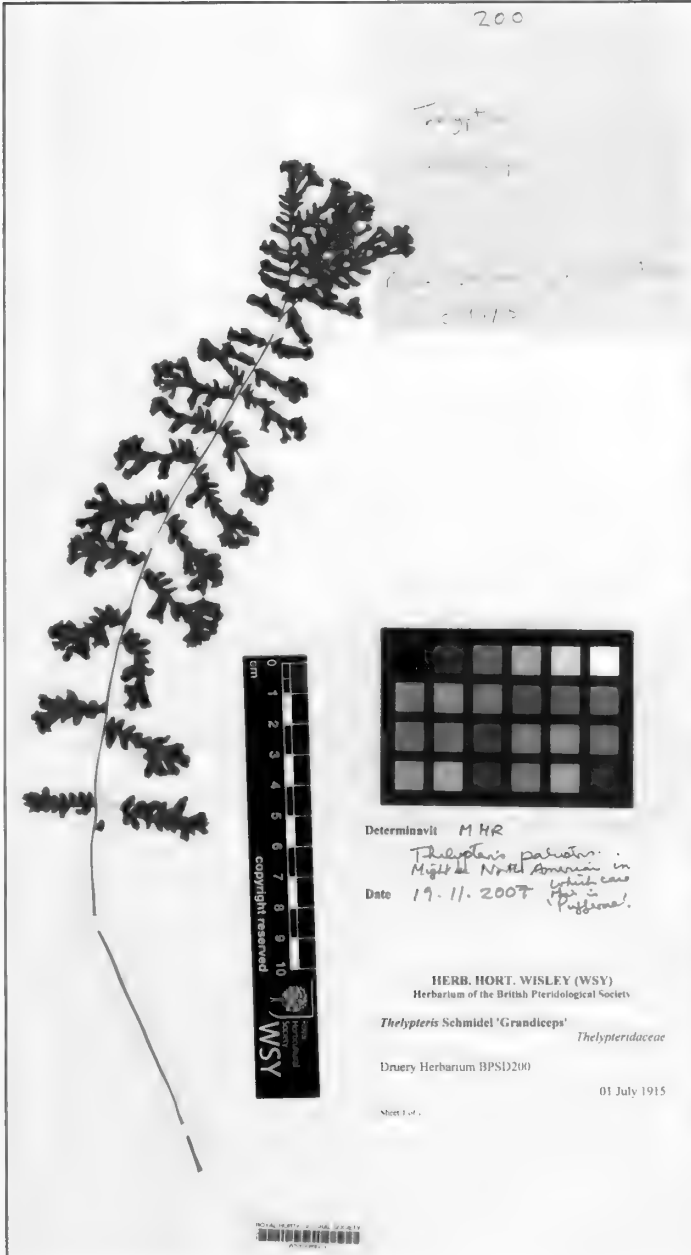


Fig 2. Druery's propagated specimen of the Crested Marsh Fern, *Thelypteris palustris* var. *pubescens* 'Grandiceps' Druery. © BPS and the Royal Horticultural Society (WSY0089374).

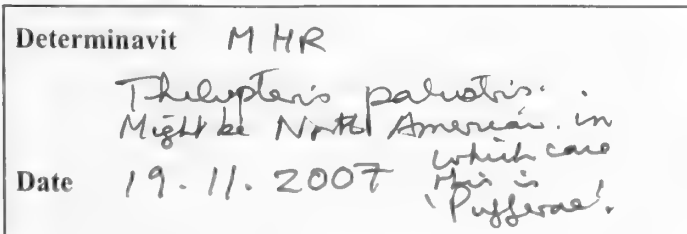


Fig 2a. Enlargement of the Determinavit slip which reads:-

'*Thelypteris palustris*. Might be North American, in which case this is "Pufferae".'



Fig 3. A Crested Marsh Fern frond from material in the Hudgens garden (Maryland) in 2005. Photograph Martin Rickard.

During a BPS fern tour to the north-eastern USA States ("Feast in the East", organised by John Scott) in June/July 2005, Martin Rickard spotted some Crested Marsh Fern in the Hudgens garden in Maryland, a frond of which is shown in Fig 3.

Subsequently, in June 2011, members of BPS and the Hardy Fern Foundation took part in another USA fern tour of the south-eastern States, organised by Naud Burnett of Casa Flora. During our first day, we visited the Eco-Gardens nursery of Don Jacobs in Decatur (near Atlanta, Georgia). Don proved to be a venerable old man with a wealth of plant knowledge, a true "plantsman" in fact. The diversity and rarity of his large collection was quite astonishing, much of it "hiding" amongst a jungle of native vegetation. Amongst these riches, Martin Rickard again demonstrated his prowess by spotting some more Crested Marsh Fern

## Mrs Puffer's Marsh Fern

(Fig. 4)! He acquired some rhizome with fronds which he is hoping to grow on, and Martin donated a frond of this material to the RHS herbarium at Wisley (Fig. 5). Jerry Hudgens, whose plants originated from Don Jacobs, tells me that his Crested Marsh Ferns are not thriving as well as he would like in his Maryland garden, but that may be due to their position in the garden, being a little too dry.

In the second half of 2011 I conducted a survey of fern growers in both the USA and Britain in an attempt to determine: –

- if anyone else grew Crested Marsh Fern,
- if anyone knew of others who grew this plant,
- whether anyone had found another one in the wild.

Unfortunately, I did not receive a positive response to any of these questions, and neither Jerry Hudgens nor I have been able to determine the provenance of Don Jacobs' material. Alison Paul kindly viewed the herbarium specimens at the Natural History Museum and found no sign of crested in any of the specimens (thus, in her words, "a very well behaved species"! ). Broun, 1938 refers to the distribution as "eastern Massachusetts and occasionally elsewhere", but I have been unable to discover the source of his "occasionally elsewhere" statement. However, at the end of 2011 I tried again, and made contact with Bryan Connolly (Massachusetts State Botanist) who circulated my query to some of his contacts. Although no-one had knowledge of the fern in the wild, two more instances of the fern in cultivation were revealed. Bill Brumbeck (Conservation Director of the New England Wild Flower Society) provided some interesting information about one of these (e-mail 15/12/2011) :-



Fig 4. Crested Marsh Fern *Thelypteris palustris* var. *pubescens* f. *pufferae* in Don Jacobs' nursery in Georgia.

Photograph Martin Rickard.

"We may have forma *pufferae* growing at Garden in the Woods. After the change from *Dryopteris* to *Thelypteris*, the name was listed in our plant records as *Thelypteris palustris* forma *pufferae*, but was later changed to *Thelypteris palustris* var. *pubescens* (crested form). The Horticulture staff noted that the plants under this name were alive this year. Garden in the Woods was started by Will Curtis in the 1930s and was given to the New England Wild Flower Society in the late 60s. The origin of some of the plants in the Garden (many of those present when the transfer to the Society was made) is unknown. When plant records were begun, these plants of unknown origin were given a "B76" notation (meaning present before 1976), and the Crested Marsh Fern has that notation. Since Sudbury, Massachusetts, is just around the corner from the Garden, and since Curtis was a well-known plantsman and collector, it is quite possible (maybe even likely) that the plant in the Garden is from the type location, but we cannot be sure. It would be interesting to know the exact location of the type specimen to see if the plant still exists in the wild, but I think it would be a wild goose chase. According to the type specimen data (online from the Gray Herbarium) [see Fig. 1] it was found in Sudbury "beside stone wall on south-easterly slope of hill exposed to full sunshine."

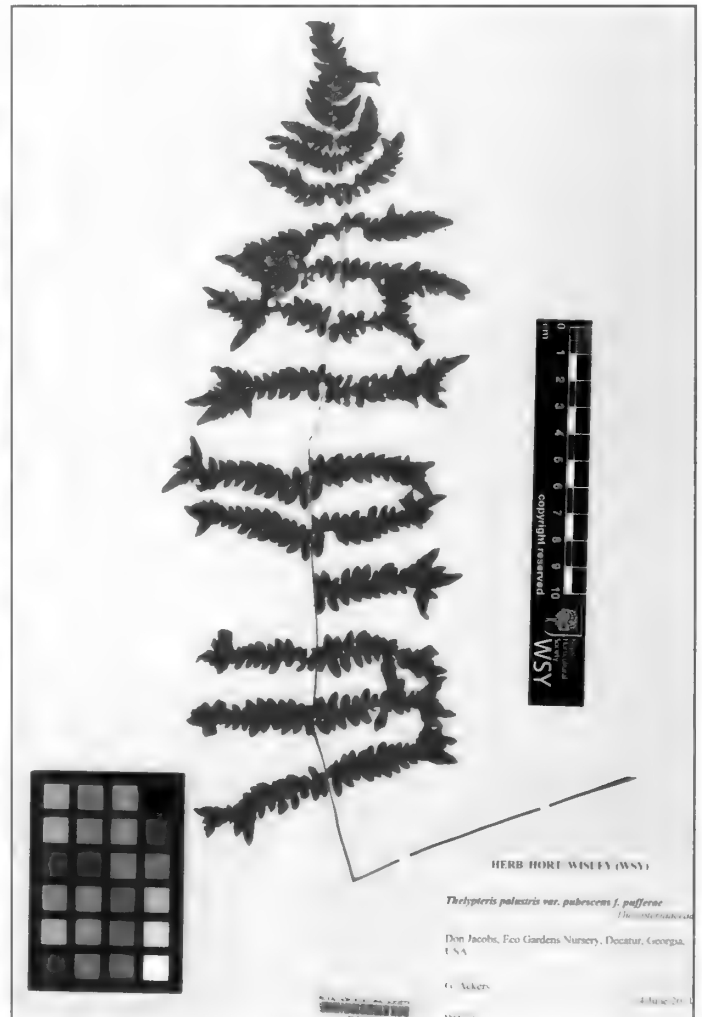


Fig 5. The herbarium specimen frond of *Thelypteris palustris* var. *pubescens* f. *pufferae* from material in Don Jacob's nursery. © BPS and the Royal Horticultural Society (WSY0140219).



Thus, to summarise, we have positive evidence of the original find in 1901 and its possible continuing existence in the 1930s. Also we know that some of the original material was sent to Drury, who propagated and improved his stock. We are unsure of the provenance of Don Jacobs' nursery material, but have identified three further instances of the plant in garden cultivation in the USA (plus Martin Rickard's material here, providing new fronds are produced in the summer).

I do appreciate that *Thelypteris palustris* may not be the most decorative fern in the world, and its crested form is perhaps even less so. However, there are many growers who are fascinated by fern varieties and I am sure would love to add this to their collection. Notwithstanding aesthetic considerations, I do think this is a fascinating story, and will perhaps alert people to the possibility of coming across a crested specimen in the wild in Britain. You never know!

**Acknowledgements:-**

Particular thanks to Martin Rickard, but also to Bill Brumbeck, Bryan Connolly, Jerry Hudgens, Alison Paul, John Scott, and Chris Whitehouse for their help with this article.

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**Young Ponga Frond**

This striking image of a young ponga frond testifies to the fractal-like nature of fiddleheads of a tree fern, such as those of the New Zealand silver tree fern, *Cyathea dealbata* ("ponga" in Maori). The uncoiling of the primary fiddlehead brings into view a number of small lateral fiddleheads, arrayed alternately along the midrib; these are the young, major divisions, or pinnae, of the frond. They, in turn, uncoil to reveal yet smaller fiddleheads, the fine divisions of the pinnae.

Guenther K. Machol



Photo: Andrew McMillan "The unfolding frond of a Ponga (New Zealand tree fern) by the Akatarawa River, New Zealand" (in the public domain), accessed at [http://en.wikipedia.org/wiki/File:Tree\\_fern\\_fron\\_d\\_at\\_Akatarawa.jpg](http://en.wikipedia.org/wiki/File:Tree_fern_fron_d_at_Akatarawa.jpg)

# POLYPODIUM SPECIES AND HYBRIDS IN THE YORKSHIRE DALES

Ken Trewren

This article was written by the late Ken Trewren in January 2005 and intended for publication in the *Pteridologist* that year. It is reproduced here by kind permission of his widow, Kate, and we hope it will inspire others to continue investigating this and other areas for *Polypodium* hybrids. AEG

I first became familiar with *Polypodium cambricum* as a university student at Bangor, the species being common in North Wales. A glance at the distribution map makes it clear that it is predominantly a species of the warm Atlantic coasts of Britain, and the Mediterranean, where it is found at low altitude, usually on limestone or mortared walls.

Imagine my surprise, then, when I found it in 1965, miles from the sea in the middle of the Yorkshire Pennines, firstly in Trow Gill near Clapham (SD755716), and then (as I thought at the time) in Gordale Scar (SD915641).



Fig. 1. Trow Gill, near Clapham, looking west.

In Trow Gill several of the colonies are within reach, on the limestone cliffs on the southern side of the gorge, but there are other colonies higher up the cliffs which may only be reached by a skilled rock climber. Some of these could be hybrids, since *P. vulgare* is growing within a few metres of one of the colonies of *P. cambricum*, and *P. interjectum* is present two kilometres away on walls in Clapham village, and probably closer than that also. In all of the colonies in Trow Gill, paraphyses<sup>1</sup> are present very sparingly, but some of the colonies are quite luxuriant.

In Gordale Scar there are several colonies of *Polypodium* high up on the cliff faces on both sides of the gorge between the upper and lower waterfalls. (Fig. 2) All of these are totally inaccessible, but in September 1965 I found two senescent<sup>2</sup> fronds lying at the foot of the cliff, which, at the time, I identified as *P. cambricum*, due to the presence of paraphyses<sup>1</sup> (but see below). One striking colony was spotted through binoculars during a BPS field trip in November 2004, (Fig. 2 Site B) this colony being on a ledge right at the top of a 40 metre high *overhanging* cliff face!

Unfortunately, assuming that these colonies are by now known to the botanical recorder of the area, I didn't think to re-confirm the records for Atlas 2000, in which both appear as historical records.



Fig. 2. Gordale Scar, Yorkshire. 40m overhanging cliffs form a gorge accessible in its upper reaches only by a short scramble next to a waterfall. Sites A and B are the *Polypodium cambricum* colonies

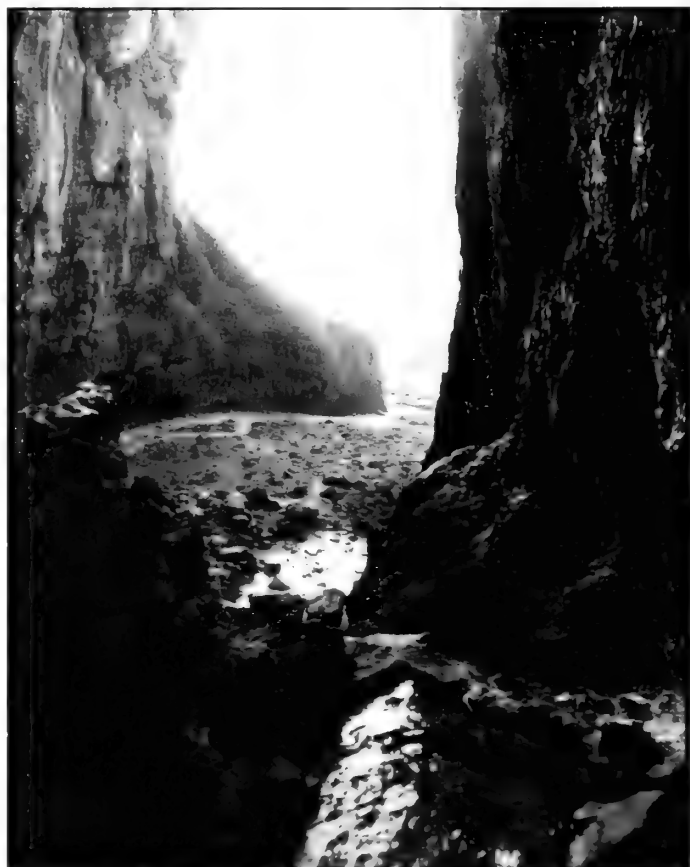


Fig. 3. Gordale Scar, from the top of the waterfall

Since 1965 I have re-visited the Trow Gill site on a number of occasions, but following the publication of Atlas 2000 decided to re-visit both the Trow Gill and Gordale sites along with fellow BPS member Vincent Jones, in February 2002. We found the Trow Gill colonies in fine fettle, and then, in the Malham area, inspected a number of colonies in a small, dry, unnamed (on the map) gorge less than one kilometre to the west of Gordale Scar. This small gorge proved to be a fascinating site for Polypodium. Since then I have re-visited the area on a number of occasions, alone, or with Vincent Jones, and in September 2003 I was supposed to lead a field visit of the Leeds and District Group of the BPS to the area, but, at the last minute, had to ask Barry Wright to lead it, armed with my notes, due to my absence in Bangladesh. In November 2004, armed with the latest information, I was able to lead a combined Leeds and District and North-west Group outing to the Malham area. Prior to that outing, I had given information on the location of the colonies to Bruce Brown, and he has also made a number of field visits to the area, and compiled much useful information.

In late 2003 Vincent Jones and I inspected Ing Scar, above Malham Cove. We found several colonies of *P. vulgare* on small, exposed rocky outcrops, but also, at the confluence of the two arms of the valley, (SD 89233 64830) a large colony which had fronds noticeably wider than those of the two common species. Although the colony was only about four metres up the cliff face, there were no good hand and foot holds which would have enabled us to collect a frond, so we left, feeling somewhat frustrated. A couple of weeks later I returned, armed with three bamboo canes and a knife, which I inserted into a cleft in the uppermost cane. Subsequent examination of the fronds revealed a clear case of *P. x shivasiae* (confirmed by Rob Cooke). Most of the sporangia (Fig. 5.) contained mis-shapen white spores, but some contained large, round yellow spores (Fig.4.). Paraphyses<sup>1</sup> were also present in quantity. There are several other colonies higher up on the cliff face in inaccessible positions, but all appear to have rather broad fronds, so they are probably either *P. x shivasiae* or *P. cambricum*.

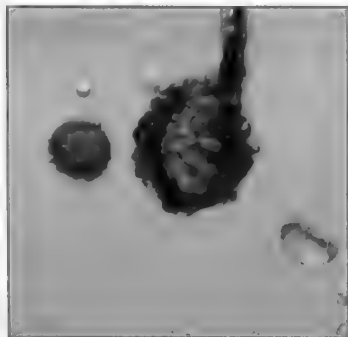


Fig.4. Large round yellow spores found in the *P. x shivasiae* sample (x50)



Fig.5. Sporangia of *P. x shivasiae* (x50)

pole surmounted by a scissors device. (Fig.6.) This made it possible to examine fronds of several colonies which had not previously been studied due to their inaccessibility.



Fig. 6. Bruce Brown using his Polypodium sampling tool to collect a frond of *P. x shivasiae*, November 2004

About 150 metres further down Ing Scar (SD 89497 64542) Bruce sampled some fronds from a large colony growing on a ledge. This proved to be problematical, but after discussing the specimen with Rob Cooke it is now considered to be *P. x font-queri*. The colony is atypical of that hybrid since the sporangia contain a mixture of white and yellow spores, but there are no paraphyses<sup>1</sup>, and numbers of indurated and basal cells<sup>3</sup> in the sporangia, and general frond morphology fit that hybrid (see Fig 7 of sporangium, below).

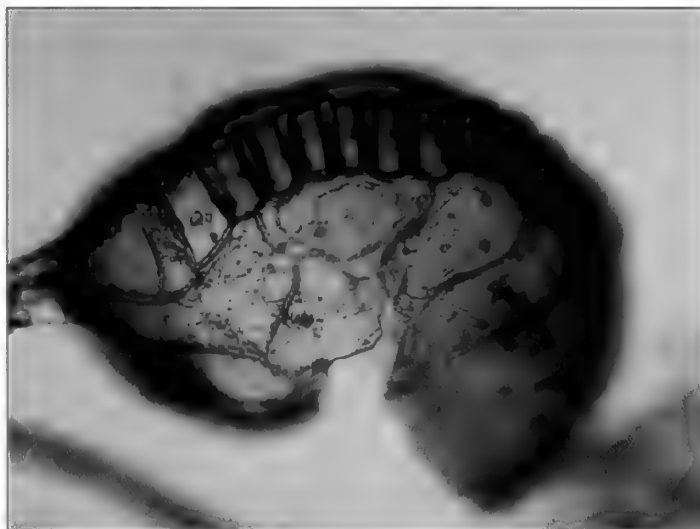


Fig. 7. The atypical sporangium of *P. x font-queri* (x150)

Still further down Ing Scar, high up on the cliffs on the west side (SD 89526 64490), in the 2004 outing, Bruce sampled some fronds. This colony was of small, rather stunted fronds, but subsequent examination under the microscope revealed a few paraphyses<sup>1</sup> amongst sporangia containing good spores, thereby confirming it as being *P. cambricum*. (Fig. 8.) This was a good

During the course of the November 2004 outing, Bruce Brown produced his invention – a polypodium sampler. This consisted of several sections of interlocking tent



find because the species has not been recorded from the area in recent times – there is an old specimen in the herbarium of the Natural History Museum labeled “Malham Tarn”. At 320 m it may well be the highest colony of the species in Britain?

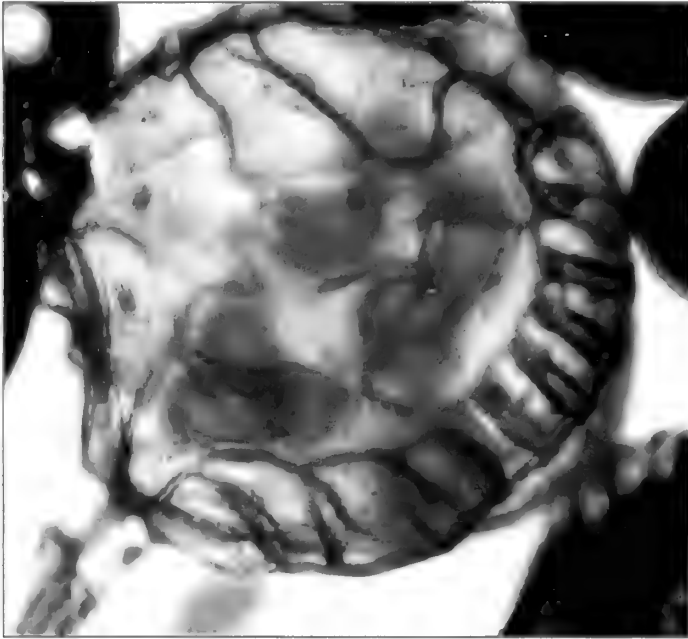


Fig.8. Sporangia of *P. cambricum* (x150)

*Polypodium interjectum* has not yet been found in Ing Scar, although it could be one of the inaccessible colonies on the cliff face above the *P. x shivasiae*.

In the gorge to the west of Gordale Scar, on the cliff face on the east side (SD 9080 6378), is a colony which appears to be typical *P. cambricum*, although, being sterile, its identity has not yet been confirmed.

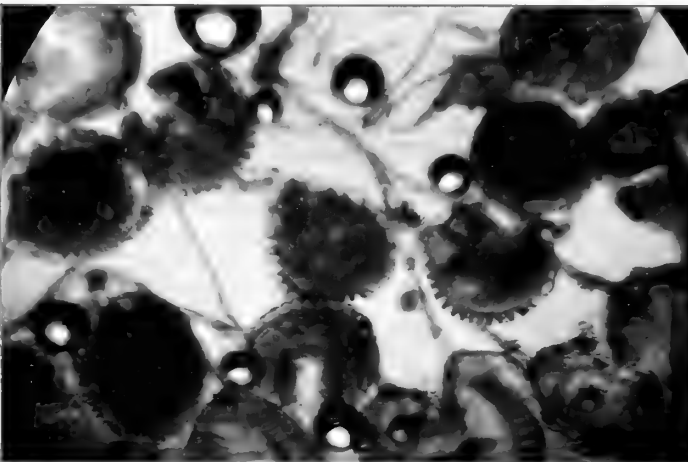


Fig. 9. Sporangia of the “probable *P. x mantoniae*” (x50)

About 20 metres further on, high up on the rock face (SD 9082 6382), is a colony of what was initially thought to be *P. interjectum*. This colony has since provoked much discussion and argument. The general frond outline and texture are those of *P. interjectum*. The sori cover almost the whole of the underside of the frond, and they are large, and yellow. Microscopical examination of the sporangia reveals that the numbers of basal and indurated cells<sup>3</sup> fit *P. x mantoniae*; some of the sporangia contain mis-shapen white spores whilst others contain yellow spores, but in the latter the spores are very large,

and the sporangia only contain half the normal number of spores. Rob Cooke agrees that this colony is “probably *P. x mantoniae*”. (Fig. 9.)

The next colony, about 20 m further on, growing at the base of an ash tree, is *P. x font-queri* (SD 90831 63846). With its typical frond outline, totally white spores and absence of paraphyses<sup>1</sup> there could be no doubt about this one. *Polypodium x font-queri*.



Fig. 10. The *Polypodium x font-queri* colony growing at the base of an ash tree,

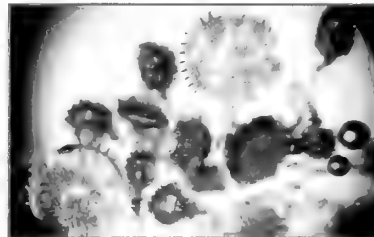


Fig. 11. *Polypodium x font-queri* sporangia (x50)

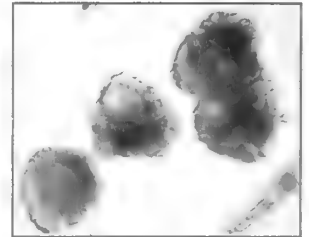


Fig. 12. *Polypodium x font-queri* spores.(x150)

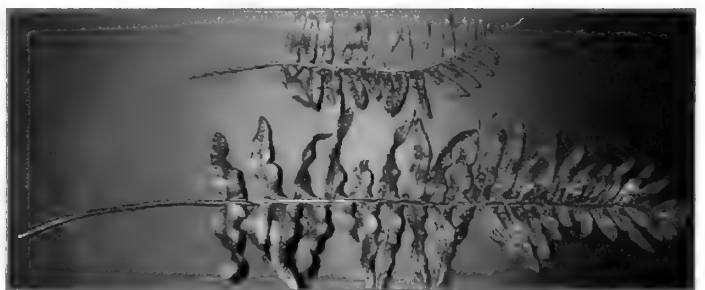


Fig. 13. Fronds of *Polypodium x font-queri*.

