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**Morphological and Genetic Diversity of the  
Fern Genus *Polystichum* Roth  
(Dryopteridaceae) in New Zealand.**

**A thesis presented in partial fulfilment of the requirements  
for the degree of**

**Doctor of Philosophy  
in  
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## Abstract.

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Two morphologically variable taxa in the fern genus *Polystichum* Roth (Dryopteridaceae) from New Zealand were investigated using a combination of morphological, cytological, and molecular (AFLP DNA-fingerprinting) analyses to test the null hypothesis that each constituted only a single evolutionary lineage. In this study, lineages for which there was prospective evidence (looking to the future; eg. inference of Specific Mate Recognition System, or SMRS, differentiation) of assortative fertilisation were recognised as distinct species. Lineages for which there was only retrospective evidence (looking to the past; eg. character state variation) of assortative fertilisation were recognised at the subspecific level.

*Polystichum richardii* (Hook.) J. Smith was shown to be an allopolyploid complex of four evolutionary lineages, with two tetraploid and two allo-octoploid lineages. The new combination *P. wawranum* (Szyszyl. in Wawra) comb. nov. is proposed for one of the tetraploids, with the name *P. oculatum* (Hook.) J.B. Armstr. reinstated for the other. The two octoploids, which are allopatric, are recognised as separate subspecies under the reinstated name *P. neozelandicum* Fée, of which the name *P. richardii* is a later synonym. The new combination *P. neozelandicum* subsp. *zerophyllum* (Colenso) comb. et stat. nov. is proposed for the southern octoploid lineage.

The same methodology confirmed that *P. silvaticum* (Colenso) Diels and *P. vestitum* (G. Forst.) C. Presl should be recognised as separate species, but did not indicate that morphologically ‘divergent’ plants from the Chatham Islands comprise a separate lineage from the remainder of *P. vestitum*. Consequently, *P. vestitum* is retained as a single, albeit morphologically variable species.

Also investigated was the genetic relationship of the New Zealand species of *Polystichum* to their geographically closest congeners from Australia and Lord Howe Island using AFLP DNA-fingerprinting and DNA sequences from the chloroplast. These data are consistent with the hypothesis that the ecologically diverse New Zealand species of *Polystichum* were derived from a single trans-Tasman disjunction event (between New Zealand, and Australia/Lord Howe Island), with long-distance dispersal implicated rather than vicariance.

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# Table of Contents.

---

Title page .....	i
Abstract .....	ii
Acknowledgements .....	iii
Table of Contents .....	iv
List of Tables .....	viii
List of Boxes .....	viii
List of Figures .....	ix

## Chapter One: Introduction.

---

<b>1.1 The Genus <i>Polystichum</i> Roth</b> .....	<b>1</b>
<b>1.2 <i>Polystichum</i> in New Zealand</b> .....	<b>3</b>
<b>1.3 Thesis Objectives and Structure</b> .....	<b>4</b>
<b>1.4 Nomenclatural Changes and Lectotypifications</b> .....	<b>5</b>

