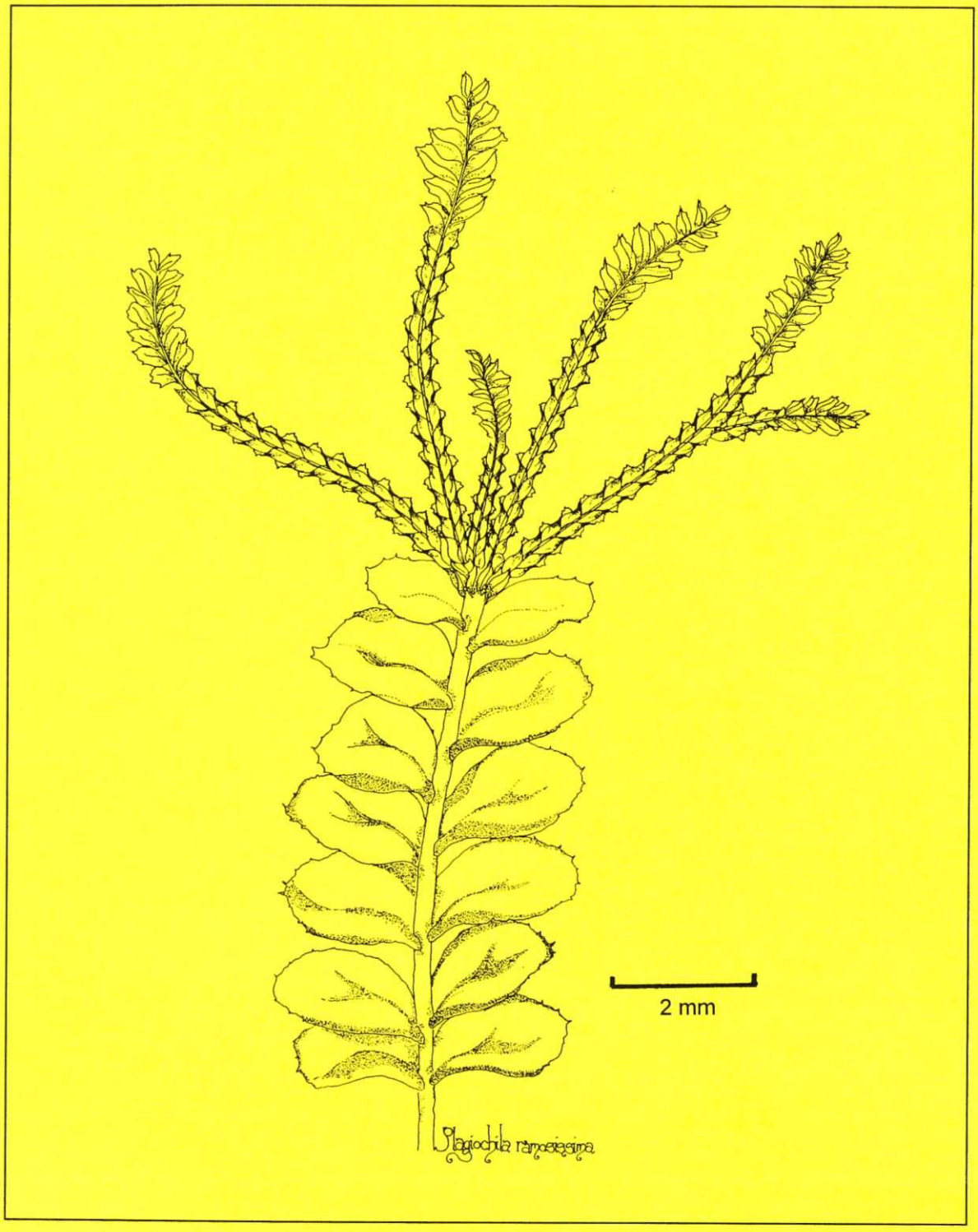
NEW ZEALAND BOTANICAL SOCIETY

NEWSLETTER

NUMBER 57 SEPTEMBER 1999



New Zealand Botanical Society

Subscriptions

The I999 ordinary and institutional subs are $18 (reduced to $15 if paid by the due date on the subscription invoice). The 1999 student sub, available to full-time students, is $9 (reduced to $7 if paid by the due date on the subscription invoice).