On the opposite side of the gorge, on a ledge which was only just accessible (SD 90781 63829), was a small, rather stunted colony which, in 2002, looked intermediate between *P. cambricum* and *P. interjectum*. Most of the fronds were infertile, but a few had some sori which contained mostly abortive sporangia. I thought at the time that this might be *P. x shivasiae*, but in the following year there were many fertile fronds containing sporangia with good, yellow spores. Paraphyses<sup>1</sup> were abundant, and a chromosome count confirmed it as being *P. cambricum*.

Higher up on a rocky outcrop there are two colonies of *P. vulgare* and a classic *P. x mantoniae* (SD 90740 63843).

In Gordale Scar itself, in 1965 I found two small, senescent<sup>2</sup> fronds lying at the foot of the cliffs between the upper and lower waterfalls, on the west side (SD 9159 6409). From the presence of paraphyses<sup>1</sup> in the sori I concluded at the time that they were *P. cambricum*, although the frond outline was more like that of *P. interjectum*. In 2004 Bruce Brown found one small but fertile frond lying at the foot of the cliffs, and, after consulting Rob Cooke, it has now been decided that Bruce's specimen is another colony of *P. x shivasiae*. There is more than one colony high up on the cliffs, the largest of which comprises fronds that are not particularly broad, so it is likely that this is the hybrid. At least one of the smaller colonies has very broad fronds, so *P. cambricum* may be present also. It is now thought likely that my specimen of 1965 is also *P. x shivasiae*, although it differs from Bruce's specimen in the presence of paraphyses<sup>1</sup> (could this character have changed with the passage of time?).

In 2004 Bruce Brown studied some colonies closer to Malham, in the vicinity of Janet's Foss waterfall. In addition to some very impressive colonies of both *P. vulgare* and *P. interjectum*, he has found both *P. x mantoniae* (SD9093 6315) and *P. x shivasiae* (SD 9096 6323). These colonies are about 500 metres from those in Gordale Scar and the adjacent gorge.

The fact that *P. cambricum* can survive at such an altitude in such exposed positions is very surprising, but the presence of all three hybrids in the area provides additional interest. What makes the area particularly exciting is the fact that almost every colony is different from the next one. There are many other potential sites in the area which have not yet been explored, including some cliffs close to Malham Tarn, so *P. cambricum* could yet be found at still higher altitude. The icing upon the cake is the scenery: there can be few places in Britain as impressive as Gordale Scar and Malham Cove, and as interesting botanically as the limestone pavement. The study of the Polypodium species and hybrids of the area has been a sheer delight, and immensely rewarding. □

**Acknowledgements:-**

Many thanks to Bruce Brown for his very significant contribution towards our knowledge of this fascinating area, and to Rob Cooke for his assistance with the identification of the hybrids.

<sup>1</sup> **Paraphyses**:- (singular paraphysis) Branched hairs found amongst the sporangia in the sorus. They are only found in *P. cambricum*, or sometimes in *P x shivasiae*, where they are less branched.

<sup>2</sup> **Senescent frond**:- this is a dead (and dried out) frond usually found on the ground.

<sup>3</sup> **Basal and indurated cells**:- The annulus of the sporangia consists of both indurated and basal cells, and is well illustrated in Fig 7. Indurated cells have thick cell walls, which together act as a 'hinge' so as the sporangia dries out it forces other cells to tear and thus releases the spores. This can be seen in Fig 5. Basal cells are those found between the indurated cells and the stalk of the sporangium. The sporangia in Fig 7 has 2 basal cells.

All magnifications are approximate.



Fig. 14. The stunted colony of *P. cambricum*

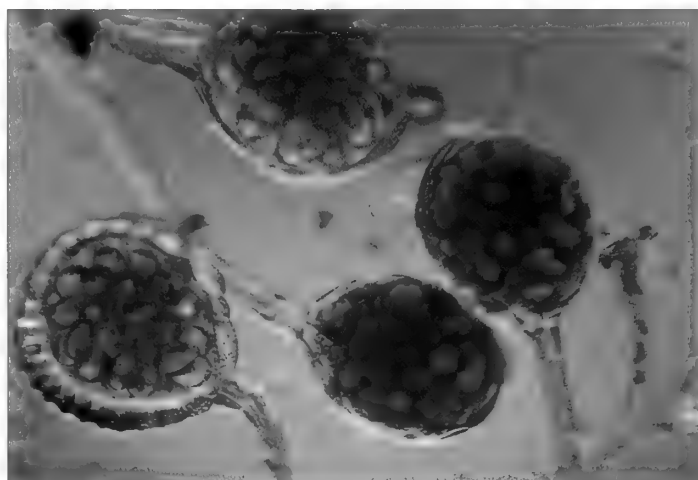


Fig. 15. Sporangia of *P. cambricum*. Note paraphysis<sup>1</sup> on right. (x100)

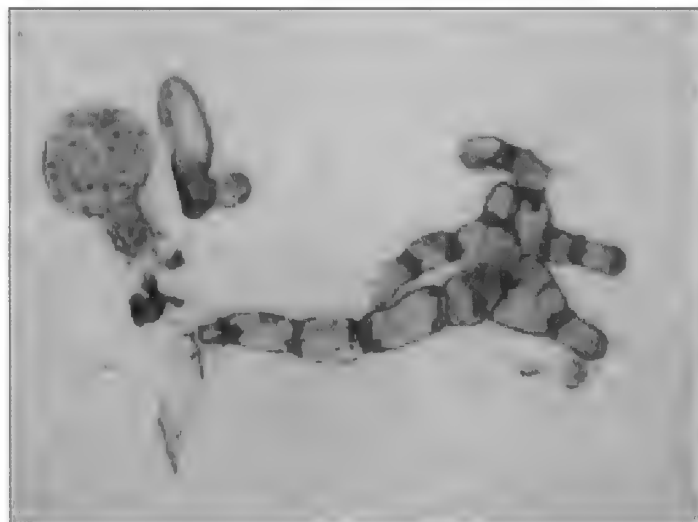


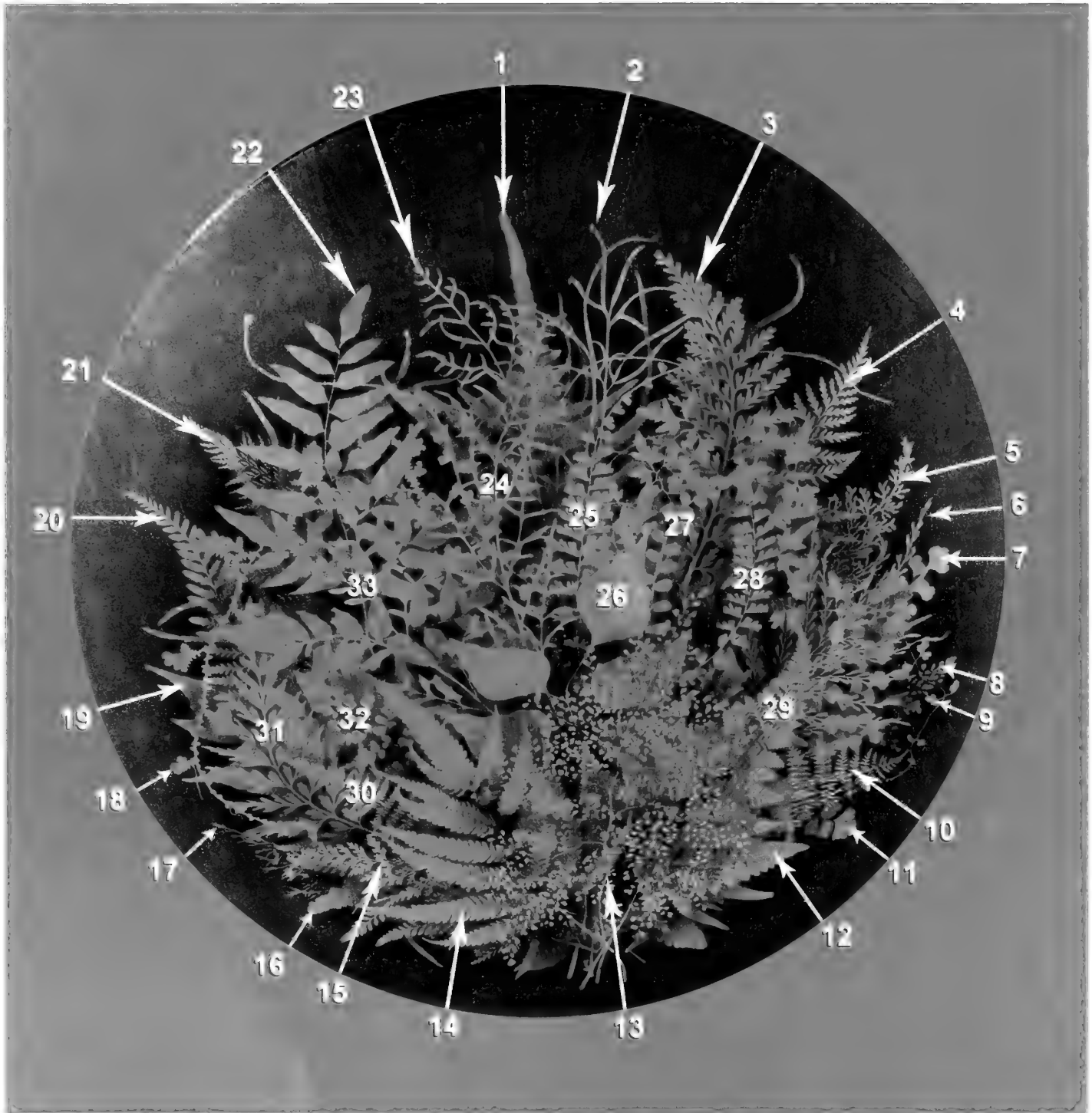
Fig. 16. Paraphysis<sup>1</sup> of *P. cambricum*. (x100)

# A Challenge to all Fern Lovers!

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On page 382 is an article describing many items of Mauchline furniture decorated with ferns. This is Table B described in that article after it had some slight restoration.

The challenge is to identify the ferns!

Several are duplicated, and some have only small amounts visible. However, most, if not all seem to be exotic or tropical. It has been suggested that one of the sources of ferns, at the time this table was made, would be Birkenheads' nursery. If anyone has the time and opportunity to browse through some of their catalogues it might help to identify most of these ferns.

Another suggestion is that Lowe's *'Ferns British and Exotic'* might be useful.

You might have your own ideas. All contributions, however small, would be most welcome to the above e-mail address please.



# LYCOPODIUMS: TRIALS IN POT CULTIVATION

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My interest in lycopodiums developed over the course of several years prior to my first real effort to try to grow them in pot culture in 2005. Perhaps the earliest encounter was in the mail order catalogue of Arthur Eames Allgrove who specialized in terrariums and suitable plants back in the late 1960s. What may have pushed my interest in trying to grow them was the discovery of a species of *Lycopodium*, perhaps *L. obscurum*, that was being sold at a local pet shop as an aquatic plant! However, I did not really try growing any species until 1967 at which time I had collected a plant of *Lycopodiella inundata* from a bog in Humboldt County, Northern California. This plant appeared to grow well here in northwestern Santa Barbara County, California; at least, until I watered it with tap water!



Fig. 1. *Lycopodium annotinum*.

## The Root Book

It was not until sometime in the early 1980s that I ran across an ad in an issue of *Flower and Garden Magazine* in which club mosses appeared as being available for mail order. As I had absolutely no knowledge on how to grow these kinds of plants and could find no information on their culture, I went ahead and ordered their catalogue as the ad had mentioned growing information was available. In receiving the catalogue I found that the club mosses were being sold as a threesome of *L. clavatum*, *obscurum*, and *annotinum* and also found a listing for a booklet called the *Root Book* in which could be found even more information. Completely hesitant about ordering any lycopodiums at the time I went ahead and acquired the *Root Book*.

Written by Norma Phillips of Orchid Gardens, Andover, Minnesota, this is a spirally bound booklet with heavy glossy pages. While providing the only information that I could find on lycopodium culture, this unique booklet focused upon growing the plants in the ground and not in containers. Nonetheless, there are some pertinent notes that Mrs. Phillips made on lycopodiums growing within their natural habitats.

The two most important observations were the acidic nature of the loamy soil that the plants were growing in and the companion plants that occurred along with specific Lycopodiums. She noted that the species required moist to wet soil and shade, especially in winter when they should have full shade which is generally accomplished in nature with a deep layer of mulch from the overhanging deciduous trees.

The companion plant *Cornus canadensis* may be found with *Lycopodium clavatum* and *L. complanatum*. *Maianthemum canadense* may be found with *L. complanatum* while *Trientalis americana* may occur with *Lycopodium obscurum*.



Fig. 2. *Lycopodium clavatum* at the start of the trial.

## The First Trial, 1986, *Lycopodium* Species

I was completely clueless when it came to trying to work out what would pass as acidic soil! The only acidic soil I knew about was the commercially prepared mixes for azaleas and rhododendrons. Yet I was hesitant about using this type of mix and decided to try to blend up a mix using what would seem to be the type of soil that the plants would occur in, even though I had never seen the plants in nature. Northern Santa Barbara County is not a place where lycopodiums can be found. The only place in California is the northwestern-most corner of the state near Oregon, where *Lycopodium clavatum* can be found at an elevation of about 500 feet (about 152 meters) within Douglas Fir Forests.

The initial mix I developed was a combination of decomposing fir bark mixed with green moss and some of the commercial azalea mix. There was not much else available at the local nurseries and home improvement stores. It felt good is about the only test I could use to judge its worthiness! With some hesitation, as I did not want to lose the plants outright, I made my first order of the lycopodium threesome in late 1985.

In early May, 1986, I received the plants and immediately set about to pot them up! The mix was ready and I had prepared three plastic fern pots to plant them into. I had set aside an area of broken shade under some potted evergreens and had purchased a quantity of steam distilled water to use in watering them. After potting and setting them out I maintained a daily vigil of checking on the plants and spraying them with distilled water two or three times a day as the area generally has low humidity. I watered the pots at least two or three times a week. The plants seem to respond well to the culture but then by mid-1987 decline began to set in.

On de-potting I discovered that the mix was not just moist but soaking wet! The rhizomes were in various stages of rot. They were essentially gone. For plants that were reputed to need moist to wet substrates something was definitely missing in my understanding!



Fig. 3. The mucky mix of the wet substrate that caused the rhizomes of the lycopodiums to rot.

**The second trial, 2005, *Lycopodium* species.**

It was not until 2005 that I made the attempt to grow lycopodiums again. With such a span in time between my initial attempt and this renewed effort, I had forgotten about the 1987 failure. However, with the new effort I made several purchases of some very interesting substrates over the internet which I was using to pot up various orchid species. The primary substrate found on the net was ground coconut fibre. Together with aspen litter, which was sold for rodent bedding, that I found locally at a grocery store, and fine ground cover bark sold at a local home improvement centre, I developed a new lycopodium mix. To 2 cups each of the bark, the aspen litter, and the coconut fiber, I added a cup of dry milled peat moss. Again using the shallow plastic fern pots, I bottom-filled the pots with coarse fir bark, top-dressed with the lycopodium mix and planted the same trio of *Lycopodium clavatum*, *L. annotinum*, and *L. obscurum*, from the same source in Minnesota. Again I used distilled water, both in watering and in spraying down the plants. The plants were potted and placed outside in shade on 27 April 2005.

Having placed the potted plants in heavy shade, I watered weekly. Because of the low humidity in my area, I misted three to five times during each day and hourly when the Santa Ana winds were blowing through the area. While I began with the use of steam distilled water by July, 2005, I had acquired a reverse osmosis unit from SpectraPure and was able to begin to use r/o water.

By November, 2005, *Lycopodium clavatum*, though losing some growth, had added an impressive amount of new growth. While I had tried various methods of maintaining humidity in the growing area during summer and fall, with the advent of winter I had cut back on these efforts. By December, 2005, the plants were all looking rather yellowish green. I tried to remove some of the shading so that more light could reach the plants in the hope that they would green up some. It was not until November, 2006, that the *L. clavatum* died. In February, 2007, the *L. annotinum* looked like it was dying off while the *L. obscurum* appeared to be alive but with little sign of growth occurring. So I decided to re-pot the two survivors.

In de-potting the plants I discovered that the mix was just too wet again, though the plant of *L. obscurum* had good looking rhizomes and rhizoids. Needless to say, I did not use the old mix again. Instead I made up a new mix of cypress mulch, which was a product sold for reptile bedding over the net, and of Japanese Maple leaves from my tree. The formula was 1 part cypress to 2 parts crushed up leaves. Both of the repotted plants had died out by 15 November 2007.



*Lycopodium obscurum* had developed a nice rhizome system along the inside of the pot's wall. They appeared to be healthy

Rhizome of *L. obscurum*. Surface layer in fair condition and the bottom fill is intact. The mix proper has rotted into a muck.

Fig. 4. The developed rhizome system of *Lycopodium obscurum*

Once again I was saddled with not being able to work up a mix that was suitable for the plants. It is definitely difficult to develop a mix without any real knowledge of the actual type of substrate that such plants occur in within their natural communities. I worked up a more elaborate mix in an effort to replicate the presumed state of their natural substrate. This mix consisted of a combination of river sand, part crushed oak leaves, fine bark, cut up pine needles, milled peat moss, pine shavings, cypress mulch, cedar shavings, and a commercial potting soil.

**Redesigned Lycopodium Mix. 15th Nov 2007**

- 1 part Pre-Mix
- 1 part River Sand
- 1 part crushed oak leaves

**Pre-Mix:-**

- 10 parts fine ground cover bark
- 5 parts Monterey Pine needles cut less than 1 inch
- 5 parts peat moss
- 8 parts pine shavings
- 6 parts Kellogg's Patio Plus Natural Outdoor Potting Soil
- 3 parts Cypress mulch
- 1 part Cedar shavings

With the development of a new potting mix for lycopodiums, I decided to try a new approach to how I pot the plants up. Instead of just using the mix with a bottom-fill that is designed to minimize loss of mix out of the pot's drainage ports, I decided to use a strata-based approach to potting. The system would be of four tiers of a bottom-fill, top-dressed with a mulch, then the mix, with a final layer of a top-dressing that would serve to help keep moisture in the mix.

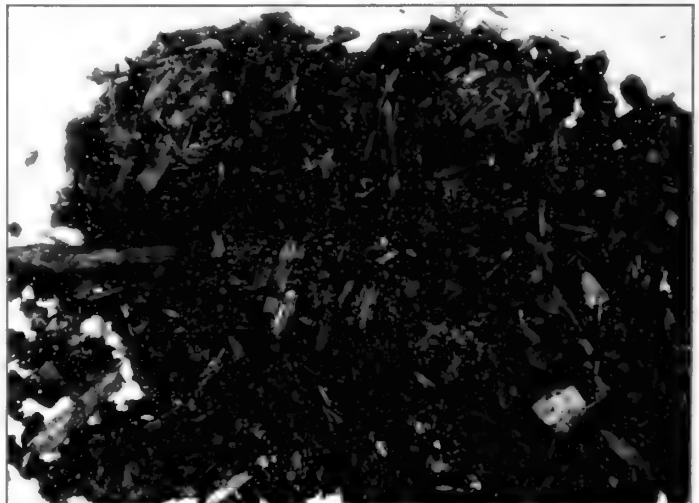


Fig. 5. The new potting mix for lycopodiums.

The four tier system would be tentatively constructed of:

1. Bottom-fill of coconut chunks
2. Mulch of cypress
3. Mix of an inch or two depth that the plant rhizomes are placed with just a light covering of the rhizomes by more mix
4. Top-dressed by cypress mulch.

**The third trial, 2008, *Lycopodium* species**

It was not until 9 May 2008 that I was able to pot up another test run of the *Lycopodium* species. In this test I had one pot with *L. clavatum*, two pots with *L. obscurum*, and two of *L. annotinum*. After potting and a thorough watering with reverse-osmosis water, I sat the potted plants in a heavily shaded spot where the plants would only receive some sunlight during late afternoon for about an hour or less. My initial watering frequency was two to three times a week which eventually devolved to a weekly routine as I saw that the pots were staying quite wet.

By August, 2009, the pots of *L. clavatum* and *L. obscurum* appeared to be dead or dying. I de-potted the two species and discovered that my strata technique in potting made little difference in providing for better drainage and aeration of the soil mix. The mix had rapidly decomposed with only some of the coarser bark and of the cypress top-dressing being intact. The decomposed mix was essentially just muck!

Yet the two divisions of *L. annotinum* appeared to be growing well. In one of the pots of *L. annotinum* there were aerial runners that were growing beyond the rims of the pot. On de-potting I discovered that the soil mix was bone dry! The mix appeared to be as decomposed as that of the species that had died. The only difference is that I had let a plant of a *Persicaria* species sow itself into the pot. The *Persicaria* species is semi-aquatic and naturally occurs locally in wet to muddy places. Its roots had grown throughout the mix of the *Lycopodium annotinum* pot.

I decided to weigh the potted *L. annotinum* (with the aerial stems) with its substrate dry and with its substrate thoroughly watered. The dry weight was 7.75 ounces. The wet weight was 16 ounces. With the weight of the plastic pot at 2.5 ounces, the difference between the wet and dry weights was 5.75 ounces. This was the weight of the water that was absorbed by the dry substrate. (This plant survived until April, 2010.)



Fig. 6. *L. annotinum* growing in a dry soil mix with the *Persicaria* species just visible, bottom centre and left.

The most surprising observation that came out of this test was the realization that a species of lycopodium appeared to be able to handle an apparently dry substrate,

even though this was a substrate that got wet and then dried out with the plants being sprayed throughout a weekly watering cycle as a response to low humidity in the local weather. This condition occurred under almost a state of total shading from sunlight.

**The first trial, 2008, *Diphasiastrum digitatum***

On 4 June 2008 I received a well grown plant of *Diphasiastrum digitatum* from New York. The soil mix it was in appeared to be a combination of peat moss, perlite, and sand, but it was native soil with some perlite added. I treated it similarly to how I handle the lycopodium test plants by potting into a plastic fern pot using a layered substrate of a bottom-fill of cypress mulch, topped by a blend of equal parts of the mix the plant came in, the redesigned lycopodium Mix (Nov. 2007 blend), and perlite. I placed the rhizomes on top of the mix and lightly covered with this new blend and top-dressed with cypress mulch.



Fig. 7. *D. digitatum* as received from New York, showing the perlite and native soil mix.

The plants were placed in a new growing area that I had cleared out on the north side of my small greenhouse that was sheltered on the east by my back porch, and on the west by a tall planter with a *Pinus devoniana* and Boston ferns providing both shade and shelter from wind. The northern portion of the new growing area is entirely exposed to winds. Sunlight reaches the area for about two hours during mid-day, otherwise the area is entirely shaded.

The plants looked so much healthier than the lycopodium species I acquired from Minnesota that I felt that they should do well. However, after a few months they appeared to be dying. In assessing their demise my conclusions were that this species really needed a much more humid environment than I was providing. I also felt that I had too much depth to the substrate and needed either to decrease the absorption ability of the mix or to reduce the depth so that the mix could dry out faster while at the same time maintaining a high humidity.

**The first trial, 2008, *Lycopodiella inundata***

*Lycopodiella* is my favorite genus within the *Lycopsidea*. Perhaps this is due to the fact it represents the only member of the order that I have been privileged to see in its natural habitat. As I had success with growing a collected specimen I was surprised to find that the species was available from a grower in Maryland. I placed my order in May, 2008, and set about to prepare a suitable growing mix for the plant which was based upon my observations while visiting the bog in Humboldt County, California.

My basic mix consisted of a milled peat moss and perlite blend. The blend consisted of: 2 parts partially decomposed fir bark, 2 parts shredded aspen litter, 2 parts milled coir, 1 part milled peat moss, 1 part milled sphagnum moss, and 1 part medium perlite.



## LYCOPIDIUMS: TRIALS IN POT CULTIVATION



Fig. 9. *Lycopodiella inundata* growing in the 'pot within a pot' system used to maintain water levels in the substrate.

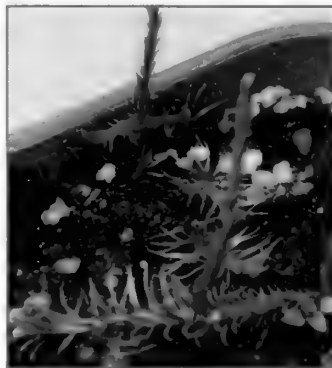


Fig. 10. The same plant of *Lycopodiella inundata* just two and a half months later. Note the new strobili forming.

When I received the plant on 8 June 2008, I wetted down the potting mix and filled a pot about three-quarters full and tapped down the wet mix. Upon this I placed the plant and filled in with more mix around the plant to cover its rhizoids, lightly pressing in the mix around the plant. I top-dressed with milled sphagnum moss. I then inserted the pot into a container that held water and filled it with reverse-osmosis water until it reached just below the rim of the pot. I subsequently kept the water level to cover half way up the sides of the pot. I sat the plant where it would get about three hours of direct sunlight.

After just two and a half months the plant had grown so well that it had produced multiple branches and new strobili. The plant looked happy and was growing better than I had anticipated. However, after a year it was gone. Part of the problem was I had to deal with slugs getting into the pot and eating the plant! I also believe that my culture was not quite what it should have been.

My assessment of the *Lycopodiella* trial is that:

1. I should not have sat the potted plant in a container that held water. Instead I should have watered the plant twice or three times daily and let the water drain out
2. I should have not made the substrate so deep but rather have a shallow substrate, perhaps half the height of the pot and planted the plant inside of the pot. This would have provided for localized humidity as the bog environment is very humid whereas my plant bench where I had sat the potted plant was exposed to the harsh drying winds of an already low humidity environment
3. I should have kept the plant under the shade of my back porch roof or at the least on the north side of my greenhouse where I had placed the *Diphasiastrum*.

### Substrate tests, 2009 October

Based upon my observations as to the reasons behind the failures of the tests on the three *Lycopodium* species, I conducted a test on substrate blends. The aim of these tests was to find a substrate that would allow for acceptable aeration of the mix whilst also allowing for appropriate retention of moisture to protect the rhizoids from desiccation. The basic ingredients in the blends would be perlite, cypress mulch, pumice, and granitic gravel used in combination with the redesigned mix of November, 2007.