## Chapter Two: Species as Prospective and Retrospective Evolutionary Lineages.

---

<b>2.1 Species as Evolutionary Lineages</b> .....	<b>6</b>
2.1.1 An Evolutionary Basis for the Description of Biodiversity .....	6
2.1.2 Species Concepts Terminology .....	8
2.1.3 The 'Evolutionary Species Concepts' .....	9
2.1.4 Sexuality (or lack of ...) and the Pluralism of a Lineage Concept .....	10
2.1.5 Pattern and Process .....	11
2.1.6 A Temporal Perspective of Lineages .....	12
<b>2.2 Processes Engendering Lineage Separation</b> .....	<b>12</b>
2.2.1 Post-Fertilisation Barriers .....	13
2.2.1.1 <i>Post-Fertilisation Barriers and Species Concepts</i> .....	13
2.2.1.2 <i>Diversity of Post-Fertilisation Barriers</i> .....	14
2.2.1.3 <i>Negative Heterosis</i> .....	14
2.2.1.4 <i>Polyploidy as a Post-Fertilisation Barrier</i> .....	15
2.2.2 Pre-Fertilisation Barriers .....	16
2.2.2.1 <i>The 'Recognition Species Concept'</i> .....	16
2.2.2.2 <i>The SMRS as a System of Preference</i> .....	17
2.2.2.3 <i>Using SMRS-Differentiation to Delimit Lineages Prospectively</i> ...	19
2.2.2.4 <i>Assortative Fertilisation by Allopatry</i> .....	20
2.2.2.5 <i>Assortative Fertilisation (or not) by Ecological Differentiation</i> ...	21
2.2.3 'Speciation' or the Formation of New Lineages .....	23
2.2.3.1 <i>The Origin of New SMRSs</i> .....	23
2.2.3.2 <i>Allopatry and Sympatry</i> .....	24
2.2.3.3 <i>Ecological Differentiation</i> .....	25
2.2.3.4 <i>'Speciation' by Reinforcement</i> .....	25
2.2.4 Summary of Processes Engendering Lineage Independence .....	27

<b>2.3 The Retrospective Delimitation of Separate Evolutionary Lineages</b> .....	<b>28</b>
2.3.1 Similarity .....	29
2.3.2 The 'Phylogenetic' Approach .....	31
2.3.3 The Monophyletic Perspective .....	33
2.3.4 The Diagnostic Perspective .....	34
2.3.5 A Concordant Perspective .....	36
2.3.5.1 <i>Coalescent Theory</i> .....	37
2.3.5.2 <i>The Temporal Progression of Concordance</i> .....	39
2.3.5.3 <i>Analysing Concordance and the Null Hypothesis</i> .....	40
2.3.5.4 <i>The Extent of Concordance</i> .....	43
2.3.6 The Spatial Context of Retrospective Lineage Delimitation .....	44
2.3.7 Retrospectively-Undelimitable Lineages .....	44
2.3.8 Lineage Permanence .....	45
2.3.9 Lineage Integration: Individuals and Classes .....	45
<b>2.4 The Taxonomic Delimitation of Lineages</b> .....	<b>47</b>
2.4.1 The Delimitation of SO Lineages as Taxonomic Species .....	48
2.4.1.1 <i>The Varietal Category in SO Organisms</i> .....	48
2.4.1.2 <i>'Cryptic' SO Lineages</i> .....	49
2.4.2 The Taxonomic Delimitation of NSO Organisms .....	50
2.4.3 Summary of Taxonomic Delimitation .....	51

## Chapter Three: Materials and Methods.

---

<b>3.1 Sampling</b> .....	<b>53</b>
<b>3.2 Morphological Methodology</b> .....	<b>54</b>
3.2.1 Measurements .....	54
3.2.2 Analysis of Morphological Data .....	55
<b>3.3 Cytological Methodology</b> .....	<b>59</b>
<b>3.4 Molecular Methodology</b> .....	<b>60</b>
3.4.1 DNA Extraction .....	60
3.4.2 DNA Electrophoresis .....	62
3.4.2.1 <i>Agarose Gels</i> .....	62
3.4.2.2 <i>Polyacrylamide Gels</i> .....	63
3.4.3 Single Locus PCR .....	66
3.4.3.1 <i>PCR Protocol</i> .....	66
3.4.3.2 <i>Sequencing of Single Locus PCR Products</i> .....	68
3.4.3.3 <i>Analysis of the Sequence Data</i> .....	69
3.4.3.4 <i>rps4-trnS Spacer Genotyping</i> .....	69
3.4.4 AFLP Analyses .....	70
3.4.4.1 <i>Restriction of Genomic DNA</i> .....	70
3.4.4.2 <i>Ligation of Adapter-Linkers to the Digested DNA</i> .....	71
3.4.4.3 <i>The AFLP PCR Steps</i> .....	71
3.4.4.4 <i>Electrophoresis, and Profile Visualisation and Scoring</i> .....	73
3.4.4.5 <i>Quality of AFLP Data</i> .....	73
3.4.4.6 <i>Splits and Edges</i> .....	76
3.4.4.7 <i>Analysis of Concordant Partitioning in AFLP Data</i> .....	77

