

# A Fern Propagation Report (2005-2009)

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## Introduction

I've been experimenting with fern propagation for nearly four years with some success. The beginnings of this interest can be traced back to six months before that when we relocated to our present bush clad section in Maraetai, South Auckland. Even in my then botanically uninformed state, the presence of ferns and their influence on me was undeniable. Subsequent count revealed that there were already fifty-one fern species present on the property!

## Overview and Background

In my particular experience, the task of fern propagation has consisted of

- 1) identification,
- 2) location,
- 3) collection,
- 4) propagation.

As an identification study guide and reference manual, I have found the book *New Zealand Ferns* (Brownsey, 1989) indispensable. Historical accounts, such as contained in Field (1890) and Dobbie (1921), provide additional background and interesting insight into past, as well as possible present, species distributions. Locating ferns in the wild is often not easy.

*"One word of warning, O trustful reader; when you see a species marked 'abundant,' do not be too sanguine, I have searched for some so described for 40 years, and never found them."*

H.B. Dobbie, Auckland, 1916.

Fortunately, now at least travel throughout New Zealand is much easier than it was in Dobbie's time. I have personally observed *Blechnum nigrum* in the Hunua Ranges, *Sticherous flabellatus* on Great Barrier Island, *Loxsonia cunninghamii* in the Coromandel peninsula, and an extensive stand of *Ptisana salicina* in Taranaki.

For me, propagation from spore was chosen as the method of choice because it is by far the least disruptive to existing populations. However, this method imposes an often frustrating timing constraint on collection. Each year, the "window of opportunity" for collecting mature spore can range from as long as a number of months (*Cyathea*), to several weeks (*Leptopteris*), through to seemingly almost non-existent (*Hymenophyllum*).

I collect only small cuttings consisting of one to perhaps six pinnae, cleanly cut with care taken not to otherwise damage the host plant.

## Propagation Method

Noteworthy accounts of propagation methods are given by Field (1890), Dobbie (1921), and again Dobbie (1951). My approach has been to glean the principles from the past but update to present materials and technology.

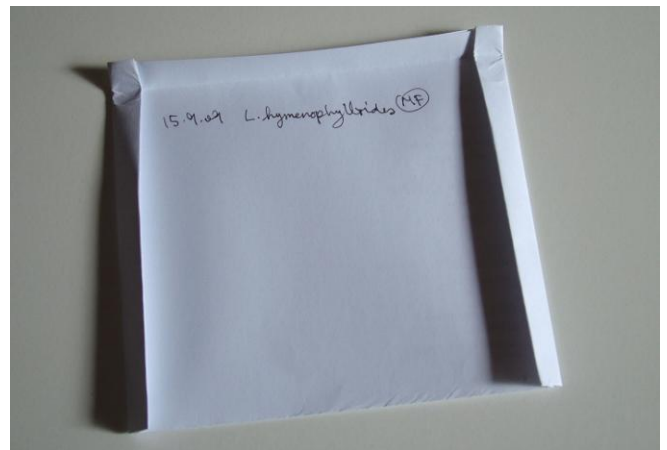


Fig. 1. A spore packet.

I place cuttings in folded white A4 paper for spore release, which often occurs within 24 hours. Most species are left at room temperature for this and unforced desiccation of the sample occurs. However, for green spore species, anything other than very slight drying can kill the spore. For these species, the paper packet is placed in a plastic zip bag and additionally sometimes in a refrigerator.

After spore is released, I remove the dry pinnae and then tap the paper to separate out the spore from detritus, which is discarded (mostly empty sporangia shells). Working with "pure spore" helps prevent subsequent destructive contamination.

Most recently I've been using purchased seed raising mix as propagation media. I sterilise the media in a glass dish by adding distilled water until thoroughly moist and subjecting it to several eight minute cycles in a microwave set to high power.