As a basic hypothesis I defined substrate aeration as the ability of air to move freely throughout a potting mix. This ability is affected by the nature of the particles as well as their size and surface features. As the amount of small particles would tend to reduce the available free space within a potting mix and would act to hold water more readily than would be the case with a potting mix of entirely larger particles, I concluded that degree of aeration can be tied to the weight of a potting mix. Therefore, I defined the percentage of aeration of a potting mix as the quotient of dry weight divided by the wet weight converted to a percentile.

In October, 2009, I put together a test run to see if my conclusions would provide me with any reliable verification. This test was conducted on a small sample of just five test substrate blends. Involved in the tests was not only the blending of the substrate ingredients but also weighing the dry mix, the wet mix, and the water that ran out after a specified amount of water was poured over the potted mix. From these measurements I was able to determine the gain in the weight of the potted mix after watering and draining off of the excess water. While this measurement alone would indicate that blend which offered the best aeration, it was the formula of dividing the dry weight by the wet weight and multiplying by ten and rounding to a whole number that gave me a percentile that confirmed the significance of the weight of the water that drained off.

The chart below provides the details on this test.

October 2009 Substrate Tests					
Formula Mix	No. 1	No. 2	No. 3	No. 4	No. 5
Amounts per test in ounces					
Plastic pot	0.50	0.50	0.50	0.50	0.50
Dry Mix	11.00	8.00	15.50	6.250	18.25
Wet Mix*	17.50	12.00	20.00	9.50	21.25
Drainage**	1.50	4.00	4.50	3.25	3.00
Gain in wt	6.50	4.00	4.50	3.25	3.00
% aeration***	63	67	78	66	86

\* 8oz of water was poured into mix housed in a pot that holds 24oz and allowed to drain until no water continued to dip out of the holes.

\*\*This is the amount of water recovered after each test was allowed to drain out.

\*\*\* 10x(Dry/wet) rounded

Test Sample Formula (by part)					
	Old Mix	Pumice	Perlite	Gravel	Cypress Mulch
No. 1	1		2		
No. 2	1		2		2
No. 3	1	2			1
No. 4	1		2		3
No. 5	1			2	2



Fig 11. *Lycopodium dendroideum*, as received in the post, looking healthy and vigorous (Oct 2009)

**The fourth trial, 2009, *Lycopodium dendroideum***

In October, 2009, I discovered, while browsing eBay, that there was a source for *Lycopodium dendroideum* in Wisconsin. At last I was able to order just one species to test and was able to acquire enough to test out my new substrate (Oct 2009 Mix No.5).



Fig. 12. The styrofoam cups used as pots for the 2009 trial of *Lycopodium dendroideum*.

The plants made it across the country in just two days and looked great. I had prepared the new substrate and instead of using plastic pots had prepared 32 ounce styrofoam cups to use in potting the plants up by punching a hole in the bottom and holes around the bottom of the cup. I potted all the plants up using the new No.5 blend and used a top-dressing of chopped up pine needles and duff for four pots and dried crushed-up Japanese maple leaves for one of the five test plants. I watered each with eight ounces of reverse-osmosis water. Before placing them on the north side of my greenhouse I weighed each watered potted plant as I wanted to monitor the change in plant growth by the change in overall weight of the watered potted plant. Before each subsequent weighing I watered each potted plant with 8 ounces of reverse-osmosis water.

	No.111	No. 112	No. 113	No. 114	No. 115
04/11/09	32.50oz	25.50oz	30.00oz	31.25oz	33.00oz
30/05/10	36.25oz	28.00oz	33.00oz	36.25oz	37.00oz
06/08/10	36.50oz	27.75oz	32.00oz	35.00oz	36.50oz

The readings indicate the seasonal nature of growth in the Lycopodiums. Winter into Spring showed the most significant growth. From very late Spring into late Summer the growth appeared to have ceased as the weights indicate a slight loss in overall weight.

What was the most exciting discoveries in this trial were the growth of new rhizomes and the progressive development and maturation of the strobili. Test plants No.114 and No.115 showed the best strobili development. I knocked No.114 out of its pot to check out its rhizomes and was delighted to see healthy rhizome development. This would explain the fact that this test plant appeared to be the best growing one in the test group.

**Strobili development in test plant No.114**

By 12 February 2010 the branch tips of this lycopodium were forming tiny cone-like buds which were whitish once the young strobili emerged from the green bracts that were surrounding them.

By 14 March 2010 the tiny strobili had become elongated. Two months later, 17 May 2010, their elongation had



Fig.13. Tiny cone like buds forming (Feb. 2010)



Fig.14. Strobili emerging from the buds.

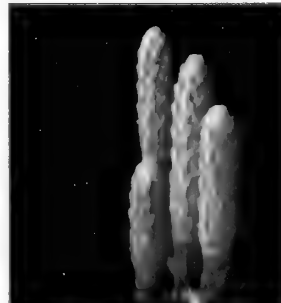


Fig. 15. The elongated strobili (March 2010)

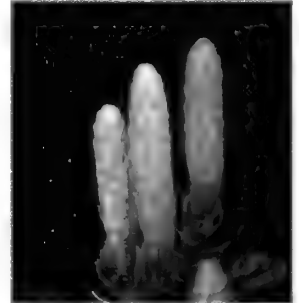


Fig. 16. Mature strobili. (June 2010)

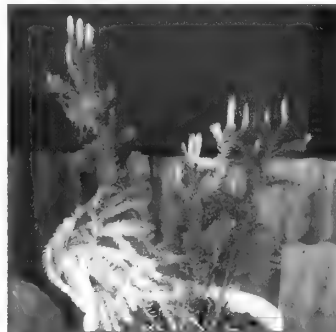


Fig.17. Test Plant No.114 (June 2010)



Fig. 18. Test plant No. 115 showing a fertile stem with strobili.

lengthened and taken on the appearance of strobili. By 17 June 2010 they looked even more so.

While test plant No.114 was slowly maturing into a viable strobilus state, test plant No.115 had already reached this condition by 23 July 2010.

An interesting observation is that illustrated by test plant No.115. Alongside its sterile stems was a fertile stem that housed the strobili. The difference is obvious in the photo.

**Rhizoids and new growth in test plant No.114**

While the fertile stems were busy producing strobili the subterranean parts of the plant were also busy producing new growths and rhizomes. Unlike the previous trials which had failed (with exceptions) after a year of testing, the lycopodium mix No.5 (Oct. 2009) had proven itself to be a medium in which some of the test plants grew well. This mix of gravel not only held up but the level of aeration (86%) within it was sufficient to allow for a longer life of



Fig. 19. Left: Growth in the substrate. Middle: Growth above the substrate. Right: Substrate detail.

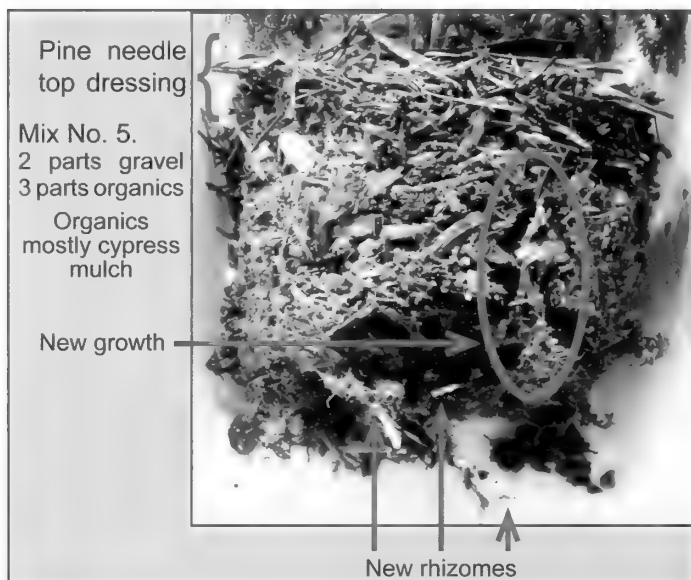


Fig. 20. Detail of the new growth of test plant No. 114, *Lycopodium dendroideum* in Mix No. 5.

the organics used. Mix integrity was evident with particulate consistency extant despite the frequent waterings during the week and the frequent daily mistings as was required to counter low humidity and drying winds.

In addition to the new growth arising from deep within the substrate I spotted a young new growth that was rising from the substrate.

What was surprising about the new growths that arose was that they were not like the pine tree type growths that initially I had received and potted up. Their branches seemed short and bunched in appearance. Eventually the new growths were the fertile branches of the plant that ended up bearing the strobili. The sterile branches with the familiar pine tree appearance died off as the fertile branches grew and began producing strobili.



Fig. 21. Plant No. 111

Left: November 2009.

Right July 2010

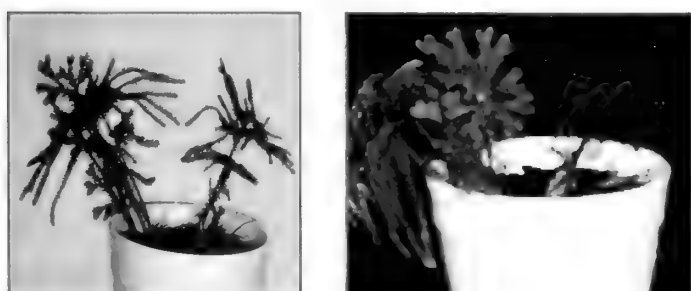


Fig. 22. Plant No. 113

Left November 2009.

Right. July 2010.



Fig. 23. Plant No. 114

Left: November 2009

Right: July 2010

Trial 4 began in 2009 using *Lycopodium dendroideum* has proven to be a confirmation of my presumptions that these plants really do better in a well aerated and well draining substrate. Of the five test plants, three, No.111, No.113 and No.114, have survived to date. At this date, 7 February 2012, plant No.111 is most likely dying; test plant No.113 has excellent rhizome growth; and test plant No.114 has rhizome growth that appears to be rotting. The fault in the long term (2 years, 4 months) failure of successful plant growth for those test plants that have been lost apparently is due to inadequate drainage!

On de-potting the three survivors I discovered that the drainage holes that I had made using an ice pick were clogged up and the pots could hold water. The old mix portion of the lycopodium mix No.5 had deteriorated and blocked drainage out of the styrofoam cups which in turn retained water and lead to further deterioration of the mix into muck.

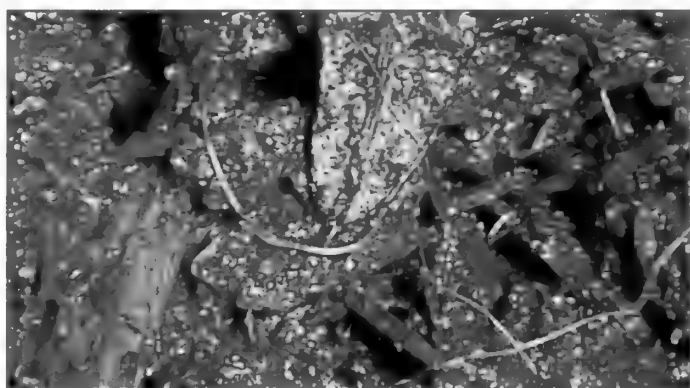


Fig.24. Deteriorated mix covering cypress and gravel ingredients (Feb. 6th 2012)

Upon this discovery I cleared the drainage holes using a Phillips screwdriver and added more holes around the base of the cup as well as up an inch and up a couple of inches above the base of the cup for test plants No.113 and No.114. As No.111 looked pretty well gone I removed the living fertile branch with rhizome, wrapped it with a damp paper towel and bagged it to join test plant No.114 in my refrigerator to rest until Spring.

Test plant No.113 was a surprise to me as its rhizome system looked very healthy considering the fact that the soil looked somewhat mucky. I believe the presence of a Cardamine species with its extensive root system helped counter the anaerobic conditions that would have been evident in the flooded mixes of both No.111 and No.114. The addition of additional drainage to the cup should help it survive. After making this adjustment I dropped the intact plant into its cup and set it back outside under the shade of my back porch roof.





Fig.25. Test plant No 113 showing the healthy root system despite some deterioration of the potting mix. The cardamine species is visible at the top

Hopefully the test plant No.114 which I am keeping over winter in my refrigerator will survive. I am keeping it at around 38° F to see if it will have any kind of effect upon the production of new shoots (sterile branches).

**Fifth trial, 2010, *Lycopodium dendroideum***

While browsing eBay during September, 2010, I found a seller of *Lycopodium dendroideum* and of *Diphasiastrum digitatum*. With what I considered to be a success with the lycopodium mix No.5, I wanted to try and run at least one more test using another type of substrate, osmunda root. What encouraged me to do so was an email from the seller of the two species that *Lycopodium dendroideum* occurred in a soil that was light and fluffy and filled with pine roots. This idea of a root filled substrate reminded me of osmunda root.

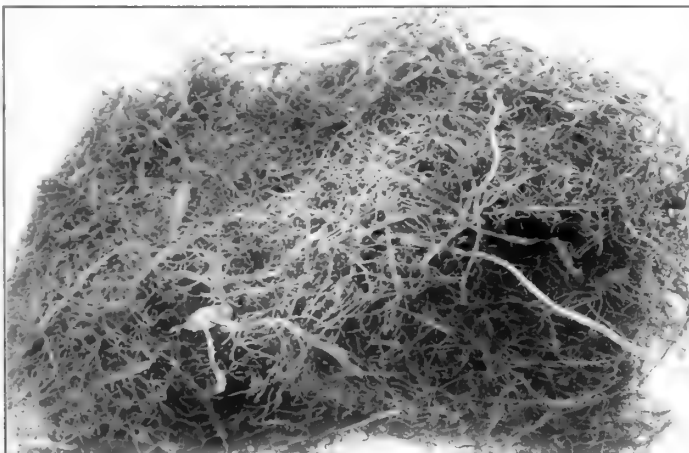


Fig.26. Osmunda root fibre

As I have been growing that fern for many years the colony has produced a thick and deep layer of roots that I could easily harvest without harming the plant. I have used it in the growing of some tropical orchids and found that they seem to do quite well in it. The ability of the root to hold up in pot culture and its light weight suggested that it might even prove to be a better substrate or a mix ingredient in lycopodium mixes.

**Osmunda aeration tests**

In October, 2010, I tested straight osmunda root and various substrate blends that incorporated osmunda to determine their aeration percentiles. The procedure I used was identical to that used in determining the aeration percentiles for a lycopodium mix. The results of these tests were:

1. Osmunda root alone: 80%
2. Osmunda and cypress mulch blended in equal parts by volume: 63%
3. Osmunda, cypress mulch, and dry green moss blended in equal parts by volume: 57%
4. Osmunda, 5 parts; cypress mulch, 3 parts; dry green moss, 1 part, by volume: 66%
5. Blend of No.4 above with gravel at equal parts, by volume: 76%
6. Blend of No.4 above at 1 part to 2 parts of gravel, by volume: 86%

With these results in hand, I decided to attempt to test osmunda mix No.6 as well as straight osmunda root on the next test plants which I acquired from a seller in New York State. There were six test subjects. Four of the plants were potted using the osmunda blend No.6 while two were potted using osmunda blend No.1. These were potted into four inch square plastic pots and were placed on the north side of my greenhouse. They were mostly shaded all day long. The plants in straight osmunda were watered twice daily while the others were watered two or three times a week. All were sprayed daily as much as the conditions of humidity required.



Fig.27. Left: Plant No. 118. Right: Plant No. 119 showing native soil blended with perlite as delivered.

Two of the plants, No.118 and No.119, came to me potted in native soil that was blended with perlite and top-dressed with moss.

Test plant No.118 was planted into osmunda blend No.6. Test plant No.119 was planted into blend of osmunda blend No.6 with the native soil that it came with.

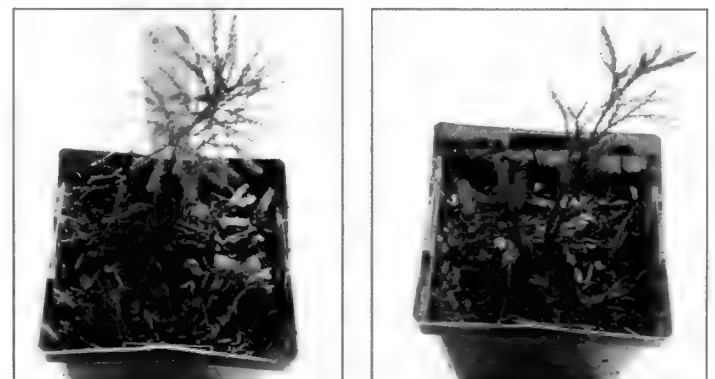


Fig.28..Left. Plant No. 118 potted with osmunda blend No. 6 Right: Plant No.119 potted with the same osmunda blend plus native soil.

## LYCOPODIUMS: TRIALS IN POT CULTIVATION

The remaining four plants came to me bare-root. These were also planted into four inch square plastic pots with two into the osmunda blend No.6 and two into osmunda blend No.1. It is my belief that the plants were native harvested rather than pot grown as had been the test plants No.118 and No.119.

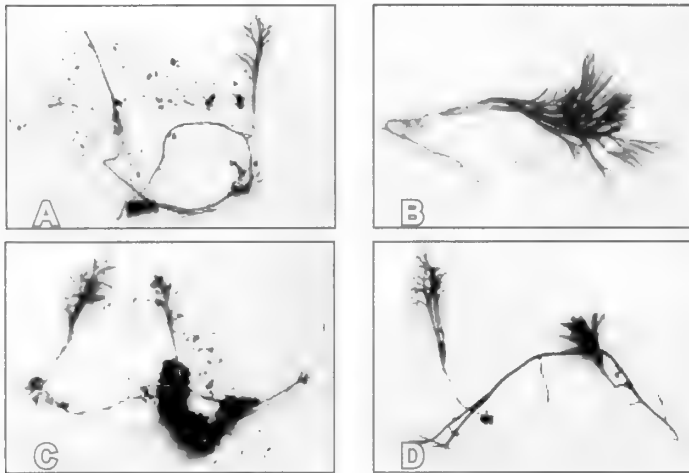


Fig. 29.

A: Test plant No. 125.  
B: Test plant No. 126  
C: Test plant No. 127.  
D: Test plant No. 128

Test plants No.125 and No.126 were planted into Osmunda Blend No.6. After planting test plant No.127 into straight osmunda, a few days later I used the native planting mix that test plants No.118 and No.119 were being grown in as top-dressing for the potted No.127 as I was concerned about too much desiccation because of our low humidity and drying winds. Test plant No.128 was also planted in osmunda but I have been wanting to see if the use of Osmocote would be harmful or beneficial to the plant and so I added one quarter teaspoon Osmocote to the bottom-fill and one quarter teaspoon Osmocote to the top of the

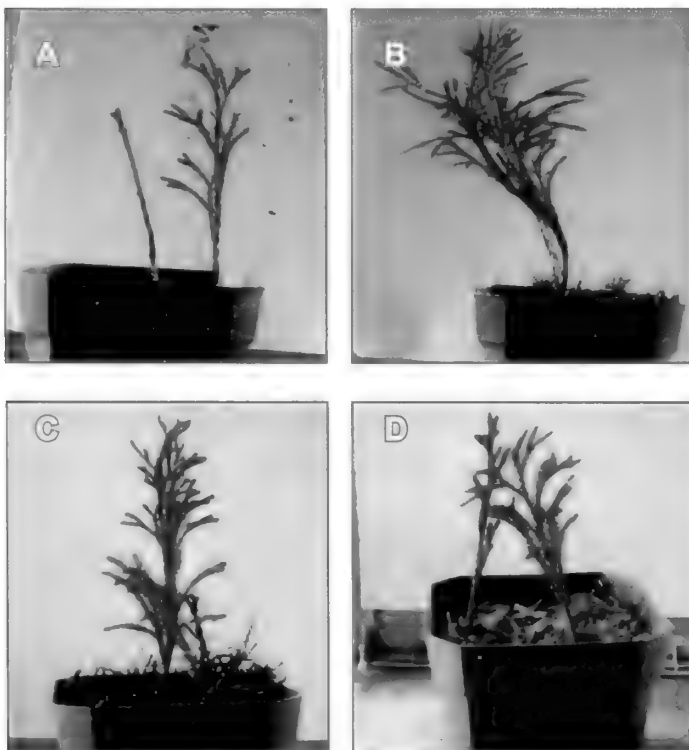


Fig. 30.

Test plant 125 (A) and test plant 126 (B) potted using osmunda blend No. 6  
Test plant 127 (C) planted in straight osmunda fibre and top dressed.  
Test plant 128 (D) , osmunda fibre, Osmocote and cypress mulch top dressing

mix over which I added a top-dressing of cypress mulch.

All the plants were placed in the growing area on the north side of my greenhouse. The plants testing osmunda Blend No.6 were placed to receive some sunlight during mid-day. The plants in straight osmunda were placed in a shaded spot.

With such strong looking plants I was hoping to see some positive results from this new experiment using osmunda root. However, by 11 December 2011, only two of the test plants had survived! On de-potting the dead looking plants I discovered that the planting mix was soaking wet despite the high percentile of aeration that I had found in testing the mix.

The only explanation I could deduce is that because of the very dry winds and lack of sufficient humidity which I attempt to compensate for by frequent mistings during the day and heavy watering during the week that the mix was not able to dry out enough as the plastic pots only had four drainage ports. Another consideration is that the nature of the mix may have made it difficult for the rhizomes to generate the rhizoid system needed for anchorage and water absorption. If so, then the stress generated by the low humidity and drying winds may have been too much for the plants to handle the new mix.

One interesting note is that the two plants that had survived for 15 months were test plants No.119 and No.127. Both of these plants had native soil as a part of its test substrate or as a top-dressing. Whether this is of any importance is undeterminable at this time. As of this date, 7 February 2012, these two test plants have been repotted into an irregular blend of gravel, osmunda blend No.6, and a lycopodium blend developed in May, 2011. They are sitting under the protection of my back porch roof in shade and covered by a plastic dome I made to help retain humidity.

### Second trial, 2010, *Diphasiastrum digitatum*

In October, 2010, I received two plants of *Diphasiastrum digitatum* from New York. I repotted one plant, No.120, into the same soil mix as used for *Lycopodium dendroideum* No.119, a mix of osmunda blend No.6 with native soil. The other plant of *D. digitatum*, No.121, was potted into used lycopodium mix No.5 that I saved from the discarded plant of *L. dendroideum* No.116 which had died. Test plant No.120 was planted into a four inch square plastic pot. Test plant No.121 was planted into a used Styrofoam cup to which I punched additional drainage ports around the side of about an inch above the base of the cup and in which I poured a bottom-fill of gravel.

Both of these test plants were placed along with the test plants of *Lycopodium dendroideum* on the north side of my greenhouse. They were watered with the same frequency of that of the lycopodium test plants with reverse-osmosis water.

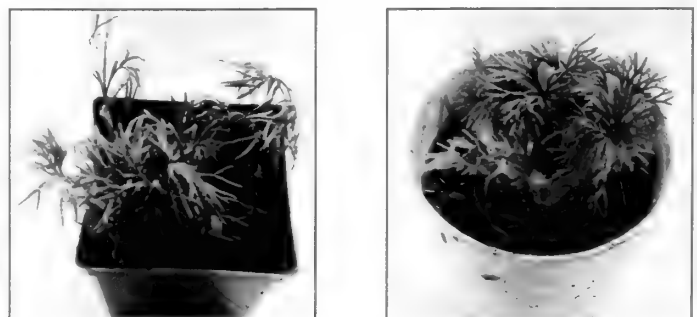


Fig. 31.

Left: Test plant No. 120 potted in Osmunda mix No.6 and native soil  
Right: Test plant No.121, Lycopodium mix No.5 in Styrofoam cup.

## LYCOPODIUMS: TRIALS IN POT CULTIVATION

By 8 September 2011, test plant No.120 had died. On de-potting I found that the mix was just too wet. Test plant No.121 was still alive though the substrate felt wet. On the pot of No.121 I punched additional drainage ports into the bottom of the Styrofoam cup. By 11 December 2011, test plant No.121 had died. On de-potting the mix was fairly dry.

Though I had attempted to grow *Diphasiastrum* back in 2008, I was hoping that the new substrates would prove to be more amendable to its culture. However, I had absolutely no information about the habitats of this lycophyte species and did not consider its morphological attributes in assessing a methodology by which to grow this unique species.

My thoughts about my failure with *Diphasiastrum* are centered around the distinct morphology of the species. Unlike the *Lycopodium* species I have tested, this *Lycophyte* genus has species whose stems are more or less flattened in appearance in stark contrast to the more or less rounded stems of the tested *Lycopodium* species. This would suggest that *Diphasiastrum* would need much more protection from both sun and wind, as with a flattened leaf, the amount of area subject to desiccation is more substantial than would be the case with the rounded stems of lycopodiums. With the stress of re-potting, exposure to partial sun and to frequent drying winds, the demands on the plant may have made recovery impossible. For subsequent tests I would suggest that the plant be kept in full shade and under protection that would retain humidity.

### Sixth and final trial, 2011, *Lycopodium* species

On Friday the 13th of May,(!) 2011, I received propagations of *Lycopodium clavatum*, *L. obscurum* and *L. annotinum*. Perhaps the date was an omen! As I had ordered these plants in late 2010 I had planned to test them with lycopodium mix No.5. By the time I received them my supply of the granitic gravel and the cypress mulch was exhausted and I lacked the resources to acquire any additional supply of same.

So I was hamstrung into throwing together some kind of mix that would offer, at the least, some measure of survivability for the propagations. This cobbled together mix of 14 May 2011 was like raiding a fridge and throwing bits and pieces into a pot for some old fashioned Mulligan's stew. Of course, you never know what you will get when it is all done and ready to consume!

The mix consisted of an unmeasured blend of gravel, peat moss, pine needle duff, used cypress substrate, fine bark, crushed maple leaves, used osmunda mix No.6, sand, coir, powdered green moss, and aspen fiber. Because the mix was not to my liking, I only poured enough into the fern pots to have a depth of some 1.5 to 2 inches ( 2.5 to 5 cm). Upon this fill I placed the propagations and covered each with additional mix. Watered them with r/o water and placed the three pots under my back porch roof so that they would be in shade all day, except around 4pm for about 30 to 40 minutes. I also covered each with a large plastic bag which I later replaced with plastic domes that I made from packaging scraps that I had saved for hobby use.

### *Lycopodium annotinum*, Bristly Club Moss

While I have had considerable more success in growing this species, the specimen that I received illustrated the rather coarse nature of harvesting, as well as, the rather free-ranging habit of the species. With only four nodes of rhizoid development present, the rhizoids showed significant damage with only the two apical (toward the growing tip of the creeping stem) nodes appearing to be viable. Yet even these two rhizoid systems seemed damaged and were probably much more extensive than is evident in Fig. 32.