## Chapter Four: The Dissolution of *Polystichum richardii* (Hook.) J. Smith: the *P. neozelandicum* Fée Complex.

---

<b>4.1 Introduction</b>	<b>85</b>
<b>4.2 Taxonomy</b>	<b>87</b>
4.2.1 Key to Taxa of the <i>Polystichum neozelandicum</i> Complex	87
4.2.2 Taxonomic Descriptions	87
4.2.3 Names of Uncertain Synonymy	107
4.2.4 Hybrids	107
4.2.5 Distributions	108
<b>4.3 Lineage Delimitation</b>	<b>110</b>
4.3.1 Cytological Analysis	110
4.3.2 Morphological Analysis	111
4.3.3 AFLP Analysis	119
4.3.3.1 <i>Sampling</i>	119
4.3.3.2 <i>Results</i>	120
4.3.3.3 <i>Comparison to Perrie et al. (2000)</i>	125
4.3.3.4 <i>Subsequent Analysis of Polystichum neozelandicum subsp. neozelandicum</i>	125
4.3.4 Allopolyploidy of <i>Polystichum neozelandicum</i>	126
<b>4.4 Taxonomic Delimitation</b>	<b>129</b>
<b>4.5 Discussion</b>	<b>131</b>
4.5.1 The Relationship of <i>Polystichum wawranum</i> and <i>P. oculatum</i>	131
4.5.2 Allopolyploid Origin of <i>Polystichum neozelandicum</i>	132
4.5.3 Ecology	132
4.5.4 Conservation	132

## Chapter Five: *Polystichum vestitum* (G. Forst.) C. Presl on the Chatham Islands.

---

<b>5.1 Introduction</b>	<b>134</b>
<b>5.2 Taxonomy</b>	<b>136</b>
5.2.1 Taxonomic Description	136
5.2.2 Relationship of the Chatham Islands' Form to <i>Polystichum vestitum</i>	149
5.2.3 Hybrids	150
<b>5.3 Lineage Delimitation</b>	<b>150</b>
5.3.1 Morphological (and Geographic) Category Delimitation	150
5.3.2 Ecological Observations	152
5.3.3 Morphological Analysis	153
5.3.4 AFLP Analysis	158
5.3.4.1 <i>The 'North and South Island' Sample Set</i>	159
5.3.4.2 <i>The 'Chatham Islands' Sample Set</i>	161
5.3.4.3 <i>The 'Combined' Sample Set</i>	161
5.3.4.4 <i>Interpretation of AFLP Results for Lineage Delimitation</i>	167
5.3.5 Summary of Lineage Delimitation	169
<b>5.4 Taxonomic Delimitation</b>	<b>170</b>
5.4.1 <i>Polystichum silvaticum</i>	170
5.4.2 <i>Polystichum vestitum</i>	170

5.4.3 Intraspecific Taxonomy of <i>Polystichum vestitum</i>	171
<b>5.5 Discussion</b>	<b>173</b>
5.5.1 The Dispersability of <i>Polystichum vestitum</i>	173
5.5.2 The ‘Divergent’ Morphological Variation	173
5.5.3 Conservation	175
5.5.4 Southern <i>Polystichum vestitum</i>	177

## **Chapter Six: Origins of the New Zealand *Polystichum* Species as Inferred from Genetic Relationships.**

---

<b>6.1 Introduction</b>	<b>178</b>
<b>6.2 Sequence Analysis of the Chloroplast <i>rps4-trnS</i> Spacer in South-Western Pacific <i>Polystichum</i></b>	<b>181</b>
6.2.1 Number of Trans-Tasman Disjunction Events	184
6.2.2 Other Features of the Spacer Sequence Data	186
<b>6.3 AFLP Analysis of South-Western Pacific <i>Polystichum</i></b>	<b>187</b>
6.3.1 Trans-Tasman Relationships	189
6.3.2 Relationships Between the New Zealand Species	192
6.3.3 Relationships Between the non-New Zealand Species	193
<b>6.4 Timing of Disjunction Events</b>	<b>194</b>
<b>6.5 Discussion</b>	<b>195</b>