**Fig. 2. Propagation boxes on a purpose built wooden rack (with shade cloth) located outdoors.**

After cooling, media is spread in clear PVC clam-shell lid food grade boxes. Spore is dusted in, misted with distilled water, and the lids are shut tight. The boxes are placed out-of-doors on racks and opened only once a week for misting and inspection. Spore germination and the first hint of the green coloured gametophytes typically takes anywhere from several weeks (*Pteris*) up to several months (*Cyathea*).

The gametophyte phase of the fern lifecycle is rarely observed in the wild due to the small size of individuals (2-10mm) and their inconspicuous appearance. Fern gametophytes have deservedly been the subject of study in their own right (Nayar 1971 and Raghavan 1989).



**Fig. 3. Wooden racks are also used for the next few stages of propagation.**

Anywhere from at least several months to, more commonly, a year or more is required for gametophyte fertilisation and the subsequent appearance of the first sporophytes, the more familiar phase of the fern lifecycle.

Among other influences, temperature, light intensity, light wavelength, humidity, and media chemistry all play a part in gametophyte development and fertilisation (Raghavan 1989). In my experiments,

given the fact that the propagation boxes are placed in a relatively uncontrolled environment, there is variability in the development timeline.

I prick-out individual sporophytes and replant them usually after the appearance of the third frond. Successful hardening-off is aided by frequent misting and some initial protection from the elements.

**An example: *Rumohra adiantiformis***

In New Zealand, *R. adiantiformis* is found as an epiphytic climber on tree ferns. The fronds have a distinctively opaque plastic appearance.



**Fig. 4. *R. adiantiformis* climbing up the trunk of a tree fern.**

As a challenge for the collector, fertile fronds are usually located inconveniently above head height and out of reach. (*Blechnum filiforme* does this too!)



**Fig. 5. *R. Adiantiformis*: distinctive black sori.**

Mature sori are round, rather large and unmistakably very dark black which is an aid to identification in the field.



**Fig. 6. *R. adiantiformis*: spore imprint.**

In my experiments, after storage for several days, each collected sample released a copious amount spore which left an (easily disturbed) imprint inside its paper packet. Spore separation was easy as there was almost no detritus mixed in with the black coloured spore.



**Fig. 7. *R. adiantiformis*: mature gametophytes.**

Germination occurred within several weeks. Notably, ten months after sowing spore, mature *R. adiantiformis* gametophytes retained a relatively fresh clean featureless look.



**Fig. 8. *R. adiantiformis*: heart shaped first fronds.**

The first sporophytes appeared after twelve months total had passed. I observed that the very first fronds of *R. adiantiformis* have a characteristically elongated heart shape.



**Fig. 9. *R. adiantiformis*: ready for planting-out.**

Nine months after that, the sporophytes exhibited a slight growth spurt when the propagation box lid was propped open for initial hardening-off, but grew very slowly after that.

### **Overall Results and Summary**

When taking identification, location, collection and propagation all into account, there is probably no universal answer to the question of which species are easy and which are difficult. Sometimes good fortune prevails and at other times it is elusive.

However, with that said, through no effort on my part, some uninvited (but not unwelcome) “guest” ferns have appeared in my propagation boxes. The guests were indeed very easy!

### **Guest fern species:**

*Pteris tremula* (numerous),  
*Deparia petersenii* (numerous),

*Diplazium australe* (a few),  
*Paesia scaberula* (a few).

Overall, I have collected cuttings for propagation from nearly fifty fern species, the majority of which released viable spore.

**Species that at least germinated: 38.**

Failed at a subsequent stage: 5.  
 Lost to misfortune (a flood!): 5.  
 Progressed to planting-out: 17.  
 Still in progress: 11.

In my personal experience to date, I would characterise the majority of the (non-guest) species which have progressed to the planting-out stage as being moderately difficult. The exceptions, *Pteris tremula*, *Pteris macilenta*, *Adiantum hispidulum* and *Diplazium australe* were easy. *Doodia squarrosa*, *Lastreopsis hispida*, *Pneumatopteris pennigera* were difficult.