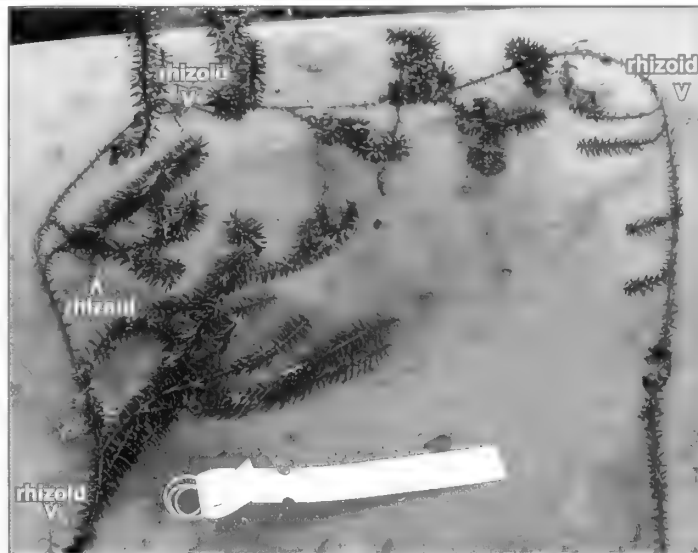


Fig. 32. *Lycopodium annotinum*, Bristly Club Moss, showing four nodes of rhizoid development.

An interesting observation of the received plant shows that the creeping stem is green. This means that the stem is exposed to some degree of sunlight and is actively involved in photosynthesis. Another observation is the distance between the nodes where the stem's rhizoid systems initiate and grow. Presuming rhizoid development is capable at every node along the stem, the initiation of rhizoids may be an indication of some unknown environmental factor, such as moisture or coolness. Such development seems to occur after there has been significant stem growth with the growth of rising leafy branches.

### *Lycopodium clavatum*, Staghorn Club Moss

*Lycopodium clavatum* is the most interesting of the three species. Having had a good measure of success in growing it back in 1986 into 1987, I was surprised to find that I had received a plant that was in the process of producing strobili. This propagation looked like a nice strong division. It's rhizoids were mostly concentrated at the base of the growing tips of the multi-branched stems. With such apical rhizoid systems the possibility of a successful transplant seemed highly likely. (Fig.33)

Again the creeping stems were green indicating some degree of exposure to sunlight and subsequent photosynthetic activity. With rhizoids appearing to be concentrated near the base of the growing stems, I would surmise that rhizoid development is occurring roughly about the same time as stem elongation occurs such stem growth possibly being dependent upon the development of the rhizoids that would be primarily serving as an anchorage system as the elongating stems grew out over their substrates.



Fig. 33. *Lycopodium clavatum*, staghorn club moss, starting to produce strobili in various places.



## LYCOPODIUMS: TRIALS IN POT CULTIVATION

An interesting observation is that of the rise of the strobili. Unlike *L. dendroideum* with its fertile and sterile branches, the branches of *L. clavatum* appear to have strobili development irregardless of the ages of the branches, with young branches with very young stages of strobili development occurring. The creeping stems appear to end with the development of a strobilus with this strobilus being the most mature in development.

### *Lycopodium obscurum*

The most obvious observation of *Lycopodium obscurum* is the apparent lack of green coloration in the stems from which the green branches arise. (Fig.34) These subterranean stems are generally called rhizomes. Since no photosynthesis occurs in them, their role in the lifecycle of the plant are to serve as a means of colonizing its habitat and of providing a solid anchorage for the erect green branches which bear leaves and strobili. Rhizoids in this sample appear to be tied to the node area where the erect branches occur.

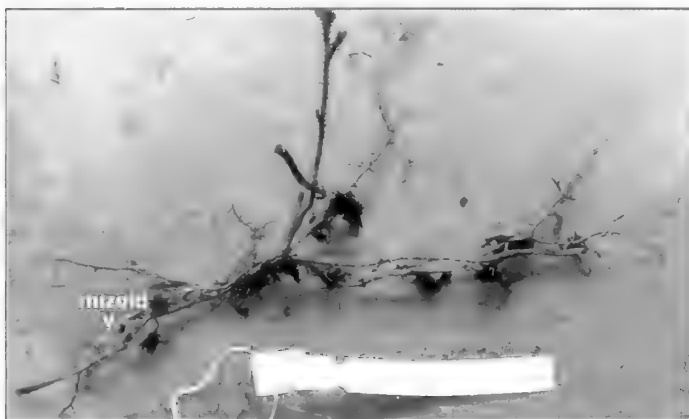


Fig. 34. *Lycopodium obscurum* showing rhizome and rhizoid structure.

The fact that this plant possesses only an underground creeping stem system causes me to consider that it may fall into some other genus other than the previous species of *L. annotinum* and *L. clavatum*. These types of stems also cause me to believe that this particular species occur in areas of deciduous forests, in contrast to either *L. annotinum* or *L. clavatum*. If this is the case then *L. obscurum* would seem to be more tolerate of sunnier exposures than the other two species in this trial.

With just the one rhizoid present I did not know just how successful this particular sample would be in surviving the transplant. It was apparently growing in an area where there was an extensive amount of roots from vascular plants. There were many rootlets that seemed to be attached or surrounding the rhizomes with attached soil debris present.



Fig. 35. Lycopodiums potted up and ready for the trial.

A: *Lycopodium annotinum*. B: *Lycopodium clavatum*  
C: *Lycopodium obscurum*

By 8 September 2011, both *Lycopodium clavatum* and *L. obscurum* had died. There were lots of slugs in the pot of *L. clavatum*. There were probably slug eggs in the used mix that I had used in making up the soil mix. In my first experiment with this species I also was dealing with slugs chewing on this particular species.

I did not see any slugs in the pot of *L. obscurum*, but then I was not all that hopeful for success with this particular division. The upright branches had rotted. The

potting mix in both test plants was very wet. However, as was experienced with earlier trials, *Lycopodium annotinum* seemed to grow well despite the damp to wet mix. I punched a few more holes in the bottom of its pot and set the pot upon an inverted tray so that water would drain out and not pool around the base.



Fig. 36. *Lycopodium annotinum*, 14 September 2011.  
(The only survivor, so far, of the trial!)

Presently, this plant sits in shade except for very late afternoon when some sun hits it for about 40 minutes. I have the plant covered by a homemade plastic dome that is open at the base where dry air can enter. Despite the case the plant has suffered some desiccation on those portions of the branches that were growing over the lip of the pot in the September 2011 image. (Fig. 36)

Currently my plans for this surviving plant is to de-pot it in April 2012 and re-pot using lycopodium mix No.5. I have acquired some of the ingredients for the mix and will be drying out the old mix from the failed trials. With screening and washing of the old mixes I hope to have one that will be free of seeds from vascular plants and any snail or slug eggs. I may construct a humidity chamber to keep the plant in (though this is just a notion at the moment.). Now to avoid the temptation to try another trial! □



Fig. 37. Detail of *Diphasiastrum digitatum*.

### References:-

Phillips, N. (1983). *Root Book: How To Plant Wildflowers*. Little Bridge Pub. Co.

## Book Review

Fern Fever. By Sarah Whittingham. Published by Frances Lincoln, 2012.

Hardback, 256 pp. ISBN 978-0-7112-3070-5

This long awaited book was published on 2nd February 2012, and is available through BPS booksales at a very favourable price.

The author, Sarah Whittingham, describes herself as an architectural historian. In her guise as 'Miss Frond' she has been amassing material on ferns since at least the 1990s. She admits that she is neither a botanist nor a horticulturalist, but has a fascination for the Victorian passion for ferns that was fuelled by a visit to Ascog Hall, that magnificent sunken fernery on the Isle of Bute.

Sarah is well known to the BPS The society gave the author a grant from the Centenary Fund in 2008 and several members of the BPS have assisted her in amassing material, information and facts for this book. Her previous small publication *A Victorian Fern Craze* (2009) was received with enthusiasm by fern lovers. It can now be regarded as a taster for the real event.

This book is much bigger (287 x 230mm) and goes into far greater detail. It is lavishly illustrated with over 150 images in both colour and black and white. Many of the illustrations appeared in her previous book but here they are displayed larger, many are full page. The vast majority of the illustrations are by the author or from her collection and clearly demonstrate how extensive her research has been.

The cover (Fig.1) is an adaptation of *Facts and Fancies About Ferns* by the BPS member J.G. Newsham (c1876) and is a fitting introduction to all that is between the covers.

The extensive content covers the obsession of Pteridomania from the cradle to the grave. Sarah Whittingham traces the horticultural and social history at the onset of 'fern fever' and shows its development in literature, decorative arts and ferneries around the world.

Fern nurseries from that age are shown to have sold many ferns that are today considered rarities because of the overcollecting that took place.(Fig. 3)

Throughout the book are examples of the use of ferns in the decorative arts from delicate lace, furniture, (Fig.4) household items (Fig.2) and even gravestones.

Ferneries, both in the UK and abroad, are lavishly illustrated and whilst many have since, sadly, disappeared it is hoped that those remaining will continue.

The select bibliography runs to 10 pages, conveniently split into contemporary (pre- 1939) and modern (post 1939) works, and the 6 pages of references show just how thorough the research for this book has been.

At 256 pages this must be the definitive work on Pteridomania. The fern enthusiast will find that every facet of the obsession has been explored, illustrated and described in a clear and comprehensive manner, whilst the uninitiated cannot help but be fascinated by the extent to which this 'fever' gripped the nation. The craze even spread to the New World and many ferneries from New Zealand, Australia and America are featured, showing how these countries were influenced.

I suspect that Sarah herself is gripped by a modern version of 'fern fever'. At this year's AGM of the BPS she was proudly wearing an antique brooch that she found whilst lecturing in the Lake District (Fig. 5)

*Fern Fever* is indeed a ravishing book about a fascinating subject that is extremely well researched and written. Make room in your bookcase for it now!

Alec Greening

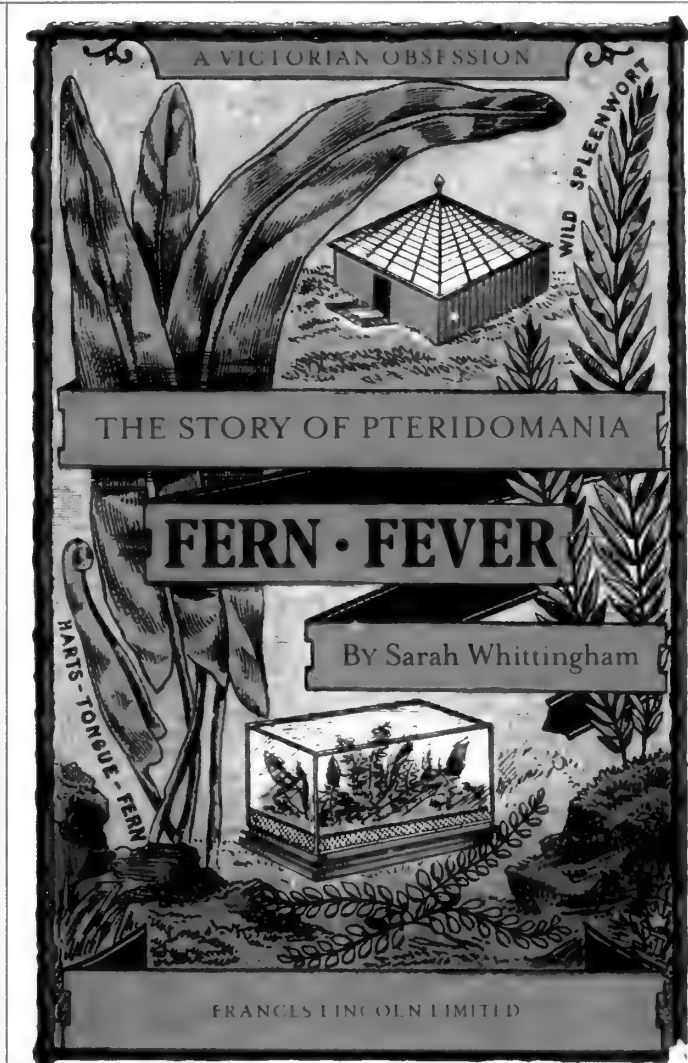


Fig. 1. The front cover adapted from *Facts and Fancies About Ferns* by J.G. Newsham (c1876)



Fig. 2. Ridgways dinner service 'Maiden Hair Fern' design (1880s)



Fig. 3. 1880's advert for a fern nursery. Edmund Gill's Victoria Fernery in Lynton, North Devon.



Fig. 4. Coalbrookdale cast iron bench 'Fern and Blackberry' depicts *Pteridium aquilinum*.



Fig. 5. Antique fern brooch. By a strange coincidence the writing says 'Sarah'!

# Fern Hunting in China

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Would you believe me if I told you that this fern-hunting trip came about because of my interest in Phasmids? Let me explain. One of my jobs at Manchester Museum involved preparing, pinning and identifying a huge jar full of stick insects which were preserved in alcohol. These were collected during expeditions to North Vietnam in 1998 and 1999 by BPS member Mike Hill. The first part of the task was easy and actually really quite enjoyable – or was it the alcohol? The second part, however, that of identifying them, has caused me quite a few headaches. You might have noticed that many stick insects look the same! And this is not helped by the paucity of good, understandable literature to help identify them.

To this end I widened my search for books and one which came up on the radar was *The Phasmids of China* which I obtained from The Chinese Scientific Book Service. The book is in Chinese but has line drawings, reports measurements in mm using numbers I can understand and uses scientific names and also newly described species have English abstracts. So I was quite pleased to have this book. It came from China beautifully wrapped with pink raffia bows. As a result I was put on the CSBS email list. One day a flier for *The Ferns of Yunnan* dropped in my inbox. I couldn't wait for the slow boat and so ordered the book (at some cost!) via airmail. The book has hundreds of colour photos with Chinese and English captions (Fig.1). I was hooked and knew I wanted to go there, but how? So I wrote to the main author of the book, Prof. Xiao Cheng at the Kunming Institute of Botany (KIB) essentially waxing



Fig. 2. Left to right: 2 forest guides; Mr Gardener; Klaus Mehlretter; Patrick Acock; Tom Ranker; Xiao Cheng; Tim Pyner; Roland Ennos; Alison Evans; Martin Rickard; Yvonne Golding; Michael Hayward; Paul Ripley and Roger Golding.

lyrical about the book and asking lots of questions about how easy, or not, a trip to Yunnan to see some of these ferns might be.

I did some research about KIB and I was heartened to see that there had already been botanical excursions organised by the institute for groups from RBG Kew and RBG Edinburgh. Looking back further, I discovered that Roy Lancaster had done a wide-ranging botanical tour of S.W. China with members of KIB back in the 1980s and, of course, going back much further opens up a whole rich tradition of plant hunting in China. One of the most famous (and the greatest of these early plant hunters in my opinion) was E.H.(Chinese) Wilson, who brought back to Britain hundreds of plants for cultivation, transporting them in Wardian cases, which many of us grow in our gardens today.

Given that there is a long tradition of plant hunting in China, why not ferns and why not by members of The British Pteridological Society? The difference nowadays, of course, is that we hunt for ferns, admire and photograph them, but do not collect them.

That is the background for our expedition. Prof Cheng was very encouraging. He organised an itinerary to make the best use of our two weeks, enabling us to see as many ferns in as many varied regions as possible. He reconnoitred our excursion in August 2010 and in the following month 11 BPS members set off for China.

Why is Yunnan so botanically rich? The Province is situated in the South West of China, bordering Vietnam; Laos and Burma in the south and west and Tibet in the north west. It has an extremely complex natural environment, with an average altitude of 2000m. The landforms include high mountains reaching up to 5000m, deep valleys, plateaus and Karst. The vegetation ranges from tropical forests in the south, subtropical broad leaved woodland, temperate broad-leaved woodland, coniferous woodland, grassy plains, alpine montane vegetation and with over 600 rivers and 40 lakes there is no shortage of water in Yunnan. There are nearly 14,000 species of angiosperms and almost 1000 species of ferns and lycophytes in Yunnan Province. So that's why we wanted to go there.

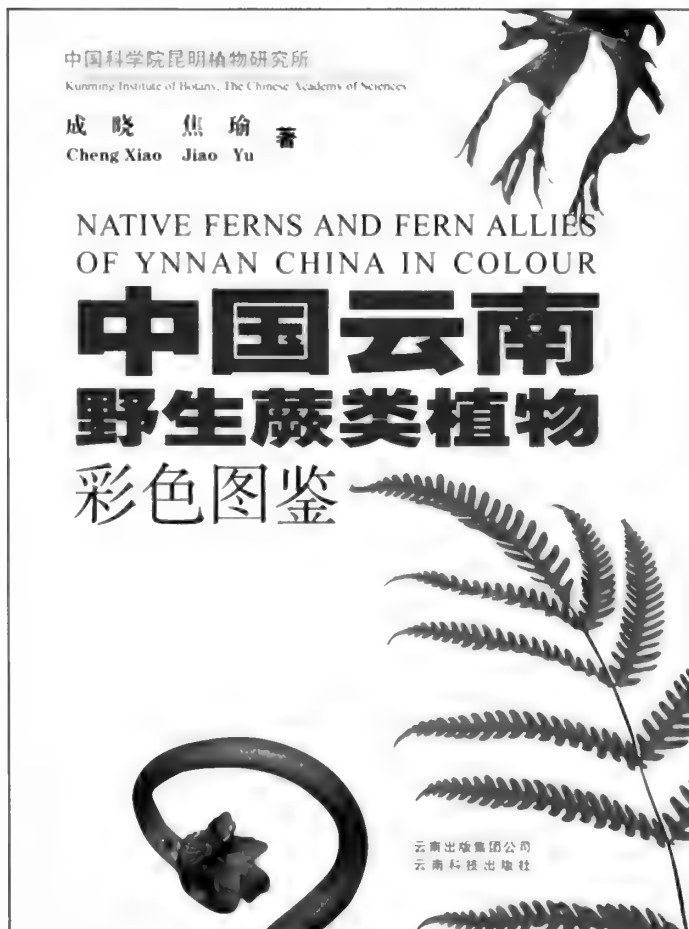


Fig. 1. The cover of '*Native Ferns and Fern Allies of Yunnan*' that inspired this trip to China.



## Fern Hunting in China

We flew into Kunming, which is the capital city of Yunnan Province. It lies around 2000m and is often called 'The city of Eternal Spring'. Although now a large sprawling modern city, the old capital of Yunnan Fu is around 2000 years old. We first set off south to the town of Hekou on the Vietnamese border, where we explored some tropical forests in and around the Gulin Qing National Park. After this we headed north east to the town of Ping Bian, where we explored the foothills of the Daweishan Mountains, around 1600m and the species-rich forest of the Daweishan Natural Reserve. From Ping Bian we drove north again to see some fantastic karst limestone scenery at the world-famous stone forest at Shi Lin. From here we drove west across the Kunming plateau past rice fields and fruit-growing areas and through the famous dinosaur valley, where many rare and new dinosaur species have been discovered. In the west we stayed in the town of Bin Chuan and climbed the sacred Jizu Shan mountain before finally ending up in the beautiful ancient town of Dali for a spot of sightseeing and a spectacular trip on the cable car up into the Cang Shan mountains. The last stage of our journey took us due east back to Kunming, where we spent some time sight seeing, visiting the museum of ethnic minorities and walking up into the Western Hills above Kunming.

Of the 550 or so species described in Native Ferns and Fern Allies of Yunnan, we recognised around 250 taxa. I found the diversity quite staggering and there is no way that I can describe or list them all so I will instead tell you about some of them, highlighting some ancient, some endemic and some favourite ferns picked out by members of our expedition. I will leave it up to you to try and match the fern to the person, but first I must mention the lycophytes!

### Curious clubmosses:

Considering how dominant and huge clubmosses became in the geological past (*Lepidodendron* reached 45m!), present-day species could be considered a disappointment but maybe that is part of their appeal. They separated from ferns and seed-bearing plants around 360 million years ago and today tend to be smallish creeping plants. In Yunnan we found only 3 species but we could easily have overlooked others, being distracted by the large and stunning ferns which surrounded us: *Huperzia phlegmaria* (Fig.3); *Lycopodium casuarinoides* and *L. japonicum*.



Fig. 3. *Huperzia phlegmaria*



Fig. 4. *Selaginella willdenowii*, an introduced, iridescent species



Fig. 5. *Selaginella pulvinata* growing in exposed limestone.

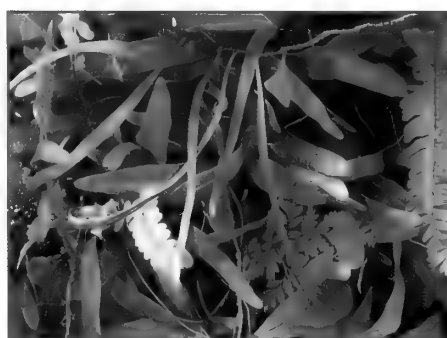


Fig. 6. *Vittaria flexuosa* an epiphytic, unfern-like fern.

### Sensational Selaginellas:

Selaginellas are always a joy to come across, especially tropical species, which are usually very beautiful. We identified 6 of the 9 native taxa described in Cheng and Jiao and one introduced, though stunning, iridescent species, *S. willdenowii* (Fig.4), which crept around in deep shade under rubber plantations down near the Vietnamese border. This is sometimes called the peacock fern because of the fantastic blue colour, but this is not derived from any pigment. It is the result of light interference between two layers of epidermal cells; in green selaginellas there is just one layer of cells. It is complex, but the suggested function is that this allows for greater absorption of light, which is necessary for photosynthesis in deep shade. Another *Selaginella* species worthy of note was *S. pulvinata* (Fig. 5) which, in complete contrast, was small, green and compact growing on quite exposed limestone in the Western Hills above Kunming.

### Whimsical Whisk ferns:

One of the first unfern-like ferns we saw on arriving in the tropical south was *Psilotum nudum*, growing near the base of an ornamental palm growing in the streets of Hekou. This strange fern, which is closely related to the adder's tongue family and the horsetails, essentially looks like photosynthetic stems with sporing nodules. It usually grows on tree ferns and palms and in my greenhouse often pops up in pots. I last saw this plant in the wild in La Reunion, where it grew out of rock crevices. Along with the *Psilotum*, we found many other epiphytic species of fern growing on these same trees, including the exquisite and tiny *Lemmaphyllum microphyllum* and the unusual *Vittaria flexuosa* (Fig.6). These served to wet our appetite for what was to come.

### Exciting Equisetums:

Well some find them so and, like the clubmosses, you have to admire their dominant past and the fascinating DNA evidence that shows they are closely aligned with ferns and in fact are ferns! We saw only two species: *E. debile*, spotted by a pond in the Stone Forest at Shi Lin, and fertile *E. diffusum* in a fabulous location by a stream in the Cang Shan mountains above Dali.

### Prehistoric Fabulous Ferns:

Apart from the diversity of topography, landform and climate already mentioned, much of the botanical diversity of Yunnan is due to the ancient geological origin and the fact that SW China was not directly

## Fern Hunting in China

invaded by glaciers during the Ice Age. Thus, some representatives of ancient families have remained and many more have evolved. As far back as the Tertiary period of the Mesozoic (around 180 million years ago), Yunnan had already risen above sea level, so plenty of scope for the evolution of dinosaurs and vascular plants. Ferns and Lycophytes are the most ancient living vascular plants and those present in the region account for 50% of the total number of species in the whole of China!

The area above the unexciting town of Ping Bian, in the foothills of the Daweishan mountains, proved to be a particularly rich area for extant relatives of ancient fern groups and we were surprised to come upon our first Mesozoic representative, a single plant of the green spore-bearing Osmundaceae family, *Osmunda japonica*, in what seemed an unlikely location growing by the side of a path.

The filmy ferns, like *Osmunda*, also have green spores but in other respects are quite different. Their name derives from the translucent nature of the pinnules which between the veins are only one cell thick. The sori are arranged on the edge of the pinnules, each sorus, which is an extension of a vein, is protected by an indusium formed from modified leaf tissue. The shape of the indusia is diagnostic in distinguishing the two genera. We only saw two filmy ferns, both around Ping Bian; the epiphytic *Hymenophyllum barbatum* and the hemi-epiphyte *Vandenboschia (Trichomanes) auriculata*, which both grew in the humid forest area of the Daweishan Natural Reserve. The spores of the hemi-epiphytic *Trichomanes* germinate on the soil surface, where the gametophytes develop, but after fertilisation the rhizomes of the sporophytes proceed to make their way up tree trunks.

Next on our evolutionary journey above Ping Bian, we saw five members from the ancient group of Gleicheniales, in the family Gleicheniaceae. These were the large fronded *Diplopterigyium glaucum* and *D. laevissimum*, along with the rampant geometric *Dicranopteris ampla (splendida)* (Fig.7), *D. linearis* and *D. pedata*. Their characteristic growth of elongating leaves, enabling them to scramble across dense vegetation, has surely contributed to their success and longevity.

Now we come to what for me was the highlight of the Chinese fern flora. Along a slippery and steep path, in amongst other rampant Gleicheniales, we came across the towering palmate fronds of *Dipteris chinensis* (Fig.8), a true living fossil and survivor from the



Fig. 7. *Dicranopteris ampla (splendida)*



Fig. 8. *Dipteris chinensis*  
inset: spore pattern



Fig. 10. *Lygodium confluens*  
inset: sori detail



Fig. 11. *Gymnosphaera austroyunnanensis*



Fig. 12. *Alsophila latebrosa*

Mesozoic. Today the Dipteridaceae contain just six species in one genus (also *Cheiropleuria* is now included in Dipteridaceae), but fossil evidence suggests that in the Mesozoic the family contained six genera with around sixty species. The fronds grew above our heads and as you looked up you could see the irregular oval and sometimes sausage-shaped sori with ripe yellow spores. This was quite a moment; a step back in time.

Another ancient family, the Schizaeaceae, contain the genus *Lygodium* (though now this is included as sole member of Lygodiaceae in the Order Schizaeales). Of the scrambling and climbing *Lygodiums* we recognised 6 species, one of which, the more familiar *L. japonicum*, was growing above Ping Bian and all the others around Hekou. The *Lygodiums* also have a characteristic way of climbing; the stem is in the soil and the leaf grows by means of a twinning rachis using other plants for support and to lift their leaves into the light. Another characteristic of this group is the finger-like springing extensions on the edges of the pinnules as seen in this photo of *L. confluens* (Fig.10) growing by the roadside near the Vietnamese border.