## **Chapter Seven: Summary, Conclusions, and Discussion.**

---

<b>7.1 Summary</b>	<b>197</b>
7.1.1 General Species Delimitation	197
7.1.2 Species Delimitation in New Zealand <i>Polystichum</i>	197
7.1.3 Relationships of <i>Polystichum</i> within New Zealand, and within the SW Pacific	199
<b>7.2 Revised Morphological Key to New Zealand <i>Polystichum</i></b>	<b>200</b>
<b>7.3 Future Work</b>	<b>201</b>
7.3.1 Molecular Markers	201
7.3.2 New Zealand <i>Polystichum</i>	202
7.3.3 New Zealand Ferns in General	203
7.3.4 The Specific Mate Recognition System (SMRS) in Plants	204
<b>References</b>	<b>205</b>
<b>Appendix One: Manuscript of Perrie et al. (2000)</b>	<b>222</b>
<b>Appendix Two: Sample Details</b>	<b>233</b>
<b>Appendix Three: Appendices for Chapters Three, Four, Five, and Six</b>	<b>247</b>
<b>Appendix Four: List of Files on Accompanying CD</b>	<b>254</b>



List of Tables.

---

Table 3.1. Concordant Partitioning in Qualitative Characters ..... 56

Table 3.2. The Effect of Sampling on ‘Absolute’ Concordance ..... 79

  

Table 4.1. ‘Local’ Sympatric Occurrences Between Taxa of the *Polystichum*  
*neozelandicum* Complex ..... 110

Table 4.2. Definitions of Morphological Characters for Chapter Four ..... 113

Table 4.3. Distinguishing Characters for the *Polystichum neozelandicum*  
Complex ..... 113

Table 4.4. Allopolyploid AFLP Banding Patterns ..... 127

Table 4.5. Lineage Genetic Variation ..... 128

  

Table 5.1. Definitions of Morphological Characters Used in Chapter Five ... 153

Table 5.2. Rachis Scale Marginal Projections ..... 155

  

Table 6.1. *rbcL* Variation Amongst South-West Pacific *Polystichum* ..... 180

Table 6.2. Samples Sequenced (*rps4-trnS* spacer) and/or Analysed by AFLP for  
Chapter Six ..... 182

Table 6.3. Region of Ambiguous Alignment in the *rps4-trnS* Sequence ..... 183

List of Boxes.