My success with *Cyathea dealbata* has been limited, but I suspect that is because I haven't paid sufficient attention to that species.

Additionally, although the focus of this report is propagation from spore, I have propagated a small number of fern species by other means.

**Species propagated other than from spore:**

*Asplenium bulbiferum* (bulbils),  
*Microsorium pustulatum* (rhizome cuttings),  
*Microsorium scandens* (rhizome cuttings),  
*Ptisana salicina* (by root division).

**Table 1. Summary of results by species for the first four years (11/2005-10/2009). Attempts that produced very few gametophytes and no sporophytes, or that failed completely, are not listed. Species listed as "not yet" are still in progress.**

Genus / species	Gametophytes	Sporophytes	Planted-out
<i>Adiantum fulvum</i>	prolific	very few <sup>3</sup>	failed
<i>Adiantum hispidulum</i>	prolific	prolific	yes
<i>Adiantum veridescens</i>	yes	yes	failed
<i>Blechnum discolor</i>	yes <sup>2</sup>	no	-
<i>Blechnum fluviatile</i>	prolific	yes <sup>1</sup>	-
<i>Blechnum membranacium</i>	prolific	yes	yes
<i>Blechnum nigrum</i>	few	very few	not yet
<i>Blechnum novae-zelandiae</i>	yes	yes	yes
<i>Blechnum procerum</i>	prolific	yes	not yet
<i>Cheilanthes sieberi</i>	prolific	prolific	not yet
<i>Christella dentata</i>	prolific	prolific	yes
<i>Cyathea dealbata</i>	prolific	yes	very few
<i>Cyathea medullaris</i>	prolific	prolific	yes
<i>Diplazium australe</i>	prolific	prolific	yes
<i>Doodia australis</i>	prolific	prolific	yes
<i>Doodia milnei</i>	prolific	yes	yes
<i>Doodia mollis</i>	prolific	few	not yet
<i>Doodia squarrosa</i>	prolific	few	few
<i>Lastreopsis glabella</i>	prolific	prolific	yes
<i>Lastreopsis hispida</i>	prolific	few	few
<i>Lastreopsis microsora</i>	prolific <sup>1</sup>	-	-
<i>Lastreopsis velutina</i>	prolific	prolific	yes
<i>Leptolepia novae-zelandiae</i>	prolific	yes	not yet
<i>Leptopteris hymenophylloides</i>	prolific	not yet	?
<i>Lindsea trichomanoides</i>	few	few <sup>1</sup>	-
<i>Loxosoma cunninghamii</i>	prolific	not yet	?
<i>Lygodium articulatum</i>	few	few <sup>1</sup>	-
<i>Microsorium scandens</i>	yes <sup>2</sup>	no	-
<i>Pellaea falcata</i>	prolific	prolific	not yet

<i>Pellaea rotundifolia</i>	yes <sup>2</sup>	no	-
<i>Pneumatopteris pennigera</i>	prolific	yes	few
<i>Polysticum cystostegia</i>	prolific	very few	not yet
<i>Pteris macilenta</i>	prolific	prolific	yes
<i>Pteris tremula</i>	prolific	prolific	yes
<i>Ptisana salicina</i>	few <sup>2</sup>	not yet	?
<i>Rumohra adiantiformis</i>	prolific	prolific	yes
<i>Todea barbara</i>	few <sup>2</sup>	not yet	?
<i>Trichomanes elongatum</i>	few	few <sup>1</sup>	-

1) Washed away in a flood in 2008. The remaining propagation boxes were moved to higher ground away from the stream.

2) Without the appearance of sporophytes, the identity of the gametophytes remains uncertain.

3) Sporophytes appeared, but perished. However, after nearly two years, the gametophytes are still alive.

### References

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