### Terrific Tree Ferns:

The next branch of the evolutionary tree is the tree fern group. Those found in Yunnan are from the lesser-known genera of Cyatheaceae, namely *Alsophila* and *Gymnosphaera*, all seen in the tropical south. Of these the rarest was the tall endemic *G. austroyunnanensis* (Fig.11), with only 30 plants growing above Ping Bian in the foothills of the Daweishan mountains. In the forested areas we saw a fantastic stand of *A. latebrosa*, (Fig.12) which formed a clone of multiple stems. Another commonly encountered and very attractive tree fern was *G. khasyana*.

Cyatheaceae are distinguished from Dicksoniaceae by the positioning of the sori on the underside of fronds and the possession of flattened scales on the trunk and fronds rather than woolly hairs as in the Dicksonias. The only representative we saw of the Dicksoniaceae was *Cibotium barometz* (though now I understand this is in its own family, Cibotiaceae), which was commonly found in the Gulin Qing National Park around Hekou. Local people dry the rhizome of this fern for herbal medicine extracting a powder they call Gou Ji which is reputed to replenish the liver and the kidneys, strengthen the back and relieve rheumatic conditions. Perhaps we all need some of that!



Fig. 13. *Angiopteris hokouensis*



Fig. 14. *Angiopteris wangii*



Fig. 15. *Neocheiropteris palmatopedata*



Fig.16. Caterpillar found feeding on *N. palmatopedata* (above)



Fig. 17. *Lindsaea heterophylla*  
(inset - detail of sori)

**Enigmatic Endemics.**

As previously discussed, Yunnan is a unique and botanically-rich province because of its geological history, location and diversity of habitats and as such is well endowed with endemics. I have already mentioned the endemic tree fern, *G. austroyunnanensis*. Another ancient group are the large and spectacular *Angiopteris*. These, along with the Marattias, have characteristic sausage-shaped (like hot dogs!) sori arranged along the termination of the veins on the edge of the large pinnules. We saw two species in the tropics near the Vietnamese border. The endemic *A. hokouensis* (Fig.13) was easily distinguished from *A. wangii* (Fig.14) by examination of the stipe. That of the endemic *A. hokouensis* was wrinkled and knobby, whereas that of *A. wangii* was smooth, with a grooved upper surface. I wish it was always this simple to distinguish closely related species.

Another related sub genus that of *Archangiopteris*, also occurred in the southern tropics of Yunnan. (taxonomy is contentious so please do not write in!) These are not as spectacular as *Angiopteris*, with a creeping rhizome and a different arrangement of sori, which are located along the branched veins and situated in the middle of the underside of the pinnules. In terms of morphology, this arrangement seems to me to be different enough to put them in another group but, as we know DNA can throw up some surprising results for example horsetails are in fact ferns and morphologically they are poles apart; I rest my case. So, we saw two examples: *Archangiopteris subrotundata* and *A. hokouensis*, which is another endemic found around Hekou.

A fern we were honoured to see on the last day of our Chinese adventure was *Neocheiropteris palmatopedata* (Fig.15) in broad-leaved, evergreen forests in the Western Hills above Kunming. This is a stunner of a fern, with its huge palmate fronds somewhat resembling a giant hellebore. In some ways it resembles *Dipteris* but belongs to Polypodiaceae and so is a relatively modern fern. We were lucky enough to find it fertile so we could photograph its almost linear sori. This fern is threatened in the wild and is included in the IUCN Red Data list of endangered plants. We think it will survive in this location as long as this attractive caterpillar finds other plants to eat! (Fig.16)

**Favourite Ferns:**

Now any kind of order goes out of the window as we move onto the eclectic mix of ferns that we particularly liked. I have already mentioned



Fig. 18. *Sphenomeris chinensis*



Fig. 19. *Pteris setulosocostulata*



Fig. 20. *Pteris longipes*



Fig. 21. *Acrophorus stipellatus*

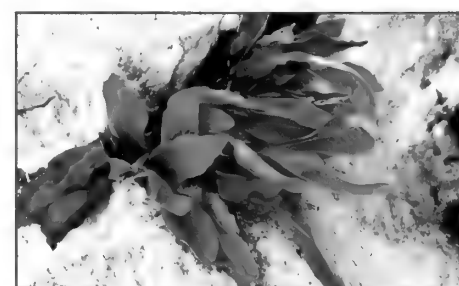


Fig. 22. *Pyrrosia sheareri*



some. The *Lindsaeas* were a feature and we recognised 5 taxa of these delightful little ferns around Hekou and Ping Bian. (Fig.17) The delicate *Sphenomeris chinensis* (Fig.18) was commonly encountered in the same area. We saw around 14 *Pteris* species and one of the favourites and probably most beautiful was *P. setulosocostulata* (Fig. 19), growing in the Daweishan mountains, with its delicate reddish-pink rachis. Other favourites were *P. longipes* (Fig.20) and *P. excelsa* around Ping Bian and growing in the Cang Shan mountains above Dali was the magnificent *P. wallichiana*, which was easy to identify and difficult to miss; it was huge! But size isn't everything! Small ferns such as the silver-backed and rusty-backed *Aleuritopteris* (*Cheilanthes*) species, seen growing on limestone rocks and town walls and roofs around Dali, were a delight (Fig.23).

One of the features of tropical ferns is that very often they do not look like ferns as we know them from temperate zones. One beautiful example *Dictyocline* (*Cyclosorus*) *griffithii*, growing under the tree ferns around Ping Bian, could easily be confused with an angiosperm, as the veining on the fronds looks very similar to the surrounding vegetation. It is only when you turn the leaf over to reveal the sori beneath that it convincingly becomes another fern to add to the list.

It is always comforting to be able to identify the only member of a fern genus represented in the area. In Britain we just have *Blechnum spicant* and similarly in Yunnan there is only *Blechnum orientale*, which we saw in just one site above Ping Bian, where the dimorphic fronds reached two metres. In the Daweishan forests we came across *Acrorumohra diffracta* (Fig.24), with highly dissected pinnae arranged along a zig zag rachis. It is always a joy when you come across a fern with coloured foliage; the young fronds of *Acrophorus stipellatus* (Fig.21) were a most delicate pink. One of our team plumped for the Taiwanese *Pleocnemia submembranacea*, which grew under the rubber plantations near the Vietnamese border. The large green, finely divided but tough fronds, perched on tall, black stipites, looked wonderful beneath the dark canopy of rubber trees.

Of the 14 species of *Pyrrhosia* listed in Cheng and Jiao we saw 8, which was not bad. These ranged from the small and pretty *P. nuda*, found growing up a tree by the side of the road near Hekou, to the thick and leathery *P. shearereri* (Fig. 22), growing out of limestone crevices in the Stone Forest by Shi Lin.



Fig. 23. *Aleuritopteris* (*Cheilanthes*) species - a delightful fern.



Fig. 24. *Acrorumohra diffracta*



Fig. 25. *Polystichum tsussimense*



Fig. 26. *Cyrtomium caryotideum*



Fig. 27. *Dryopteris wallichiana*

### Ferns to grow in your garden:

It is always a thrill to see plants which you may grow in your garden in their natural habitat. Many ferns from the temperate forests of Yunnan are suitable to grow in our gardens in the UK. In the Western hills above Kunming we came across *Polystichum tsussimense* (Fig.25), though we did not recognise it at first as it grew so large. Other Chinese *Polystichum*s also make good garden specimens such as *P. makinoi*, which we spotted on Jizu Shan above Ping Bian, and *P. xiphophyllum*. A disappointment was not to see the beautiful *Polystichum acanthophyllum*, which grows at high altitude in dark coniferous forests in Yunnan; this surely would be hardy enough to grow in my Buxton garden! We are already familiar with *Athyrium niponicum*, which grew in the Western Hills above Kunming, but what about *A. dissitifolium* which grew on Jizu Shan; this caused some confusion when Prof Cheng pointed it out! We frequently spotted *Cyrtomium caryotideum* (Fig.26) and *C. fortunei* and in one site *C. hookerianum*. We are all familiar with *Dryopteris wallichiana* (Fig.27) and *D. cycadina*, which are both on our list, but what about *D. panda* for a Chinese fern to try!

### Conclusion:

For all of us this was our first trip to China. Our hosts Prof. Cheng; our driver Odd Job (don't ask!); Kunming Institute staff Dr. DNA and Mr Gardener (that's another story) did everything possible to make it a most memorable experience. We found the Chinese people friendly and entertaining. We enjoyed the lavish Chinese food and the beer (some enjoyed the rice wine too!). The climate was pleasant and the ferns were fantastic. Our expedition to Yunnan was both a rich cultural and botanical experience and I hope the BPS will consider offering a trip to China so that others may enjoy it too. □

### Further reading:-

- Cheng Xiao & Jiao Yu (2007)** *Native Ferns and Fern Allies of Yunnan China in Colour*. Kunming Institute of Botany. The Chinese Academy of Sciences.  
**Moran, Robbin C. (2004)** *A Natural History of Ferns*. Timber Press.  
**Watson, Joan (2010)** Pteridophytes in the Mesozoic. *Pteridologist* 5(3)

I am grateful to Tim Pyner who read this script, corrected my spelling and brought some of the taxonomy up to date. A full taxa list can be obtained from Yvonne Golding secretary@ebps.org.uk

# Stamp collecting

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The number of ferns and lycophytes recorded as native in the UK varies according to who is compiling the list. Is it a species or a subspecies? Is it native or not? Did it ever occur in the first place?! The current BPS Recording Form lists 76 species. Number of hybrids – unspecified!

Over my time fern hunting I have set out to try and find most of the British species, sadly I have not always been successful! It set me wondering if anyone has succeeded – at least with those species still known to occur? After making some enquiries I suspect no one has actually seen all the currently recorded British species in the wild in Britain. If you know different please let me know.

So what are the problems?

With some species sites are kept secret, for example *Trichomanes speciosum*, although any seriously interested member of the BPS could fairly easily find someone who knows at least one site – all you need to do is convince any informant that you would in no way harm the fern, nor publish details of where it grows. Some rarities, like the two native species of *Woodsia*, grow in well recorded sites, but in their case it is like looking for a needle in a haystack, often with the haystack built on a cliff! Personally I do not believe you can ever say a *woodsia* is definitely not on a given mountain just because you cannot find it.

Some rarities are, in fact, not rare if you go to the right place. *Dryopteris cristata* which is common in certain Norfolk fens is a good example, also *Adiantum capillus-veneris* is locally plentiful on some sea cliffs in South Wales and parts of Cornwall, or even *Cystopteris montana* which is locally, fairly common on at least one Scottish mountain.

Certainly these are some of the most sought after ferns in the UK, and just for that reason virtually everyone with more than a few year's interest in our native ferns has probably seen them all given the excellent series of meetings organised by the BPS. The unseen species are usually relatively 'boring'!

How many readers of this note have ever seen *Equisetum ramosissimum*? I have not, at least not in the UK. Many years ago I travelled many miles up to the then only known site on the Lincolnshire coast. It is on made up land by the side of the estuary of the River Humber. To say it is a god forsaken spot would not be too far from the truth! There is a huge landfill site adjacent and bits of rubbish are blowing about everywhere, as you will have gathered I did not find the horsetail and I can add I have no plans to return to have another look!

More attractive and growing in a more pleasant site is *Cystopteris dickieana*. The horticulturally recognised form only grows in a couple of sea caves just south of Aberdeen. I went there many years ago. It was a hundred mile plus

detour but I did not see the fern. I saw the cave, but the tide was in!! I could not hang around to wait for it to go out, another very frustrating non-sighting!

Although relegated to lycophytes these days I still harbour an affection for clubmosses (much nicer than horsetails!). Two or three years ago I climbed Geal-charn near Aviemore to see *Diphasiastrum x issleri*. Surprise, surprise I found it! What I did not know at the time, but found out a few months later, was that *Lycopodium lagopus* grew less than 100 metres from where I'd been hunting the *Diphasiastrum*! Whether or not I'll ever struggle up that mountain again remains to be seen!!

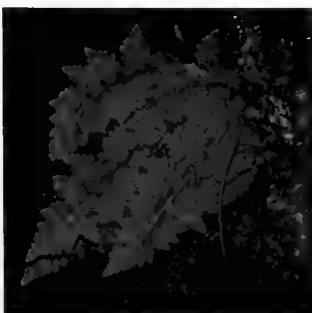
What about the Channel Island rarities? I was fortunate to be shown *Anogramma leptophylla* on Jersey, but I never got to Guernsey to see *Ophioglossum lusitanicum* or *Isoetes hystrix* (another lycophyte!). There is only supposed to be a square foot of the *Ophioglossum* so I cannot imagine I would ever have found it anyway. The *Isoetes* is fortunately very common on parts of the Lizard peninsula, and I have seen it there. I was also fortunate to find the *Ophioglossum* on La Palma – but that is not the UK and does not count!!

What about other 'extinct species'? Sporadically odd species of *Botrychium* have been recorded, but no undoubted herbarium specimens survive. One, *Botrychium matricarifolium*, was last reported circa 1885. So it has not been seen for at least 100 years. I think I am pretty safe in saying no one living can tick it off! At around the same time another species *B.lanceolatum* was recorded, it too has not apparently been seen since. If these species persist it is surprising there have been no recent records. They grow in short turf – the type of habitat general botanists, not pteridologists, love to examine, but I'm sure such botanists would spot something as different as this species. There are other apparently extinct species preserved as herbarium specimens but I think all these count as extinct stamps!

I've excluded the *Dryopteris affinis* complex from this brief survey because I cannot reliably differentiate between the species – and very few can! After about 45 years of fern hunting I therefore admit to 4 stamps not in my album: *Equisetum ramosissimum*, *Cystopteris dickieana*, *Lycopodium lagopus* and *Ophioglossum lusitanicum*. I'm beginning to doubt I'll ever see them! Never mind, I have had the great pleasure of recording all the other British ferns. Perhaps that was treat enough!

I wonder if anyone can actually claim to have all the 'stamps'? I would be delighted to hear. I would also be interested to know which species are generally the most elusive. I suspect my four non-shows will feature in many lists, but what other species might be added? □

## The ones that got away!



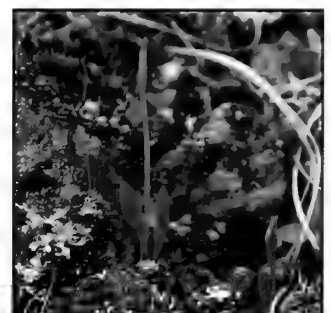
*Cystopteris dickieana*  
photo: Roger Golding



*Equisetum ramosissimum*  
photo: Roger Golding



*Lycopodium lagopus*  
photo: Roger Golding



*Ophioglossum lusitanicum*  
photo: Michael Hayward

# Dreaming of Ferns

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I had never meant to get involved in plants. It just wasn't on the agenda. A bit of a towny, I fear, schooled in Cardiff and more interested in music than moss, and girls than geraniums. But as so often is the case it all came about a bit by chance or a mistake.

After leaving school at the tender age of 17, I lived in the surreal world of death for 8½ years. I was the youngest funeral director in the country and conducted funerals at the tender age of 18 for 22 SAS Regiment in Hereford. After arranging and conducting 2,654 funerals, I moved up to head office at the age of 24 and worked for the exquisitely eccentric chairman as his personal assistant for two years. By now I had married and was always boring my wife with how terrible the service was at cafes when we went out. In true challenging fashion, she told me that if I could do better to do it myself, so one day in 1990 I decided to do just that.

Of course the world of restaurants was a total change and indeed a bit of a nightmare for the first two years, but one day we woke up to the fact that the renowned food critic Egon Ronay had just declared that we at Hudson's were in fact the best Tea House in the whole of the UK. Rather a moment and my wife certainly approved.

We sold Hudson's after many happy and mostly successful years. Meeting and greeting the public was what I was good at and thoroughly enjoyed. It was a wrench saying goodbye to all that, but as one door closes, another opens and my parents-in-law were getting to the end of their particular road with Bowden Hostas. Another challenge was looming.

We purchased the hosta business in 2004 and slowly took it on a journey towards excellence and fun (for me it has to be fun, otherwise there is no point to it). Along the way, so far, we have collected 7 Chelsea Flower Show Gold Medals and have been awarded a Royal Warrant to HRH The Prince Of Wales for Hostas. As one of my young staff would say "Not too shabby then". We in the main employed all the techniques I had learnt in funerals (attention to detail and keeping cool under pressure) and restaurants. (pretty much the same but making peoples day with a delivery of food and service). All the time I was learning and people were so helpful.

I had never liked Heucharas, one advisor told me that the market was hot in heucharas and if you wanted to make a million I should diversify into that. Well that's not what it is all about for a Penrose. No, you have to be in love with the product, it is essential if anything is to flourish. And that was where my love affair with ferns began.

We had used a *Polystichum* on a hosta display at Chelsea once and what a faff that was in trying to spell the label correctly! It put me off a bit, but I was smitten by just that one glance and I knew I would never look at a fern again with anything but love in my eyes.

And then I phoned Ben Kettle at World of Ferns one day to see what specimens he might have for a show I was thinking of doing at Gardening Scotland.

Finding the 7½ litre *Arachniodes rhomboidea* on a several acre nursery is not a form of entertainment I can recommend. Add to this the wind and rain, the tiredness of the journey from Harrogate and it just made me long for my bed, but I had rather cleverly, I thought booked up a very lovely bed and breakfast at Anglesey and I kept that in mind as the hunt wore on. (Cleifiog if you're interested).

Martin Rickard had sold the business in 2002 and Dick

Hayward, an old friend and customer took it on. He ran it for a number of years, moving the nursery to a wild, but gorgeous beauty spot near Bangor. Initially he had a couple of helpers and then latterly ran it in partnership with Ben Kettle and Jenny Jones. In time, Dick retired and Ben and Jenny continued the business which had been renamed 'World Of Ferns'. When Ben and Jenny (not Ben and Jerry as my three little children keep calling them) decided to call it a day, I was interested to see if we could continue the business.

Of course Dick was heroic and magnificent and so supportive. He was thrilled that the stock was being transferred and the name continuing, I was desperately trying to work out plant counts to see if it would all fit in the transport I had rather hastily organised.



Fig. 1. Dick, Judy & Tim discuss fern strategy at Gardening Scotland

Martin Rickard has also been incredible. Such a humble source of knowledge, facts and wisdom. People like Martin and Dick are rarities. They are so crucial to the success of this business.

When working out what number of ferns we might need to grow in the first year we estimated carefully and perhaps a little conservatively. In the event over the first twelve months we will have tripled the sales we forecast and this was without even having them in the spring catalogue. So it all been really easy then? No, not at all. Success comes from utter hard graft, with a plan and a focus on where you really want to be in a year's time. We are already on that road and are thrilled to be planning with confidence for the next 12 months.



Fig. 2. The final display for World of Ferns at Gardening Scotland



## Dreaming of Ferns

We had a superb trip to Holland to see an old contact of Martin's, but someone that he had never met! The stock that we saw and the quality and quantity of it took our breath away, I will risk incurring Martin's wrath by stating very simply that seeing him in operation at there was like seeing a little boy in a sweet shop....so excited and why not? The tree ferns we were looking at were incredible, 4 metre high *Cyathea medullaris*, gorgeous *Cyathea tomentosissima*, it was an education like no other (and we managed to squeeze in a trip to the botanical garden at Leiden) and as I dropped Martin back to the airport to catch his flight, there was a definite twinkle in his eye!

So how has it worked, practically, with the mail order side? Well, we usually despatch a 48 page hosta only catalogue. This year we have ramped it up to an 80 page catalogue with Hostas, ferns and grasses including a few fantastic bamboos. There was a lot of extra work, but it will be worth it. Full colour, the product drips luxury and hopefully after many proof readings, accuracy! We have a double page spread devoted to tree ferns and will be sending plants out to our 40,000 customers in the early February. For the first time this year, we are offering planting plans and expect to be despatching ferns far and wide through the post. No order will ever be too small for us!

We will be also displaying ferns and tree ferns at the following shows this year (2012). Malvern Spring Gardening Show, Chelsea Flower Show, Gardening Scotland, Hampton Court Palace Flower Show.

Chelsea is expected to be our highlight, a stand designed and built by Martin and many, many orders anticipated, it's a tower of logistical planning, but always worth it. We are expecting some excellent publicity for ferns on a world stage. One of the ferns we will have for sale is the normally

difficult to obtain *Polystichum setiferum* 'Bevis'. My father-in-law, Roger Bowden, had a massive specimen in his garden that came to Scotland with us for a show and we felt that since it had been discovered by Mr Bevis a Devon hedge layer, then we really should stock it, plus I like it, which always helps the sales. We will also have some ferns that aren't quite hardy, but nevertheless beautiful.

And of course we will be selling tree ferns such as *Cyathea dealbata*, *C. medullaris*, *C. tomentosissima*, *Dicksonia sellowiana*, and other ferns such as *Polystichum vestitum*. They will range from £45 for a splendid 5 litre specimen with full 4 foot fronds to several hundred pounds for the larger trunked specimens. We aim to please, so will be working hard to get it right for our many customers.

A confession though. I always enjoyed English at school, was always top in spelling, but I am struggling with the Latin (didn't go to a posh school you see). But I am trying my best, although *filix* has come back a number of times to *felix* and then back to *filix* and then unfortunately got back to *felix* again. Martin has been doing his nut (in a nice way you understand). But try I will continue to do. I am very trying.

We have such high hopes for next year. Reach for the stars I think is the comment! We want to be known for selling the finest ferns available and for having stocks of the normally unattainable. With Martin and Dick at our side how can we fail?

We love ferns, they go so well with Hostas and want to be the finest, the best supplier in the country and there's nothing wrong with aiming for that is there?

I'm with T.E. Lawrence who said:-

"All men dream, but not equally. Those who dream by night in the dusty recesses of their mind, wake in the day to find it was vanity; but the dreamers of the day are dangerous men. For they may act on their dreams with open eyes to make them possible"



Fig. 3. World of Ferns at BBC Gardeners World



Fig. 4. *Cyathea medullaris*

# Variation in *Asplenium scolopendrium*

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Having just read the article in the 2011 *Pteridologist* on variation in *Asplenium scolopendrium* in the wild we set off for a few days holiday with family and friends in Normandy where I took a little time out to search a nearby lane. I was informed that the lane was called Valvachet that is in the village of Quettehou. This was within 10 meters of the house and the furthest I walked down the lane was perhaps 1000 meters. I already knew that many ferns were very happy in this environment that is much like that of the south west of the UK. I very quickly came upon some variation in *Asplenium scolopendrium* where the tips of the fronds showed some sign of mutation, basically a bifid terminal branching. (Fig. 1.)



Fig. 1. *Asplenium scolopendrium* with bifid terminal branching

There was one plant that had a more extreme version of this with slightly more branching but still only the terminal part of the frond. (Fig. 2.)



Fig. 2. Extreme bifid terminal branching

The vast majority of them were more or less typical with slight undulation in some. The specimen in Fig. 3. was the one with the most undulate fronds and they were still fertile. *Polypodium vulgare* was very common but more so on walls than amongst other ferns. (Fig. 4). In places *Polystichum setiferum* was very prolific especially where the banks were near vertical. (Figs. 5 & 6.)



Fig. 3. *Asplenium scolopendrium* 'Undulatum Group'



Fig. 4. *Polypodium vulgare*



Fig. 5. *Polystichum setiferum*

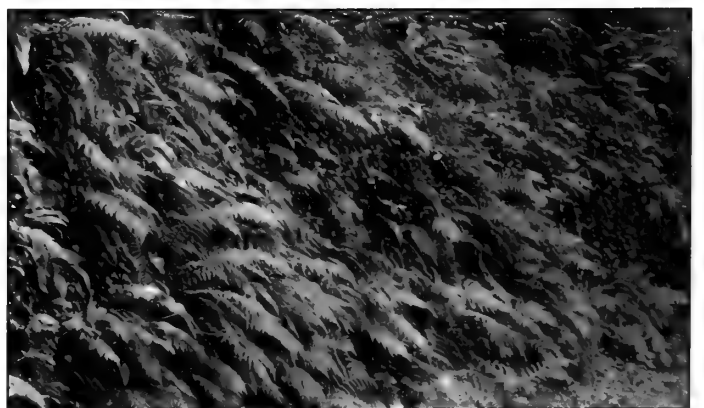


Fig. 6. The prolific growth of *Polystichum setiferum* on the near vertical banks

## Variation in *Asplenium scolopendrium*

On returning home I looked at my cultivated forms of *Asplenium scolopendrium* and realised that the distinct crispum form that was a gift from Christopher Lloyd many years ago had produced a mutation. I now had three clumps which were all divisions from the same clone but one of them, and only one, had produced the same division at the end of the frond but on the whole clump! (Figs. 7 & 8.)

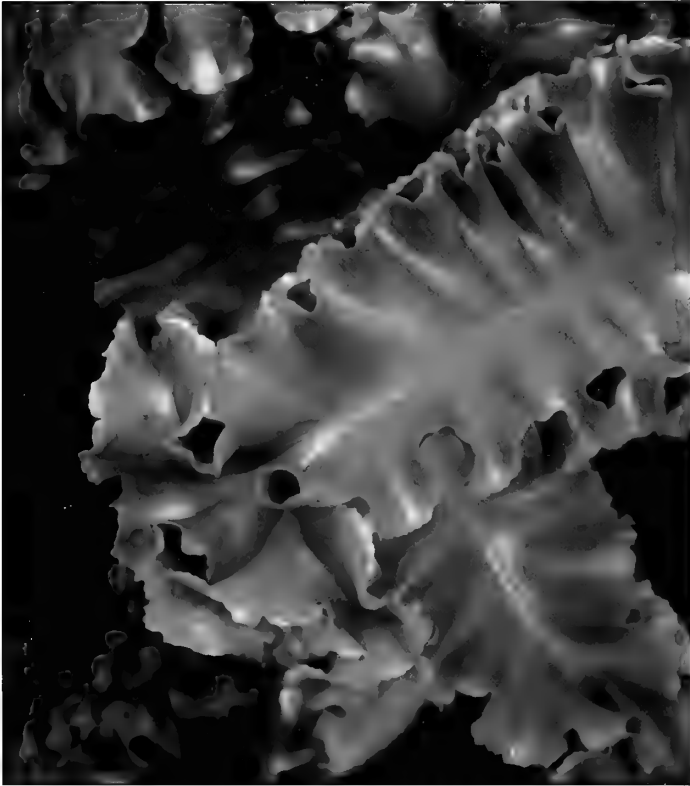


Fig. 7. Close up of the development of the frond tip occurring on *Asplenium scolopendrium* 'Crispum group'



Fig. 8. The only division out of 3 plants to show the development of the frond tip.