---

Box 2.1. Similarity Species Concepts ..... 29

Box 2.2. The Operation of Population Aggregation Analysis ..... 35

Box 2.3. Doyle’s ‘Field For Recombination’ Approach ..... 35

Box 2.4. The Genealogical Species Concept ..... 38

# List of Figures.

---

Figure 2.1. ‘Paraphyly’ or ‘Polyphyly’ From the Sundering of a Reticulating Group .....	39
Figure 2.2. Absolute and Almost Concordance .....	41
Figure 2.3. Partitioning with Qualitative and Quantitative Characters .....	50
Figure 3.1. Concordant Partitioning With Quantitative Characters .....	58
Figure 3.2. Primer Map of the <i>rps4</i> Region .....	67
Figure 3.3. Splits From Binary Characters .....	77
Figure 4.1. Fronds From the <i>Polystichum neozelandicum</i> Complex .....	88
Figure 4.2. Stipe-Rachis Junction Scales From the <i>Polystichum neozelandicum</i> Complex .....	92
Figure 4.3. Indusia From the <i>Polystichum neozelandicum</i> Complex .....	93
Figure 4.4. Spores From the <i>Polystichum neozelandicum</i> Complex .....	94
Figure 4.5. Distribution Maps for the <i>Polystichum neozelandicum</i> Complex ...	95
Figure 4.6. Holotype of <i>Aspidium wawranum</i> Szyszyl. in Wawra .....	97
Figure 4.7. Lectotype of <i>Aspidium oculatum</i> Hook. ....	99
Figure 4.8. Holotype of <i>Polystichum neozelandicum</i> Fée .....	102
Figure 4.9. Lectotype of <i>Aspidium richardii</i> Hook. ....	104
Figure 4.10. Lectotype of <i>Aspidium zerophyllum</i> Colenso .....	106
Figure 4.11. A Putative Hybrid, <i>rWeb1</i> .....	109
Figure 4.12. Chromosome Preparations .....	112
Figure 4.13. <i>Polystichum neozelandicum</i> Complex Morphological Box-plots ...	114
Figure 4.14. <i>Polystichum wawranum</i> and <i>P. oculatum</i> Scatter-plot .....	116
Figure 4.15. <i>Polystichum neozelandicum</i> Complex Scatter-plot I .....	117
Figure 4.16. <i>Polystichum neozelandicum</i> Complex Scatter-plot II .....	118
Figure 4.17. Maps of <i>Polystichum neozelandicum</i> Complex AFLP Samples ...	120
Figure 4.18. Parsimony Splits-Graph of the AFLP Data .....	121
Figure 4.19. Bootstrap Analysis Under Parsimony of the AFLP Data .....	122
Figure 4.20. Bootstrap Analysis Under Neighbour-Joining of the AFLP Data ...	123
Figure 4.21. Distance-Spectral Analysis of the AFLP Data .....	124
Figure 4.22. AFLP of the <i>Polystichum neozelandicum</i> Subspecies .....	126
Figure 5.1. Fronds of <i>Polystichum vestitum</i> .....	137
Figure 5.2. <i>Polystichum vestitum</i> Rachis Scales .....	141
Figure 5.3. Distribution maps of <i>Polystichum vestitum</i> and <i>P. silvaticum</i> ...	142
Figure 5.4. Lectotype of <i>Polypodium vestitum</i> G. Forst. ....	143
Figure 5.5. Lectotype of <i>Polystichum venustum</i> Hombr. ....	144
Figure 5.6. Lectotype of <i>Aspidium pulcherrimum</i> Colenso .....	146
Figure 5.7. Lectotype of <i>Aspidium waikarense</i> Colenso .....	147
Figure 5.8. Lectotype of <i>Aspidium perelegans</i> Colenso .....	148
Figure 5.9. Map of <i>Polystichum vestitum</i> Morphological Samples .....	151
Figure 5.10. Map of Collection Sites on the Chatham Islands .....	152

Figure 5.11. <i>Polystichum vestitum</i> Box-plots .....	154
Figure 5.12. <i>Polystichum vestitum</i> Scatter-plot .....	156
Figure 5.13. Map of ‘North and South Island’ AFLP Sample Set .....	159
Figure 5.14. Parsimony Splits-Graph of the ‘North and South Island’ AFLP Data Set .....	160
Figure 5.15. Map of ‘Combined’ AFLP Sample Set .....	162
Figure 5.16. Parsimony Splits-Graph of the ‘Combined’ Data Set .....	163
Figure 5.17. Bootstrap Analysis Under Parsimony of the ‘Combined’ AFLP Data .....	164
Figure 5.18. Bootstrap Analysis Under Neighbour-joining of the ‘Combined’ AFLP Data .....	165
Figure 5.19. Distance-Spectral Analysis of the ‘Combined’ AFLP Data ...	166
Figure 6.1. Parsimony-Based Splits-Graphs of the <i>rps4-trnS</i> Spacer Sequence Data .....	185
Figure 6.2. Indel Genotyping .....	186
Figure 6.3. Neighbour-Joining Tree of the AFLP Data .....	190
Figure 6.4. Parsimony Analysis of the AFLP Data .....	191
Figure 6.5. Distance-Spectral Analysis of the AFLP Data .....	192