## BEST IN SHOW

The Barbados Horticultural Society Annual Flower and Garden Show was held at their headquarters near Christchurch on January 28th and 29th this year.

This society exhibits every year at Chelsea Flower Show where they consistently win gold awards for their displays.

I was attracted to the 'FERNS, FOLIAGE AND FLOWERING PLANTS' section where I expected to see a display of typical Caribbean ferns.

I was stunned when I saw this *Asplenium nidus* with fronds over 2 metres tall! What a monster. Every frond was in perfect condition with no sign of damage at all. It was growing in an enormous pot and took pride of place in the centre of the display area.

Looking closely at the rosette I realised that this fern had not only won the section prize but had also been awarded 'Best in Show' - no wonder.

I later learnt that this fern was over 40 years old and whilst it regularly wins a gold award in its section this was the first time that it had won 'Best in Show'. Apparently it takes 4 men to lift the pot and a very large pick-up van to transport this fern.

AEG





# The Case for Filmy Ferns

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We have always had an interest in growing filmy ferns, but had never managed to get the conditions quite right. My husband, Dwayne, had 'souvenired' plenty of lovely specimens, only to see them drop dead in double quick time on our misted propagation benches.

"Dead Easy!" said Martin Rickard from the BPS. "Just build yourself a glass case, and make sure you can keep the humidity under control."

So, off we went to Revolve to purchase some second hand glass windows (\$30), and then to Bunnings (hardware shop) to buy a cheap glass cutter (\$15). We also purchased some aluminum angle to do the edges ((\$30). Hmm. Many bits of broken glass later, we had a basic case, minus a back. Rather than buy more windows to experiment with, we decided to purchase a single piece of glass to complete the case (\$50). The tank, once constructed, measured 143cm long by 43cm wide by 58 cm high.



Fig. 1. The case during construction.

To support the base, we initially stuck strips of cork to the glass. However, we thought better of this, and instead bought some pre-packaged cork tiles which we cut to fit



Fig. 2. The completed case

and stuck on the base (after first routing them to account for the aluminum edging). The cost of these two packets was \$13.50.

We had intended to purchase a piece of perspex for the lid of the case, but the guy from the glass shop recommended three pieces of glass, instead, one with a handle, which cost a further (\$60). Dwayne 'whipped up' the surrounds for the lid, on which the three pieces slide, out of some of the window edges we had left over.

Martin advised us strongly to test for water holding capacity (or at the very least to put the tank on a piece of rubber sheeting). Good advice, as it turned out. When we filled the tank with 1cm of water, it came gushing out of all the corners and we had a minor flood in the living room. Time for some more silicon! (We ended up going through nearly 3 tubes of silicon, which cost about \$9 each.) Eventually we had to pack the base with fibreboard (the type used in lining showers prior to tiling) and paint with waterproofing paint (about another \$20). This gave the tank an interesting green line around the base. We considered covering this with black contact, but as it is no longer available here, we decided to stick with the green instead.

Back to Martin's instructions. We were advised to use grit at the bottom, so off we went to the pet shop to purchase some shell grit (\$35 for a 25kg bag of medium grit). We covered the base with this to a depth of around 1.5cm, so that it could not be seen from outside the tank.

Martin suggested covering the grit with a mix of acid peat and some ericaceous compost or just peat. We decided that the best option for us was some of our nursery potting mix, enriched with some aged peat moss.

And then to planting! We had an old, dead trunk of *Cyathea australis* lying around, so we decided to cut it in half to provide a structure for a *Blechnum contiguum* to grow up. (We figured that we had a few plants needing a higher humidity environment that would also benefit from the tank, so we included these in the planting.) Martin advised us to plant the filmies so that some 'roots' and a little bit of rhizome were covered. He also advised us to use

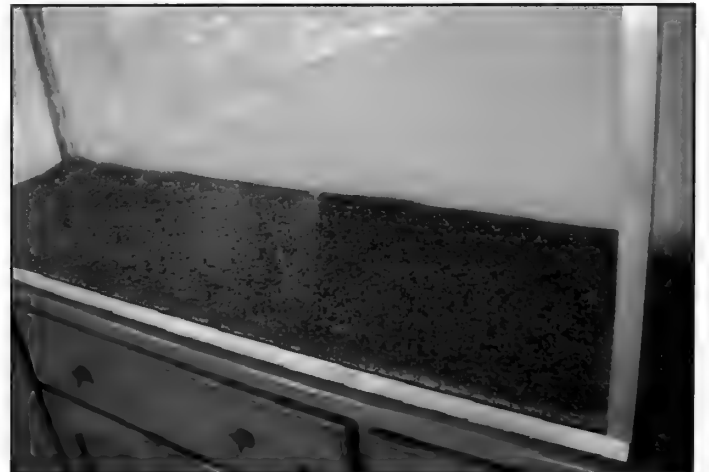


Fig. 3. The grit base in position.

## The Case for Filmy Ferns

stones and pieces of wood to hold them in place until they get going - "House bricks are splendid - if you've got some which look reasonably attractive". So now all we needed to do was to 'souvenir' some new filmy ferns, confident in the knowledge that we had a suitable environment for them to grow and thrive in!

Several casualties later, we determined that the *Cyathea australis* trunk was not a suitable medium. It does not retain the same level of moisture as the more favoured *Dicksonia antarctica*. Luckily, we were able to source some of the latter before too many of our precious plants dropped dead!

We also invested in a grow lamp to provide better lighting. This is an unattractive long bare fluorescent tube sitting just above the tank, which has been mounted to the wall. It cost an additional \$30 (including fitting) but was worth every cent, as it not only provides enough light for the plants, but also allows us to see more clearly what is going on inside.

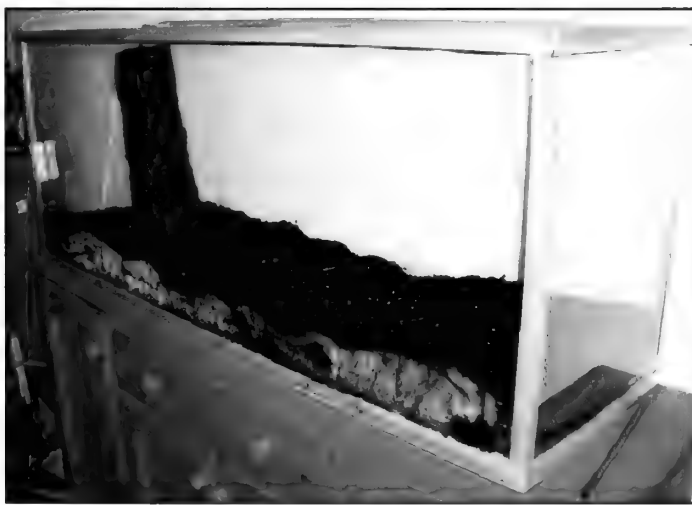


Fig. 4. Ready for planting.

A note to the enthusiast – Martin also provided us with two golden rules for managing the tank environment:

Rule one:-

Don't let weed ferns get out of hand. However careful you are you will get weeds. It's always tempting to leave the weed ferns because inevitably you will get some you don't recognise! In the wild filmies do not usually thrive in competition with other plants.



Fig. 5. The initial planting.

Rule two:-

Try and keep the glass clean. Algae will grow on the inside of the glass, and it can be difficult to remove without damaging the ferns. (We purchased a magnetic aquarium glass cleaner to help accomplish this task – a snap at \$15 from the pet shop)

Finally, he advised to keep the tank covered. Mist the whole with rain water (preferably) once planted, but don't be tempted to mist too often! Keep an eye on the moisture levels – do not over water! Martin advises that tanks without an airtight seal seem to do better "it's a bit like the old adage - a dry plant will often recover if watered, a waterlogged plant is usually already dead". You can sometimes open the lid up a little to reduce the moisture levels in order to avoid it becoming too wet.

Oh – and the total cost of the exercise? About \$300 (about £190 – Ed.)

We did consider purchasing a second hand aquarium. We found some suitable candidates on eBay, but the cost of these plus the travel to collect, was far in excess of what we paid to construct our own.

Our filmy fern cabinet currently contains the following species:

*Arthropteris becklerii*.

*Asplenium laserpitiifolium*.

*Asplenium capitisyork*.

*Crypsinus simplicissimus*.

*Gleichenia rupestris*.

*Grammitis billardiarei*.

*Grammitis stenophylla*.

*Grammitis wurunuran*.

*Hymenophyllum baileyianum*.

*Hymenophyllum brassii*.

*Hymenophyllum cupressiforme*.

*Hymenophyllum flabellatum*.

*Leptopteris fraseri*.

*Leptopteris hymenophyllum*.

*Leptopteris moorei*.

*Leptopteris wilkesiana*.

*Lindsaea brachypoda*.

*Oenotrichia tripinnata*.

*Pteridioblechnum neglectum*.

*Tmesipteris ovata*.

*Cardiomanes reniforme*.

(Plus a couple of moss species, for good measure.)



Fig. 6. Everything is thriving.

## *Polystichum setiferum* 'Cristato-gracile'

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The background to this variety of *Polystichum setiferum* is quite fascinating. In *The British Pteridological Society Abstracts of Reports 1894-1905* we learn that this variety was first found by Mr Gray. Below are the appropriate paragraphs:-

### Cristato-gracile Moly

So thoroughly crested in all their parts are the true forms of cristato-gracile, that the name percristatum might with propriety be given to them.

The original form was found in 1862, in South Devon, by Mr Gray. Shortly afterwards Mr Jackson found his in North Devon. It is believed that Mr Wollaston, Mr Wills and Mr Charles Cowper are the only other discoverers of the true form of this variety. Mr Elsworthy's and Mr Padleys crested forms called by this name, lack the precristate character., Mr Moly's form is now generally admitted to be the finest and most characteristic of the class. Next probably come the two of Mr Wills, found in Dorset and Sidbury, in 1872 and 1874.



Fig. 1. My herbarium specimen of *Polystichum setiferum* 'Cristato-gracile', showing terminal crests at the end of all the pinnules.

Note the broad frond base that is typical of *Polystichum setiferum*



Fig. 2. Detail of the pinnules showing that not only are the tips of each pinnule crested but all the actual pinnae themselves have a small crest.

In Druery's *British Ferns and their Varieties* he says the following:-

Found at Ottery St Mary by Mr C Jackson, and also by Mr R. J. Gray; it has delicately cut pinnules and small terminal crests to the fronds and pinnae; another form however, C.G.(percristatum) Moly, found by Mr Moly has the pinnules also regularly fanned at the tips as well

I'm afraid I cannot claim to have found mine in the wild but at Rumsey Gardens near Petersfield where Mr Giles grew them from spores<sup>1</sup> I suspect from the BPS spore exchange. I bought several at the time as they were running the ferns down as he was very ill and I felt the chance of getting them again was small. One was like the picture above (Fig. 2.) having tiny ruffles to all the pinnae, pinnules and to the apex of the frond. Others had slight cresting to the apex as well.

Growing them on, little changed for a year or so and then one season something switched on and one of the plants changed abruptly. (Figs. 3 & 4.)



Fig. 3. The variation in *Polystichum setiferum* 'Cristato gracile'



## *Polystichum setiferum* "Cristato-gracile"



Fig. 4. Close up of a single frond crest.  
Photo : Mark Border

As can be seen the pinnae have got narrower with a hint of forking at the tips with a massive crest, the whole plant only standing about 25cm (10ins)

Some of the others have stayed true but yet another has done something really different. The fronds started as a 'Cristato-gracile' but then changed dramatically as can be seen in Fig. 5. below



Fig. 5. Showing the unusual development of the tips of the fronds  
(I have nick-named this *P. setiferum* 'Hurricane')

This reminds me of the pictures in the books of 'Grandiceps' but the pinnules along the rachis are severely reduced to almost one pinnule see Fig. 6. for a old plant of mine called 'Grandiceps'.



Fig.6. *P. setiferum* 'Grandiceps'  
(Labelled *P. aculeatum* 'Grandiceps' when bought!)

As you can see the pinnae are reduced but still very obvious. I am sad to say that 'Hurricane' has suffered in the last few years and I am presently trying to nurse it back to health. One of its off-sets seems to have gone back to 'Cristato gracile' but it may change when it gets of age.

In Martin Rickard's *Plantfinders Guide to Garden Ferns* he says:-

"I have a range of plants differing in detail - crests are bigger and fronds branched".

This is certainly the case with the plants I bought from Rumsey Gardens and I really should sow some spores this year.

Footnote :-

1: When speaking to Mrs Giles she informed me that Mr Norman Giles passed away May 2011 and now they are rebuilding their range of ferns. All I can say is how grateful I am to still have some of his plants that he grew from his own spores and from the societies.

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**Rickard, Martin (2003)** *The Plantfinders Guide to Garden Ferns*. David and Charles

**Drury, Charles, T. (1912)** *British Ferns and thier Varieties*. George Routledge & Sons. pp197

## Bird's Nest Fern found in Cumbria!

No - not *Asplenium nidus*! As you can see from the photograph it was a bird's nest in a fern.

A group of Pteridologists from the BPS North West and Yorkshire branches were exploring the Swindale valley in the East of Cumbria this summer. As they walked down a lane they were surprised by a small brown bird flying out of a group of ferns.

On examination we found it had built a nest in the middle of a fern's crown. We beat a hasty retreat to avoid disturbing the bird any more than was necessary, but I did manage to get this photograph of the nest in situ.

The bird was a Blackcap ( *Sylvia atricapilla*) often known as the 'Northern Nightingale' because of the quality of it's song. Usually a summer visitor to the North of England they are often found nesting in bushes and hedgerows.

The fern was hotly debated and the concensus is *Dryopteris filix-mas*, however there are still those who opt for *Oreopteris limbosperma*. AEG



# Why is Chris Page's "Ferns" So Expensive?

Graham Ackers



The year 1988 saw the publication of the first (and still only) book devoted to the natural history and ecology of British ferns – it was *Ferns* by Christopher N. Page, no. 74 in the prestigious New Naturalist (NN) series. Chris Page is of course well-known to many in the Society, having been the researcher on ferns and conifers at the Royal Botanic Garden Edinburgh, a frequent contributor to the activities of the Society, and was made an honorary member in 2007. He has published many scientific papers and written another important book *The Ferns of Britain and Ireland* (second edition 1997). See Dyer & McHaffie, 2007 for an account of Chris's career.

Unlike other books on British pteridophytes, *Ferns* is not a species account, but rather explores, in thoughtful and entertaining ways, the various habitats occupied by British ferns. I have always found it a most stimulating read and particularly admired his knowledge and accounts of the historical backgrounds to the featured habitats. It was favourably reviewed by Martin Rickard in 1989, e.g. "It is in the best traditions of the series and I doubt if anyone could be better qualified to tackle this subject than Dr. Chris Page". The story told in the Author's Preface is quite amazing. Chris describes how, whilst he was photographing ferns in a quiet Devon lane, an elderly gentleman came along and struck up a conversation. It transpired that this person was taking fern photographs back in 1947, commissioned for a proposed New Naturalist book on ferns! In fact the intended book was to have been *Ferns and Mosses* by pteridologist Francis Ballard (1896-1976), but it was never written, so the arrival of NN74 *Ferns* was only 40 years late!

Perhaps surprisingly the New Naturalist series was conceived during the war, but came to fruition in 1945 with the publication of NN1, *Butterflies* by E. B. Ford. The series was the brainchild of publisher Billy Collins, who appointed a small editorial panel of expert naturalists like Julian Huxley and James Fisher. The philosophy of the series was "to interest the general reader in the wild life of Britain by recapturing the enquiring spirit of the old naturalists", as was (and still is) printed on the reverse of the half-title page. With the plethora of natural history books now available, it may seem hard to realise that for several years post-war there was a dearth of such literature. It was into this vacuum that the first two NN titles, *Butterflies* and *London's Natural History* (by R S R Fitter - NN3 issued out of sequence) were launched, and were immediately successful, selling more than 30,000 copies each in their first 18 months. The NN series successfully bridges the gap between populism and academia. Although styles and content are quite variable, they are always authoritative and do not shy away from material of a technical and scientific nature. They are not field guides, but mainly studies of identifiable regions or in depth reviews of a particular group of animals or plants, and *Ferns* fits squarely into this philosophy. A parallel series of monographs, usually on a single species, ran from 1948 to 1971.

Perhaps the most memorable feature of the series has been the wonderful iconography of the jackets, which immediately catch the eye in the bookshops and look splendid on the bookshelves of the collector. The arts and crafts influenced patterns revealed the subjects of the books boldly and in bright colours. The designs skilfully migrated over to the spines which sported the distinctive NN colophon and sometimes included a motif appropriate to the subject of the book. Clifford and Rosemary Ellis, who ran an art academy, were the first designers, producing 86 jackets (including monographs) from 1945 to 1985, finishing on NN70 (*The Natural History of Orkney* by R. J. Berry, more of which later) with Clifford's death. Since then, jackets have been designed by Robert Gillmor (Fig. 1), equally artistically and successfully following the traditional design values, but displaying his own distinctive, more striking and less impressionistic style.



Fig. 1. Robert Gillmor in his Norfolk studio  
(© Thomas Gillmor).

The *Ferns* jacket (Fig. 2) is a superb example of the genre, with conceptual but recognisable taxa, anchored by the scollie and knitted together to provide the striking colourful image. Fig. 3 shows the original Gillmor design submitted to Collins, drawn using a felt tip pen. Although this prototype is somewhat crude, it served to give the publishers and editors a good impression of the design, which as can be seen was changed little on the published jacket (but note the suggested book title). Robert Gillmor has given his personal account of this design, reproduced in Panel 1. New Naturalist expert Peter Marren rated this jacket very highly – "The jacket of *Ferns* is surely his [Gillmor's] masterpiece so far. The bold and varied pattern of the ferns themselves are ideal for lithography, and the combination of their browns and greens against a uniformly textured background is irresistible" (Marren, 2005, p. 94). In answer to the question put to Marren - "What is your favourite New Naturalist Jacket?" – Marren replied "Among Robert's work I've always admired *Ferns* – bold and simple, with wonderfully harmonious patterns" (Bernhard, 2009).

It may be noticed in Fig.2, a scan of my copy of the jacket, that the spine is somewhat faded. This is because red and yellow (and combinations thereof) are 'fugitive'

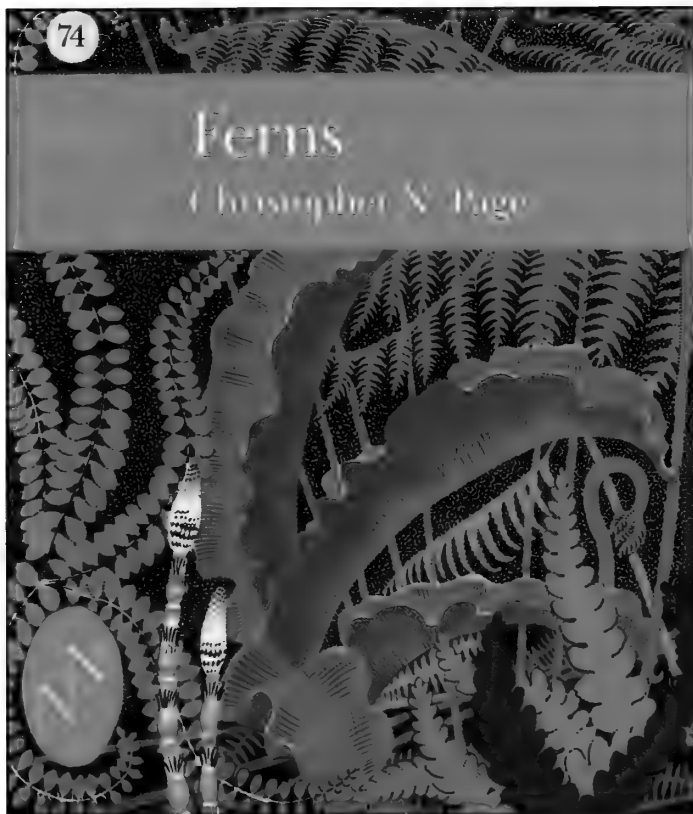


Fig. 2. The beautifully designed hardback jacket, including fading spine.

colours used for this kind of work, and fade rapidly when exposed to light for any length of time (Marren & Gillmor, 2009). This affects a number of volumes in the series and can result in the spine titles being difficult to read.

The iconography between the boards has been equally interesting. Even though in the 1940s colour photography was in its infancy and crude by today's standards, Billy Collins pioneered its use in his natural history books. Predictably, the printed results, although a novelty at the time, were mainly unsatisfactory, with images often being fuzzy and with indifferent colour rendition. Colour printing became less of a novelty but more expensive in the early 1950s, resulting in a subsequent reduction in the number of colour pictures, some volumes having none at all. During the 1970s, colour photographic technique and reproduction improved, and this has been reflected in some of the books published since then, albeit the plates had to be confined to a block towards the centre of the book – *Ferns* has an 8 page block of colour plates for example. Since 2005 advances in printing technology have allowed colour to be used extensively and within the body of the text.

The use of black & white photographs had been more successful from the start, with the published images being reasonably acceptable. The medium of photography had been expertly mastered by Chris Page, as demonstrated by his articles in this journal. Although, for reasons of economy, most photographs in his book were obliged to be black & white reproductions, nevertheless they are splendid images, singled out for special praise by Peter Marren (2005) – see Panel 2.

Following its successful first 20 years, from the mid-1960s into the 1970s, the series lost impetus. There were several reasons for this – competition from other publishers producing similar (and sometimes better) books, declining

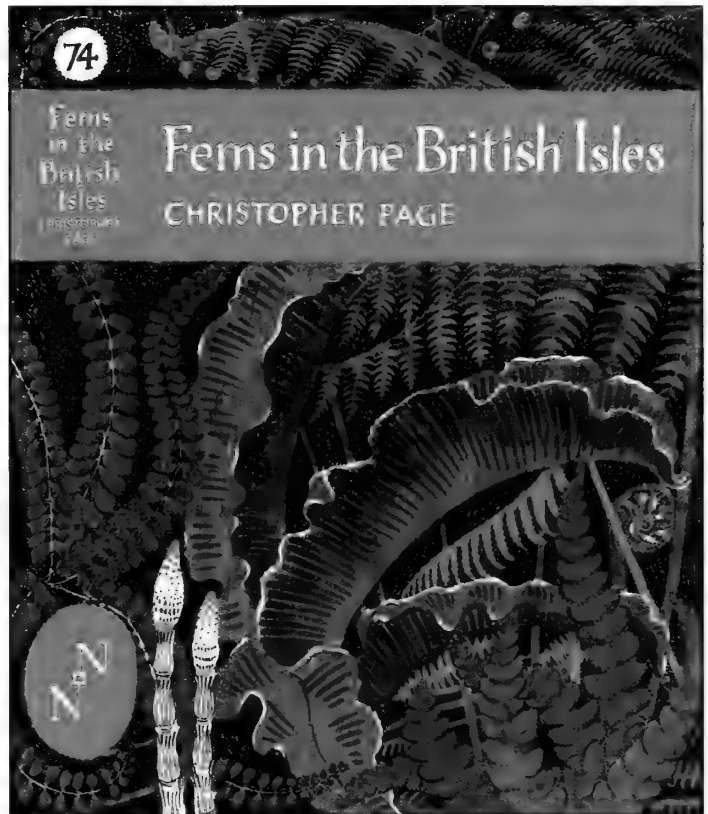


Fig. 3. Prototype jacket design

©. Robert Gillmor and Harper Collins

numbers of field naturalists (NN's main readership), the aging of the original dynamic editorial team, and the resulting financial difficulties of the series. The decline continued into the 1980s when James Fisher's son Crispin Fisher took over as the new editor. One of his recovery measures was to introduce paperback editions, which successfully encouraged sales to a new market. Moving into the 1990s, the outlook improved with titles improving in popularity, regularity, and production values. In fact the series is now so successful that up to 4 titles are produced annually – almost too great a profusion of riches!

In the 1940s and 1950s typically 20,000 or more copies were printed, but throughout the 1960s this reduced to about 6,000. With the introduction of paperbacks, the hardback runs were cut drastically and the two issued in 1985 had initial hardback runs of only 725. These books were the previously mentioned NN70, *The Natural History of Orkney* by R. J. Berry (paperback run 4,000), and NN71 *British Warblers* by Eric Simms (paperback 9,600). However, having underestimated demand for the hardback, Fisher authorised another 500 of each to be produced by stripping some paperbacks and adding boards and jackets. The resulting hardback books are slightly smaller than the originals and are known as "second state". With a hardback print run of 1,600 (paperback 2,550), *Ferns* fared only slightly better. However, from the 1990s onwards, hardback print runs gradually increased from 1,500 up to 3,000.

Although sales are now substantially less than in the initial euphoric days, nevertheless there exists a core of collectors attracted by the striking jackets, high quality of production and content, uniformity of format and a long and continuous run. At last, to address the question posed by the title of this article, well the answer is quite simple – the age-old one of supply and demand! Although the quality of



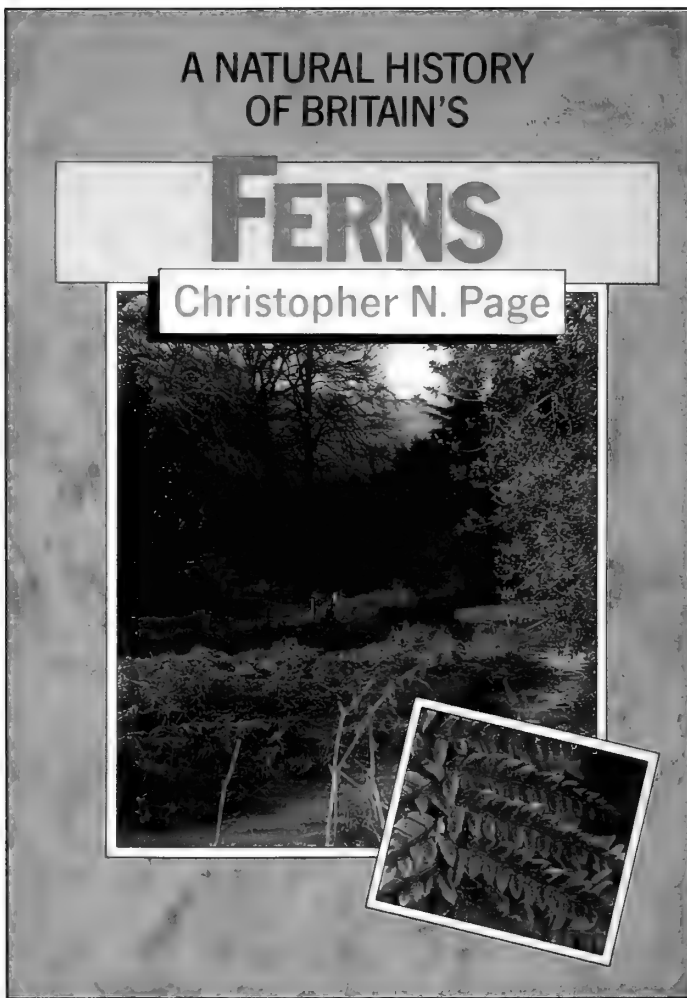


Fig. 4. The redesigned and much less striking paperback cover.

most books in the series is very high, this is subservient in the minds of a collector to their availability. You may need to ensure you are sitting down for this next bit. Both NN70 and NN71, described above, were originally published at £20 each. On the market today, for a "first state" copy you would have to pay in the region of £2,000 each and a "second state" would set you back about £1,000! Although these are now the most expensive volumes in the whole series, all of those between NN72 (1986) and NN81 (1994) inclusive had low print runs and consequently are highly priced. Sadly *Ferns* (NN74, 1988) sits squarely within this sequence. Originally published at £30, a fine copy would now set you back about £800! Much less collectable are the paperbacks, but a paperback *Ferns* (Fig. 4), originally priced at £10.95, might still cost you £100 in good condition.

And now for the good news (although if you own the original hardback, perhaps you have already had the good news!). Recently the publishers Harper Collins have provided a Print on Demand (PoD) service for all the New Naturalist titles at £50 each, available via their web site [www.newnaturalists.com](http://www.newnaturalists.com). My original hardback copy of *Ferns*, fortunately acquired whilst still in print, sits firmly on my NN bookshelf. However, I thought it might be an idea to get a PoD copy for my ferns bookshelf. From the Harper Collins web site, they state that, compared to the original, PoD jackets are all laminate, inside edition pages state that the books are PoD, and there is no title printed on the spine of the book. Thus the books are made to be slightly different, presumably to mollify collectors owning

the originals, but in my PoD copy of *Ferns*, the black and white photographs are very poorly reproduced. Despite this, I would suggest that this is a good way to acquire the book; alternatively you might just pick up a tatty paperback original for about the same price.

Chris Page's book is based on extensive field experience, an in-depth knowledge of the origins of all the habitats described, both scientific and intuitive personal observation, and a solid grounding in fern taxonomy. To add to all this, his writing style is fluent, informative and entertaining, and to end I would refer you to an example of his narrative style in Panel 3, a reading of which can be followed by a chorus of "and so say all of us"! □

Panel 1

Robert Gillmor's Account of the Jacket Design (reproduced from Marren & Gillmor 2009, p. 194).

"I enjoyed working out this jacket. It was fun to find and then to arrange the variety of leaf shapes into a decorative design. The Horsetails, like miniature totem poles, provided a nice contrast to the curving leaves. They grew in profusion in an area of the garden that seldom saw the sun and from where I could pick them on the way into the studio.

I deliberately simplified the leaf shapes, omitting all detail. Two greens, an orangey brown and black enabled me to create three further colours with the overlaps.

Today, twenty years later, and having left Berkshire for the coast of Norfolk, my wife has planted a collection of ferns under the printing-room window, joining others growing in the flint wall above. We love their elegant shapes and autumn colours which now ornament a permanently shaded area."

Panel 2

Peter Marren's Comments on Chris Page's Photography (reproduced from Marren, 2005, p. 64).

"Ferns was the first of the new style books which really works, and it does so partly because all of the illustrations are the work of one man – the author. Not only does this allow a consistency of photographic quality and style, important for this particular book, but it greatly eases the task of the printer. Equally importantly, the 180 monochrome photographs were all developed and printed by the author himself from black-and-white film, producing prints strong in contrast and far superior to the indifferent results achieved by most commercial printers. Chris Page also widely standardised their size and submitted them as a set of 8 x 10 inch glossy prints. Having had much of his job done for him by a thoughtful author-photographer, the printer did fairly well, within the limits imposed by off-set lithography and less-than-ideal paper. As a comprehensive set of portraits of living ferns, horsetails and clubmosses, this book is in a class of its own, and the editors took understandable pride in comparing it favourably with the finest fern books of the Victorian era."

## Why is Chris Page's "Ferns" So Expensive?

### Panel 3

A quotation from Chapter 6 of *Ferns*, "The Pteridophytes of Man-Made Landscapes". p. 148.

"Good examples of castles noted by the author, although there are probably many others, in which extensive growths of Southern Polypody are established, include Barry Pomeroy Castle in south Devon, Carew Castle in Pembrokeshire, and Wigmore Castle in Herefordshire. At the times of visits to the former two sites, teams of workers seemed to be especially employed to go around pulling off this relatively harmless plant. In my view, both this tendency and that for broadcast application to the stonework of such ancient castles of herbicides to rid them of their vegetation as an automatic 'first step' in their architectural preservation, seems totally insensitive to the rarity of these plants and their unique scientific interest in association with our custodianship of such unique and irreplaceable botanical sites. An area of middle ground in which an approach of considerations of structural safety as well as botanical interest are better combined seems highly desirable. For such vestments of plants seem to add considerably to the melancholy charm of such ancient structures as well as to their scientific interest, for their 'ivy-mantled towers' seem seldom so attractive when preserved stark and naked of their adorning vegetation."

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## A MAGNIFICENT HOUSEFERN - *GONIOPHLEBIUM SUBAURICULATUM*

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In April 2008, Pat Acock led an excellent 'Gentle Madeira' fern meeting with the group staying at the Hotel Estalagem do Mar on the north of the island. We regularly ate in the ground-floor restaurant which, apart from spectacular sea views, had the most impressive hanging fern display. The ferns were growing out of troughs on the first-floor bar area and dangled several metres over the balcony above the restaurant. In the main they were *Nephrolepis* sp. but notably some *Goniophlebium subauriculatum* from which the hotel staff were kind enough to let me have a piece of rhizome. Back home, I planted this up in a small hanging basket and patiently waited. I think I got one frond the first year, a couple of fronds the next year, then in 2011 it really exploded into life! I've had to go up in pot size a couple of times and, as the photo shows, the fronds are typically over a metre long. It is a magnificent looking fern, and what I particularly like is that, unlike *Nephrolepis*, it does not shed its dead pinnae everywhere. The fern hanging to the right in the picture is *Goniophlebium subauriculatum* 'Knightiae' which I bought from Dick Hayward when he ran World of Ferns. This has shorter fronds than the species, but the pinnae are very attractively incised. Both plants regularly put up new fronds but need plenty of water. While on Madeira, we only saw one *Goniophlebium subauriculatum* in the wild (well, actually on a garden wall), but I was pleased to see there are a number of plants growing in the new glasshouse at RHS Wisley. Not that I needed much reminding, but growing *Goniophlebium subauriculatum* has again taught me the importance of patience in growing ferns. □ ( See article on page 80 for cultivation notes AEG)



# A BOLTON COLLECTION

## Jack Bouckley

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I suppose there are cannot many members of our society who have never heard of Jim Lord. His wife was, I have been told, a niece of a Mr. W. Bolton of Low Bentham, Lancashire, who had a nursery some years ago and had a good collection of ferns. A photograph of the nursery and Mr. W. Bolton standing there was lent to me by a Mrs Ellena Fisher of Low Bentham. As far as I know, Jim never became a member of the BPS, but he was completely and utterly mad on ferns.

Jim was very proud of his collection and he told me that he had obtained quite a few of his ferns from various people, including Jimmy Dyce. He and I had swapped a number of plants over a few years. This was Jim Lord's so-called "Bolton" collection at Austwick, which consisted mainly of ferns from the Low Bentham nursery. In other words, some of his collection should be called the LOW BENTHAM Bolton collection, but not THE Bolton collection. The whole collection was sold before Jim's death.

In 1991, the centenary year of the BPS, I had quite a conversation with a gentle old lady named Emily Bolton, who was a direct relative of the famous holder of the well known Bolton collection of Surrey and she told me that she never heard of this Bolton from Lancashire and she had never heard of Jim Lord, but she did know about a Bolton who lived in Yorkshire. With this knowledge in mind I started making a few enquiries. Luckily, Bob Adams of Ripon had already seen a nice collection of ferns in a garden a few years ago, which he told me about. This garden was not far from Bob's home, so I went with Bob to look at the ferns from the road and they were very choice. It was through this that I came across the owner of the garden, a Fred Taylor of Ripon, when I called on him and introduced myself.

Fred's wife was a Bolton before marriage. She was a direct descendant of the famous Bolton family – in fact, she was a close relative of the Bolton, (first name unknown) who was a stone mason. A lovely work done by him with fern motifs on all sides was in the Ripon garden of Fred Taylor. Apart from the collection in the front garden, there was also a small but very choice collection in the back garden of different species, which had been given to Mrs Taylor by her relatives and these were from THE Bolton collection.

Unfortunately, Fred and his wife have both died and I have been told that their son moved the plants to his garden in another part of Ripon, but he has now moved and so far has not been traced. I have also been told the collection has been given all sorts of fancy names. One *Athyrium*, which I gave to Fred and which came from THE Southern Bolton collection and which was named, as requested by the Bolton family, as *Athyrium ex Bolton*, now has a different name altogether.

It must be hoped that some time in the near future contact will be made with Fred's son and then some of the other ferny articles, including a book signed by Drury, and some very old photographs of late nineteenth century BPS meetings, might be rediscovered. It would also be very satisfactory if the stonework could be found again and a photograph sent for the archives of our society.

There must be quite a number of ferns dotted around the country which are named incorrectly as one of THE Bolton collection. I know that the ones I have are genuine, as they came directly from the owners of this world-famous collection.

One fascinating little anecdote which I must mention is that, according to the local gossip, the wife of the Low Bentham Bolton left her husband and went to live in Canada because he insisted on keeping a pig in the kitchen!



The W. Bolton Fern Nursery at Low Bentham, with the man himself posing at the front, courtesy of Mrs E. Fisher.  
(The house still exists - but, sadly, no sign of any ferns)



# SNAILS, SLUGS<sup>1</sup>, GRASSHOPPERS AND CATERPILLARS, SOME NOTES AND OBSERVATIONS.

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## SNAILS AND SLUGS

### BACKGROUND

In the past, I have had terrible problems with snails and slugs eating my ferns despite regularly using commercial snail baits. Initially, I lessened the problem a little by wandering about at night with a torch and squashing any snails and slugs I could find. Later, I bought a plug-in lantern (designed for mechanical work underneath cars) and an extension-cord to provide better light and to avoid the need to replace batteries.

When looking for snails at night, I've found that it helps to look for tell-tale silver trails and to remember the site of any recent damage noticed during the day. Slugs and snails tend to return to the scene of the crime (as do caterpillars).

While the electric lantern was a big help, the night-stalking process was still labour intensive. So I looked for alternatives.

### BARRIERS

Snails and slugs move forward (using a kind of wave motion) on their muscular foot, which is lubricated with mucus. This method of travel works most efficiently on smooth, non-porous surfaces. Rough or porous surfaces tend to slow or to stop progress.

A number of different materials can be used as snail barriers. Some of these work because they are rough or porous (slower snails can do less damage) while others work because their smell or some other property bothers or deters snails and slugs.

Porous or rough materials used as snail barriers include:

1. crushed eggshells.
2. volcanic rock crumbs.
3. sandpaper.
4. wood ashes (this may affect soil properties).
5. diatomaceous earth (be careful not to breathe in any of this)<sup>2</sup>.
6. moss<sup>3</sup>.
7. bark mulches.
8. leaf litter mulches.

(I often wonder whether the reason ferns don't seem to be significantly affected by snails or slugs in the Australian bush, even in those areas close to snail-infested residences, is because of the presence of leaf litter.)

Other barriers that are supposed to deter snails include:

1. copper.
2. iron.
3. coffee grounds.
4. citrus peel.

Copper tape or copper foil is supposed to work by conducting ground electricity and giving the snails a little shock on contact<sup>4</sup> (it actually does seem to work but I'm dubious about the reasoning). Coffee grounds are supposed to cause heart attacks (I'm sceptical about this

also and my snails don't seem to mind it much). I haven't yet experimented with citrus or iron (though, some bait pellets use iron phosphate as an ingredient).

I used to wonder why my *Microsorium scandens* was never touched by snails or slugs while other ferns in my yard (especially *Asplenium obtusatum*) were decimated. I wondered whether the scent that gives rise to its common name, Fragrant Fern, might have a purpose that relates to protection from pests.



Fig.1. *Microsorium scandens*, an effective slug deterrent.

In the end, I found that a combination of above things was helpful. I collected lots of *Eucalyptus* leaves (small, fine ones from *Eucalyptus nicholii* that break down very slowly) and spread these around my ferns and, especially, around the base of our fence (filling in all gaps under the fence) where I assumed snails entered from outside. Then I planted *Microsorium scandens* at the end of each bed. These two steps seem to work well together against snails and slugs. However, they do not help much against caterpillars or grasshoppers. To control those, I still wander about with my lantern at night (see below).

### ATTRACTANTS

From my night-time wanderings, I've found that snails and slugs (especially slugs) are attracted to dead snails and slugs respectively. Apparently, many common species of slugs are cannibals<sup>5</sup> (and I think this might also apply to some snails). I found this useful and I left the slugs that I had squashed to attract others and that made those others easier to find a little later.

I also found that snails and slugs love mangoes. I leave the skins and seeds in the backyard near favourite ferns and come out after dark to find all the slugs from within smelling distance on the mango skins and easy to find.

1. "Britain is the slug capital of the world; nowhere else has such ideal conditions" – Bill Symondson – invertebrate ecologist and slug expert – Shepherd and Gallant, *The Little Book of Slugs*, 2002, CAT Publications.

2. <http://diatomaceousearthflea.com/diatomaceous-earth-to-kill-pest/>

3. Hoshizaki and Moran, *Fern Grower's Manual*, 2001, Timber Press.

4. <http://www.derwenttraders.com.au/contents/en-us/d133.html>

5. <http://copywritersallotment.wordpress.com/what-worked-what-didnt-slugs-and-snails/>

# SNAILS, SLUGS, GRASSHOPPERS AND CATERPILLARS, SOME NOTES AND OBSERVATIONS.

## POISONS / BAITES / TRAPS

I have had only limited success with commercial snail baits (though I presume they would work better now that I have filled in gaps under fences). Some agricultural trials show that snail baits are only about 60% effective<sup>6</sup> (though the results do not seem to distinguish between types of baits). Most commercial baits use either iron phosphate or metaldehyde.

Metaldehyde baits work by dehydrating snails and slugs. Metaldehyde is toxic and can be hazardous around small children or pets (including fish<sup>7</sup>) and even around edible plants. It tends to be a little less effective than iron phosphate and its effectiveness can be further reduced by water.

Iron phosphate baits are less likely to cause problems with pets or worms and can be used near edible plants. They are also less susceptible to water damage. They can, however, have a gradual effect upon the mineral content of your soil. Iron phosphate works by interfering with the snail's calcium metabolism. It tends to be more expensive but more effective and longer-lasting than metaldehyde<sup>8</sup>.

A number of sources suggest beer traps. Snails and slugs are attracted to the smell of stale beer<sup>9</sup> and, if a container that is deep enough is left out, they will be attracted to it and drown in it (it might be important not to fill the container too close to the top so that the snail must fully enter the container to drink).

Other websites and books suggest leaving upturned pots or other containers (especially those with some kind of little door or access hole) out at night and collecting slugs and snails that have sheltered there the next morning. Some also suggest leaving dried pet food under the containers to attract the snails (mango skins might work better).

## HELPERS

In Sydney, small lizards and frogs can be a big help in controlling slugs and snails. We installed a small pond to encourage frogs. This took about a year to work but we now have quite a few pobblebonk frogs, which make a very distinctive "bonk" call.

The pond also accidentally increased the number of small skink lizards in the yard by increasing the number of mosquitoes. Mosquito numbers gradually reduced again as more frogs and lizards arrived. (Placing a few fish in a pond can reduce or eliminate mosquito problems. White Cloud Mountain minnow (*Tanichthys albonubes*) are small, hardy, eat lots of mosquito larvae and do not eat frog eggs or tadpoles.<sup>10</sup>)

Possums, chickens, ducks, turtles, tortoises, rats, some birds and snakes also eat slugs and snails<sup>11</sup>; but some of these may not be as practical as frogs or small lizards.

## GRASSHOPPERS

Grasshoppers tend not to eat the blades of fern fronds.

Commonly, however, they will nibble at the rachis of an emerging (or other) frond and cause the death of the frond. (If you have ever noticed the top part of a new frond dangling from a damaged point on the rachis this was probably caused by a grasshopper.)

Frogs don't seem to eat grasshoppers<sup>12</sup> but presumably lizards do (depending upon relative sizes).

Horehound (*Marrubium vulgare*), coriander (*Coriandrum sativum*) and marigold (*Calendula*) can be used to deter grasshoppers<sup>13</sup>.

*Zinnias* can be used to attract grasshoppers away from other plants<sup>14</sup> (where, presumably, they can be caught).

Traps similar to the beer trap above filled with a mixture of ten parts water to one part molasses can also be used for grasshoppers<sup>15</sup>.

While grasshoppers can sometimes be attracted to the light of a lantern at night, they can otherwise be difficult to find. Sometimes, looking for long, hair-like, waving antennae can provide a clue as to their whereabouts. Grasshoppers can also be hard to catch and they bite (as I write, blood is just drying on a grasshopper bite on my thumb).

Apart from night-stalking, I have not yet experimented with the above grasshopper remedies and cannot comment about their effectiveness.



Fig. 2. Grasshopper damage on a *Pteris semipinnata* frond.

## CATERPILLARS

Searching for caterpillars at night with a light can work well, especially if you are careful to look for damage sites during the day. However, caterpillars seem able to work more quickly than snails and missing just one caterpillar for a night or two can lead to significant damage.

David Jones<sup>16</sup> provides a description of many common caterpillar pests and provides specific advice for dealing with each<sup>17</sup>. Because caterpillars can do a lot of damage in a relatively short time, you may want to do something to protect your ferns before caterpillars can be found and identified (or, preferably, before caterpillars arrive). For most common caterpillar problems, David Jones suggests *Bacillus thuringiensis*, carbaryl and/or pyrethrum<sup>18</sup>.

6. Shepherd and Gallant, *The Little Book of Slugs*, 2002, CAT Publications  
7. And even birds and hedgehogs – Shepherd and Gallant, *The Little Book of Slugs*, 2002, CAT Publications.  
8. <http://www.weekendgardener.net/how-to/snails-slugs.htm>  
9. [http://www.livingwithbugs.com/slug\\_bt.html](http://www.livingwithbugs.com/slug_bt.html)  
10. [http://en.wikipedia.org/wiki/White\\_Cloud\\_Mountain\\_minnow](http://en.wikipedia.org/wiki/White_Cloud_Mountain_minnow)  
11. <http://www.weekendgardener.net/how-to/snails-slugs.htm>  
12. <http://www.ghorganics.com/page12.html>  
13. <http://www.ghorganics.com/page12.html>

14. [http://www.ehow.com/how\\_5533538\\_kill-grasshoppers-grass.html](http://www.ehow.com/how_5533538_kill-grasshoppers-grass.html)  
15. <http://www.ghorganics.com/page12.html>  
16. Jones, *Encyclopaedia of Ferns*, 1987, Lothian.  
17. Treatment of this topic in other fern titles seems generally fairly brief.  
18. He recommends *Bacillus thuringiensis* in seven cases out of thirteen, carbaryl in six out of thirteen and pyrethrum in nine out of thirteen. These figures probably represent underestimates because, in one or two cases, David indicates that finding and squashing should be enough and does not specify particular treatments.

## SNAILS, SLUGS, GRASSHOPPERS AND CATERPILLARS, SOME NOTES AND OBSERVATIONS.

According to one manufacturer, *B. thuringiensis* is "a naturally occurring bacteria. It controls many leaf-eating caterpillars of moths and butterflies, but does not harm other insects, birds, fish or warm-blooded animals. Once a caterpillar eats treated foliage, it stops eating, but may take up to 3-4 days to die and drop from the leaf"<sup>19</sup>. *B. thuringiensis* can also be used on or near edible plants<sup>20</sup> and seems to have low toxicity for humans<sup>21</sup>. There are many other products that contain *B. thuringiensis*<sup>22</sup>. Most require re-spraying each five to seven days.

Carbaryl (1-naphthyl methylcarbamate) acts upon the nervous system of caterpillars but kills both targeted and beneficial insects as well as crustaceans. It is toxic to humans (though it is often used to treat head lice) and is classified as a likely human carcinogen by the United States Environmental Protection Agency. Its use is prohibited in several countries, including the United Kingdom, Austria, Denmark, Sweden, Germany, and Angola. It was an earlier version of the process used to manufacture Carbaryl that resulted in the Bhopal disaster<sup>23</sup>. Carbaryl might not be a good option.

Pyrethrum is a natural insecticide made from the dried flower heads of *Chrysanthemum cinerariifolium* and *C. coccineum*. Though the pesticide is natural, it can still be harmful to humans – it can irritate open cuts or abrasions and inhaling significant amounts can lead to breathing and other problems<sup>24</sup>. Pyrethrum tends to break down quickly in sunlight.

Pyrethroids are synthetic insecticides based on natural pyrethrum. One common example is Permethrin (often piperonyl butoxide). Pyrethroids (compared to pyrethrum) tend to be more toxic to insects and tend to last longer in sunlight. Permethrin, however, is dangerously toxic to cats and fish<sup>25</sup> and it can also harm beneficial insects and frogs (as can pyrethrum). Permethrin's effects on humans are similar to those of pyrethrum.

An application of Permethrin can last about six weeks<sup>26</sup>. *Chrysanthemum cinerariifolium* and *C. coccineum* can

be used as companion plants and may provide some protection without the need for regular re-spraying.

Other sources recommend sprays based on chilli<sup>27</sup>, garlic<sup>28</sup>, a combination of chilli and garlic<sup>29</sup>, molasses<sup>30</sup>, vinegar<sup>31</sup> or pepper<sup>32</sup>.

While I've relied upon finding and squashing caterpillars in the past with mixed success, I think I might now try six-weekly applications of Permethrin through spring and summer, starting with a few more easily replaceable ferns.

### CONCLUSIONS

In relation to snails and slugs, I have found that blocking access points, using porous mulch and planting *Microsorium scandens* have all been very helpful.

In relation to grasshoppers, planting deterrent species and species that attract grasshoppers away from ferns both seem ideas worth trying.

For caterpillars, a trial of six-weekly applications of Permethrin during the growing season seems worthwhile.

In the end, though, wandering about on damp nights with an electric lantern still seems to count for a lot.

I'm hoping that these notes prompt feedback and emails about your experiences and suggestions. □



Fig. 3. Small ferns from a recent Queensland trip enjoying a relatively snail and slug-free environment.

19. <http://www.yates.com.au/products/pest-control/insects-concentrates/natures-way-caterpillar-killer-dipel/>
20. [http://higher.ed.mcgraw-hill.com/sites/0072528427/student\\_view0/biological\\_controls.html](http://higher.ed.mcgraw-hill.com/sites/0072528427/student_view0/biological_controls.html)
21. <http://npic.orst.edu/factsheets/BTgen.pdf>
22. Including Able™, Biobit®, Cutlass™, Dipel®, Foray®, Javelin®, Thuricide® and Vectobac®.
23. <http://en.wikipedia.org/wiki/Carbaryl>
24. <http://web.pppmb.cals.cornell.edu/resourceguide/mfs/10pyrethrum.php>
25. <http://en.wikipedia.org/wiki/Permethrin>

26. <http://www.sawyer.com/faqpermethrin.htm#004>
27. <http://www.angelfire.com/ri/ixia/Insect.html>
28. <http://www.annettemcfarlane.com/Doityourself.htm>
29. <http://www.no-dig-vegetablegarden.com/organic-garden-pest-control.html>
30. [http://www.agric.wa.gov.au/objtwr/imported\\_assets/content/pw/chem/altsprays2.pdf](http://www.agric.wa.gov.au/objtwr/imported_assets/content/pw/chem/altsprays2.pdf)
31. <http://www.no-dig-vegetablegarden.com/organic-garden-pest-control.html>
32. <http://www.angelfire.com/ri/ixia/Insect.html>

## An Appeal to All Members

Because of the death of Graham Ackers we are in the very sad situation of having to find a new Committee Secretary. This is an important job but not an onerous one. Graham and I worked closely together covering all secretarial duties. Basically Graham covered aspects concerned with the internal running of the Committee and I try to be the external contact for the Society by liaising with the Charity Commission and the General Public and Gill Smith deals with all matters financial. In addition Alison Paul has a long term working knowledge of committee matters; she can always be called upon to clarify issues and Mike Taylor deals with the membership. Clearly there is a quite a lot of overlap between all our jobs but with good communication our aim is that everything ultimately gets covered. In a nutshell Graham organised three committee meetings a year and liaised with the organiser at AGM venues. He took notes; produced the minutes; highlighted the actions and gave us gentle reminders to fulfil them! If you feel that you could take on this role and be part of our team then please get in touch. You can be assured of our full support to help you fulfil your duties.

Yvonne Golding: [secretary@eBPS.org.uk](mailto:secretary@eBPS.org.uk)



# MAUCLINE FERN WARE FURNITURE

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Fig. 1. Corner cupboard.



Fig. 2. Fire screen.



Fig. 3. Jewel cabinet.

Scottish souvenir or decorated treen<sup>1</sup> generally known today as Mauchline ware<sup>2</sup>, was made in a variety of finishes, including spatter-printed fern ware (see Ide, J, 2009). It is the only finish in which furniture was made and is rare compared to spatter-printed fern treen. Pieces known include sideboards, corner cupboards (Fig.1), fire screens (Fig.2), a large room screen, milking stools, tiered cake stands (Fig.4) and not least, occasional tables (Figs.5-14), which seem to be the most common type of furniture made. I have recorded nine tables so far; but of the other types of furniture, just one or two of each. In three years of serious searching this difference is probably significant.

Each piece, including the nine tables, appears to be unique in its structural design, but between them they exhibit a range of styles in the spatter-printed fern decoration that adorns them, both in terms of the arrangement of the ferns and in the colouring. Unlike the structural design, some of the pieces share the same style of decoration, as seen on tables C and D (Figs. 10-13), the jewel cabinet (Fig.3) and the fire screen (Fig.2) while others are unique to the furniture pieces I have seen so far. Some of these 'unique' fern designs, however, are not unique as far as Mauchline fern ware generally is concerned. From what little is known about the origins of the different styles of fern decoration more than one manufacturer was involved. It is possible that individual decorators within a company may have had different styles, but at this distance in time it may prove impossible to find out.

Because of the apparent rarity of these pieces, any one Mauchline ware manufacturer would only have been involved with a few pieces in the period from 1870, when Mauchline fern ware was first made, until 1937, when the manufacture of Mauchline ware ceased. (Most factories had ceased production even before the turn of the 19<sup>th</sup> century.) The question arises, therefore, were the furniture pieces made by the Mauchline ware manufacturers themselves, or by



Fig. 4. Tiered cake stand.



Fig. 5. Table A.

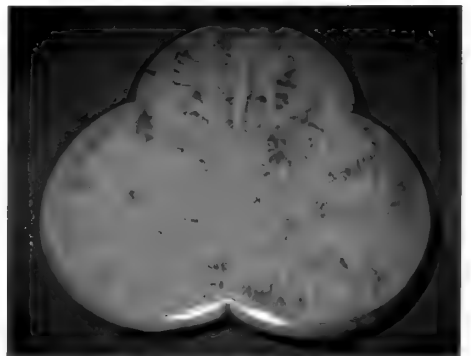


Fig. 6. Table A, detail of top.

1. Small useful items made in wood.

2. John Baker coined the term Mauchline ware in 1985 in his Shire publication. Although not all manufacturers were based in Mauchline itself, three of the better known companies were, whilst another was based in Cumnock, another in Laurencekirk and others elsewhere.

professional furniture makers, possibly as commissioned pieces, and then sent to the former for decoration? Their rarity alone might suggest that this was the case.

Perhaps at this point the frustrations for collectors and researchers should be mentioned. The manufacturers of Mauchline ware did not identify themselves on the items they produced, and nor was it not common practice for furniture makers in Britain to do so either, in contrast to continental Europe. Some Mauchline ware manufacturers have been identified from evidence such as patent applications and advertisements, but for the large part, which finishes and items they produced cannot be identified with certainty. Unfortunately, this frustration is exacerbated by the fact that the largest and longest standing manufacturer of Mauchline ware, W. & A. Smith<sup>3</sup> of Mauchline, suffered a devastating fire in 1933 when the major part of their premises, their machinery, their stock and more than one hundred years of documentation, was destroyed. The company struggled on after the fire, but finally closed in 1937.

With such a background, when an item turns up that carries the impressed mark of its maker any self respecting researcher grabs at the crumb that has been thrown to him (or her!). Such a rare exception is table A, which bears the impressed mark of *John Taylor and Son (Manufacturers) Edinburgh* (Fig.7), with presumably a pattern or catalogue number, *E2024*. The company used a range of marks over the years, with the one on the table best fitting that for the period 1902 to 1940. John Taylor started his business in Edinburgh about 1832 initially as a supplier of a wide variety of artist materials, but when his son joined him in about 1850, they gave up selling artists' materials and advertised as furniture makers and upholsterers, and at one stage as '*upholsterers to Her Majesty and supplying furniture*'. They finally went into liquidation in 1945. A search of the internet quickly reveals that furniture by John Taylor's company was of high quality in design and manufacture and commands a very respectable price in today's antique



Fig. 7. The impressed mark on Table A.



Fig. 8. Table B.



Fig. 9. Table B, detail of top.



Fig. 10. Table C.

market. However, no evidence has been found which suggests that they made fern decorated items and so almost certainly the table, or at least its top, was sent for decoration to a manufacturer producing fern ware. It is unfortunate that the fern design on this table is neither of the two styles, which so far have been associated with particular manufacturers.

Table B (Fig.8) recently had some light restoration carried out and during his work on the table the restorer discovered that the fern design was done on a white wood veneer, which has been so expertly applied to the table top that where rubbing has worn away the paint around the rim only the eye of an expert would spot it unless it was pointed out. This makes sense as the table itself is made of mahogany, a dark wood, and the silhouettes of the fronds, after spraying, would not be very visible if applied directly to the wood. Subsequent investigation revealed that the fern design has also been applied to a white wood veneer on the 'Taylor' table, which, despite superficial appearances, is also made of a dark wood, thought to be American walnut. The owner believes the veneer itself to be sycamore, the typical timber from which Mauchline wares were traditionally made. Does the use of veneers in very different tables strengthen the notion that fern furniture pieces may have been made by furniture makers and decorated elsewhere?

Tables C and D (Figs. 10-13) and another not shown do not show this veneer feature. Table C and the third one, were obtained within a few miles of Mauchline. Their owner reports that he has never had any doubt that they were made there. The tops are made of a single piece of light coloured wood, sycamore, the traditional wood of which Mauchline ware was made, but this is not proof either way that the tables were made by a Mauchline ware manufacturer. A furniture maker or even a skilled amateur woodworker living in Mauchline would be familiar with the fern ware being produced in the town and possibly made the tables in sycamore for that reason. In any case, sycamore is not uncommon as a timber for furniture.

3. W. & A. Smith, of Mauchline, was the longest-lived company and one of the most prolific in terms of types and numbers of products made. At its peak the company employed 400 people and were one of the largest employers in Ayrshire.



Fig. 11. Table D.

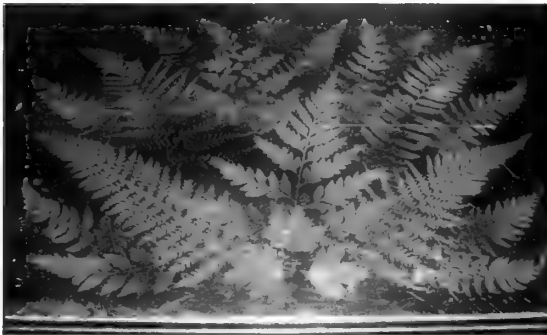


Fig. 12 Table D, detail of top.



Fig. 13. Table D, lower shelf.



Fig. 14. Table E.

Of the styles of fern decoration seen in the items illustrated, only one style can be identified as coming from a particular manufacturer, W. & A. Smith, and is that seen on tables C and D, the fire screen and jewel cabinet. Typically, their designs have a pleasing symmetry in the arrangement of the fronds and in the use of red and green colours. It is thought that the design probably reflects the artistry of the decorator, thought to be a Mr Andrew Miller, who collected ferns every summer from the Isle of Arran. Items were sent to his house in Mauchline where he decorated them before returning them to the factory for varnishing and finishing. The husband of a direct descendant of the Smith brothers and who worked in the despatch department from 1905 until the company closed, recorded that the process for making fern ware was common knowledge, but that the coloured fern application remained the secret of an employee of many years standing. Mr Miller, if it was he, was certainly a prolific decorator as this style is one of the most commonly found in Mauchline fern ware.

Tables A and B (Figs 5-9) illustrate another style. The fronds in the design are arranged as a two-dimensional bouquet and the whole design is monochrome in colour, though the colour itself is different in each case. Also, the ferns appear to be entirely non-British on both tables, something I have not seen in other styles, although a mix if British and foreign ferns is common. Is this sufficient to suggest that these two pieces were decorated by the same company or individual, although which or whom is not known?

The tables E (Fig.14) and F (Figs. 15-16) have a rare spatter-print design found in Mauchline ware. It is the simplest design possible with the fronds arranged in a single layer with no overlapping and sprayed with a single layer of paint in one colour, brown. The white colour of the wood from which the tabletop is made provides the contrast for the silhouettes. The design style lacks the three-dimensional effect obtained when more than one layer of fronds is used, as in some of the other pieces illustrated especially those manufactured by W. & A. Smith. It has been suggested that this design was possibly done by amateurs rather than a skilled craftsman from one of the factories, but I have also seen this design on a piece of treen and the silhouettes are so crisp and sharp, suggesting an experienced craftsman. Another alternative might be that it is an early design before the more complex ones were devised.

Before concluding, it has been suggested that some items identified as being Mauchline ware, especially fern furniture pieces, may not strictly be so, but were made and/or decorated by individuals in the style of Mauchline ware, perhaps even workers



Fig. 15. Table F.



Fig. 16. Table F, detail of top.



from the factories 'going solo'. To date there is no information or evidence one way or the other that this is or is not the case.

We started with a question, which it has not been possible to answer, but in examining pieces of Mauchline fern furniture for clues, tables in particular, some interesting observations have been made. These observations raise even more queries, some expressed others not. The paucity of material and information to help in the quest for the answers is a hindrance with Mauchline ware research, which is still young, and research into Mauchline fern furniture is so new it is in the throws of its birth pangs. However, despite the frustrations, there will be those who take on this research and enjoy the hunt. □

### Acknowledgements:-

I would like to express my sincere thanks to all the owners who have kindly given their permission to use photographs of their Mauchline ware furniture.

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**Ide, J. (2009)** *Mauchline Fern Ware*, *The Pteridologist* 5(2): 74-78

## The Cultivation of Metre Ferns

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*Goniophlebium subauriculatum* is known as the Metre Fern in Maderia, where I bought my own plants. The following notes should be helpful with their cultivation. As a general rule I have found that all ferns do best in 'Seed and Cutting' compost.

Metre Ferns are adaptable and fast growing, with one or two growing "flushes" annually. Ideally they need warm, humid conditions with plenty of air movement. They will take sun and thrive on it as long as they don't dry out for too long. They like plenty of water, but do not water them if the roots are standing in water already. If compost is tired, use a little well-rotted animal manure when in active growth or weak fertilizer (or diluted female urine!). They prefer to be fairly dry in winter. Very cold sensitive. Propagate by division.

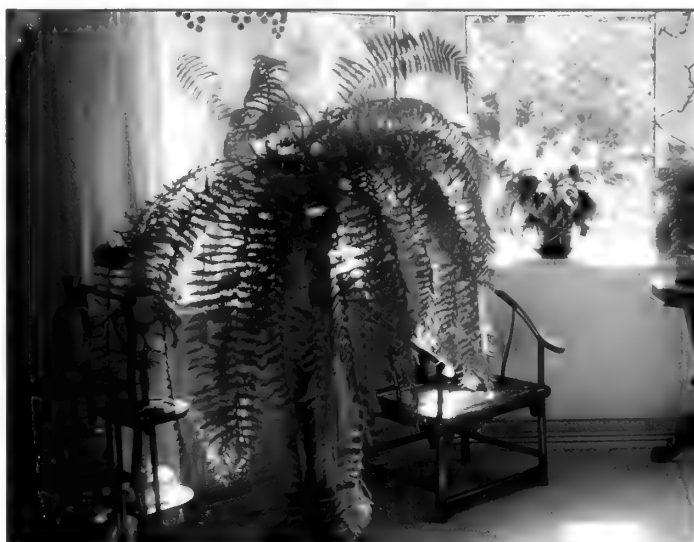
### *Goniophlebium subauriculatum*. (Metre Fern)

North India, China, Malaysia, New Guinea, Australia. Rhizomes, fronds 40-80 inches long, epiphyte/terrestrial. One of the best basket ferns available, prized for its long, willowy fronds. Very fast growing and adaptable. The height that these plants need to be stood if the fronds are not to touch the floor can make it hard to tell when they are standing in water unless you are incredibly tall. If they are standing in water, and you water them again, the roots are prone to rot, killing the plant. I use a weighted clear plastic pipe as sold for aquarium aerators, left permanently in the outer container and hanging discreetly over the side. If I blow down it and I don't hear bubbling, I know it's safe to water.

### *Goniophlebium subauriculatum* "Knightiae". (Curly Metre Fern)

A shorter form renowned for its deeply incised, broader segments. Highly ornamental. Fronds last well after cutting.

P.S. *Nephrolepis exaltata* "Whitmanii" prefers much the same conditions. Looking 10 times too delicate to be practical, it's quite easy to keep in practice.



*Goniophlebium subauriculatum* "Knightiae"



*Goniophlebium subauriculatum*

# 'England, Long and Long Ago'

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The tree fern is to me the most compelling souvenir of a very distant and remote world: few living things evoke so forcefully the tail end of the Palaeozoic period as these majestic vegetables. I share this fascination with the amateur pteridophile Charles Dickens, who cultivated New Zealand tree ferns at Gad's Hill Place in Kent, and who, writing in *All Year Round* in April 1860, reflected on 'our little island' when she was but a:-

'steaming morass, covered with the rank tropical vegetation of the tree-fern groves; its awful silence only broken by the hum of the shardy beetle, the rush of the hideous flying-lizards through lofty woods of ferns and reeds, or the tramp of giant iguanodons over the plashy wolds'.

If it is amusing to conjure up in one's imagination pictures of primaeval England, it is even more pleasurable to indulge in the fanciful recreation of these landscapes in modern times. Opportunities to recreate verisimilitudes of Old England when it was colonised by dragons, turtles and iguanodons do not abound. I was, however, recently fortunate enough to find myself in just such a position.

In the autumn of 2010 I was commissioned by Rector of the Royal College of Art (RCA) to put forward a scheme to transform the central court of their South Kensington home from something akin to an abandoned burial ground into a more congenial oasis. Darwin Court is a dark and awkward

space. Formed in the 1960s when the, then new and very stylish, buildings were thrown up, it was placed at the heart of the college and its artistic community. Its importance underlined by the fact that the outdoor space is bounded on all sides by the expansive windows of public galleries and the library, and surveyed from above by the Student Union Bar and the Senior Common Room. Although the court was clearly intended to be a verdant hub, it has for almost half a century remained a forlorn oubliette shaded by a stately pair of Victorian planes. While these handsome leviathans continue to thrive, everything else that has been introduced within this deep well, with exception a scattering of modern sculpture, has withered or perished.



Fig. 2. Misting taking place in the courtyard.



Fig. 1. Aerial view of Darwin Court

There appeared to me to be one reasonably failsafe and dramatic means of metamorphosing this dreary court into something green and memorable. Having observed tree ferns thriving in similar conditions in the West Indies and Australia, and having cultivated a handful of Dicksonias and Cyatheas in my modest East London garden, it occurred to me that it might be possible, with regular misting and watering, to create a forest of ferns.

I proposed therefore to create a multi-layered canopy of lofty Dicksonias (*D. Antarctica*, *D. fibrosa*, and *S. squarrosa*) and Cyatheas (*C. medullaris*, *C. australis*, *C. cooperi*), under whose whorls of enormous fronds would flourish a variety of native and exotic ground ferns including *Asplenium scolopendrium*, *Athyrium filix-femina*, *Belchnum spicant*, *Cyrtomium falcatum*, *Dryopteris filix-mas*, *Matteuccia struthiopteris*, *Polypodium vulgare* and *Onoclea sensibilis*. The dense canopy of the plane trees, which could not be significantly reduced, on the strict instructions of the Council's tree officer, would provide a perfect microclimate for the ferns. There were also other benefits to planting tree ferns: their unusual profiles and exotic character would guarantee that they would be eye-catching and conspicuous additions to the court; being shallow rooted they would cause minimal disturbance to the planes' roots; and the ferns' bright evergreen foliage would provide year-round interest.

The aim of the scheme was to place the bulk of the large ferns in the central sunk area of the court so to frame views into and across the space; they were also placed with a view to drawing the eye to the large and lumpen boles of the London planes. Small clusters of tree ferns with an understorey of ground ferns and maidenhair vine

(*Muehlenbeckia complexa*) were also arranged in large planters on the raised terrace that encircles three sides of the court.

Few people were better equipped to build the new garden and furnish it with plants than Lyndon Osborn, one of metropolis's foremost purveyors of tree ferns and unusual plants to the pterido-curious, and occasional denizen of Columbia Road Flower Market in Bethnal Green. A native of New Zealand, and former national park ranger, Lyndon is well versed in every aspect of fern culture, and has, moreover, a nursery full of large and eccentrically shaped tree ferns – all of which have been harvested under license in compliance with CITES regulations, and are fully documented.



Fig. 3. View from the RCA gallery to the new fernery.

Lyndon and his team prepared and planted the courtyard in late November 2011. They began their work with wheeling in of tons of bark chips to enhance the acidity of the soil. This was followed by the delivery and careful placement of the plants. The largest, and most characterful specimens were set out first, and their ultimate positions were only finalised after repeated inspections from the windows of the basement and ground floor apartments of the college, as well as aerial surveys from the terrace of the Student Union Bar (from which one also gains a view of the handsome rotunda of the neighbouring Royal Albert Hall). After all the major sentinels were in place we then proceeded to distribute the medium to small scale material. An automated watering system was installed after the planting was completed: drip irrigation was fitted to the crowns of the large tree ferns to ensure that they receive adequate water throughout the year, and misters have also been dotted throughout the garden to increase the general humidity of the court. Thermometers, too, have been fixed to some of the tree ferns to monitor the temperature in different corners of the garden. So far the mercury has not plunged below zero, even when the temperature outside the court has been significantly colder – the air in the court being moderated by the heat radiated and expelled from the building, and the space being in part protected from the effects of the cold and the wind by the immense canopies of the trees. Lastly, in so far as tree ferns are heavy feeders, the new plants have been supplied with generous doses of Maxicrop (a bio-stimulant produced from seaweed extract). Regular feeding will be continued throughout the growing season.

The garden installation took the better part of five days, largely due to the complexity of working in a Central London location, and on account of the fact that the messiest work, which involved hauling plants (some tree fern trunks weighing hundreds of pounds) and bags of soil through the pristine interiors of the RCA, had to be scheduled at times when the college was closed, or when there was nominal collegiate traffic.

I am pleased to report that Lyndon has been commissioned by the college to maintain the fern forest. The maintenance will not entail much more than a handful of visits a year to fertilise the plants, to ensure that the irrigation is functioning to plan, and to keep on top of the abundant leaf litter in the autumn so that it doesn't smother the ground ferns (the leaves will be shredded and composted, and the resultant soil will be spread over the garden). The RCA's fern forest is not, however, a static concept: Lyndon has been charged to increase over time the diversity of the plant material, and most importantly to introduce and encourage hardy epiphytes such as lichens, mosses, liverworts and smaller and larger filmy ferns, to colonise the trunks of the *Cyatheas* and *Dicksonias*.

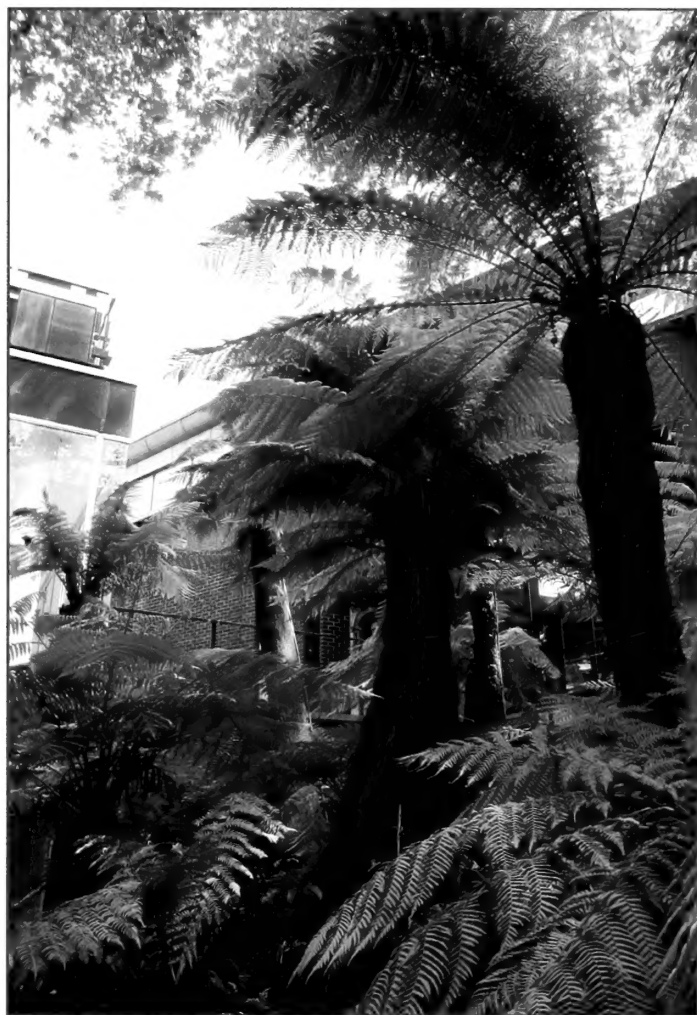


Fig. 4. Towering *Dicksonias* and *Cyatheas* in Darwin Court.

All in all, the new Darwin Court garden is a great success: the ferns appear to be happy in their new surroundings, and the staff and students of the RCA seem to be enjoying their new Jurassic terrarium. The full thrust of the new planting will not, however, be appreciated until the spring when the *Dicksonias* and *Cyatheas* begin to unfurl their giant fronds, and the ground-dwelling plants likewise start stretching heavenward, giving the court the sylvan luxuriance of a tree fern grove such as might have flourished in England long and long ago. □

Photograph credits:-

Header portrait: Charlie Hopkinson.

All others : Joe Sanders.

Todd Longstaffe-Gowan has recently written:-  
*The London Square: gardens in the midst of town.*  
Published by Yale University Press, May 2012.  
AEG



## Book Review

### The Three-Legged Society

Ian D. Hodkinson and Allan Steward  
ISBN 978-1-86220-297-9 Price £14.95.

Paperback. Published by the Centre for North West Regional Studies. General Editor: Dr. S. Riches and

### The Kendal Museum Botanical Collections (CD)

This book describes the lives and achievements of the Victorian botanists and fern hunters George Stabler, James M. Barnes and Joseph A. Martindale who all lived in the South East of the Lake District. The fern varieties 'Barnesii' and 'Stableri' are familiar to most members of the BPS.

George Stabler was a schoolmaster at the Village Boys' School, Levens, which is a few miles to the south-west of Kendal. James Barnes retired to Levens at the age of 34 and became heavily involved with the Methodist Church. Joseph Martindale was a schoolmaster at Staveley School just a few miles north west of Kendal.

They called themselves 'The Three-Legged Society' and met regularly to plan and execute botanical excursions. Barnes was the elder statesman of the group who specialised in ferns and mosses. Stabler studied mosses and liverworts whilst Martindale studied the lichens and vascular plants. Together they made a formidable team. Individually and collectively they made highly significant contributions to the natural history of the British Isles, especially the old county of Westmorland and adjacent regions.

Barnes had a  $\frac{3}{4}$  acre garden (just over 3000 m<sup>2</sup>) which was described by Druery as 'a fern paradise'. He scoured the country for his fern collection and is credited with finding 146 fern varieties.

Stabler also had a fern collection of cultivars at his house in Levens. One of his finds, *Dryopteris x complexa* 'Stableri', is widely available through commercial nurseries in Europe and the USA today.

Joseph Martindale is better known for his collections of lichens but he did study and collect fern varieties.

The book describes, in detail, the family history of each member of the group, together with their own social achievements and successes.

This book does not concentrate on ferns but they do play a major factor in each of the 'Three Legs'.

However, the editors have also prepared a CD with help from BPS members Francis Haigh, Robert Sykes and others that lists the herbarium specimens held at Kendal Museum collected by 'The Three-Legged Society' plus those of Frederic Clowes, another Lake District fern collector. This CD is available free from Kendal Museum (postage and donations accepted) and the book is due to be published in September 2012.

The book will be of interest to those members wanting to know the background to these 3 men and the CD is an invaluable record of their achievements.

Below is an article prepared by the authors to promote the book and the CD. AEG

A century and a half ago Britain was a world centre in botanical research and within Britain one of the most actively explored botanical environments was the Lake District and its surrounding country.

It is striking that the explorers were, on the whole, not prominent academics, but ordinary individuals with inquiring minds who saw opportunities to make significant contributions to the sum of botanical knowledge, and who were prepared to commit themselves to years of painstaking labour in the cause of science, with little prospect of recognition for their efforts and achievements.

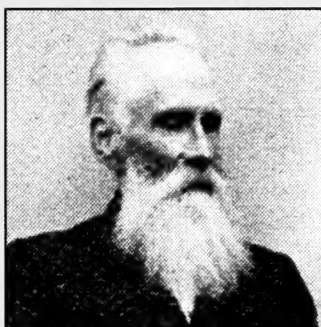
Some of the explorers were visitors, but amongst the most notable of these foot-soldiers of science were the local botanists whose enthusiasm ranged across the Lake District in all seasons and in all weathers.

Hardly anybody knows their names today. Their priceless collections, containing many 'type' specimens, laid unseen in dusty cupboards and their work was largely forgotten and lost to sight: Or would have been without the existence of Kendal Museum. At the Museum generations of diligent curators have safeguarded the collections over the long years since the passing of our botanists. Now, thanks to the dedication of the Museum's current staff and volunteers in cataloguing the collections, and the support of Kendal College, under whose remit the museum now falls, they are publicly accessible for the first time via a CD

These collections are an academic asset to Kendal, the College, and the Museum as



Joseph A. Martindale



George Stabler



James M. Barnes

they contain material of national importance to specialists in their types as well as to those with a more eclectic interest in the plants, their habitats and how the environment has reacted and is currently reacting to the impact of man and climate change. For the generalist their study illuminates the social and scientific history of botany, and for the wider public they add more perspective to the picture of what the Lakes are all about. For the modern Cumbrian they remind us of the illustrious reputation earned by the Kendal Natural History Society.

Complementing the CD is the forthcoming publication of a book about three friends whose collections it contains. 'The Three-Legged Society', by Ian D. Hodkinson & Allan Steward, is 'in press' as at October 2011 and is due to be released in the autumn of 2012. It is being published by Lancaster University's highly regarded Centre for North-West Regional Studies, on whose behalf it has been edited by Dr. Trevor Pearce. Ian Hodkinson is a retired Professor of Ecology and Entomology at Liverpool John Moores University. Allan Steward is Hon. Treasurer & a founding member of Levens Local History Group.

The book aims to raise George Stabler, James Martindale Barnes of Levens, and Joseph Anthony Martindale of Staveley out of obscurity and to expose the considerable achievements, often of national or international significance, of these not-so ordinary men, to the wider audience which they deserve.

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