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New subscriptions are always welcome and these, together with back issue orders, should be sent to the Secretary/Treasurer (address above).

Subscriptions are due by 28 February of each year for that calendar year. Existing subscribers are sent an invoice with the December *Newsletter* for the next year's subscription which offers a reduction if this is paid by the due date. If you are in arrears with your subscription a reminder notice comes attached to each issue of the *Newsletter.*

Deadline for next issue

The deadline for the December 1999 issue (Number 58) is 26 November 1999.

Please forward contributions to:

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c/- Department of Conservation
PO Box 743
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Contributions may be provided on an IBM compatible floppy disc (Word) or by e-mail to cwest@doc.govt.nz

Cover Illustration

Plagioohila ramosissima with antheridial branches. Drawn by **Inge Andrew**, Department of Botany, University of Otago.

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New Zealand Botanical Society News

- **New Zealand Botany at the End of the Millennium: a celebration of Eric Godley's contribution. Lincoln University 16–18 June 1999**

Both a report on this conference and the edited highlights of Jessica Beever's Presidential Address can be found further on in this *Newsletter*.

Eric Godley would like to thank all those who helped organise the Millenium Symposium and made it such a happy occasion; and also thank all those who gave us so many good things to think about in their talks and the discussions.

The minutes of the General Meeting of the New Zealand Botanical Society held during the Symposium will appear in a future issue of the *Newsletter*.

- **Call for nominations**

Nominations are called for the following positions of Officers and Committee of the New Zealand Botanical Society for 2000:

President
Secretary/Treasurer
3 Committee Members.

Nominations for all positions opened 1 September 1999 and close on 20 November 1999. Nominations shall be made in writing to the Secretary, and shall be signed by the Proposer, the Seconder, and by the Nominee to indicate their acceptance of nomination. If necessary, ballot papers for a postal election will be circulated with your December *Newsletter*.

Anthony Wright, Secretary, New Zealand Botanical Society, C/- Canterbury Museum, Rolleston Avenue, Christchurch 8001

- **Allan Mere Award**

To commemorate the outstanding contributions to New Zealand botany by Dr H.H. Allan, first Director of Botany Division DSIR, Dr Lucy Moore gifted a handsome greenstone mere, to be presented periodically to deserving members of Botany Division staff. Since the disestablishment of DSIR it has not been possible to fulfil the original purpose of the award. The New Zealand Botanical Society, and Landcare Research, in consultation with members of her family, have decided that Dr Moore's intentions for the Mere would best be met by having members of the New Zealand botanical community at large eligible for the Award. At its General Meeting in June 1999, the Society agreed to administer the new Award. Amended conditions follow:

Conditions of Allan Mere Award

1. The Award shall be made annually to a person or persons who have made outstanding contributions to botany in New Zealand, either in a professional or amateur capacity.

2. The award shall be administered by the New Zealand Botanical Society.

3. Nominations for the Award may be made by regional Botanical Societies, or by individuals, to the Secretary of the New Zealand Botanical Society. Nominations shall close on 30th June each year, except in 1999, when nominations will close on 1 November. Nominations shall be signed by a nominator and seconder, and accompanied by two copies of supporting information that must not exceed one A4 page.

4. Selection of the successful nominee/nominees shall be made by the Committee of the New Zealand Botanical Society, normally within three months of the closing date for nominations.

5. If, in the opinion of the Committee, no suitable nomination is received in any particular year, the Committee may refrain from making an award.

6. The Mere shall be formally presented to the recipient on an appropriate occasion by the President of the New Zealand Botanical Society or his/her nominee, but otherwise shall remain in the custody of, and be displayed by, the Herbarium Keeper of CHR at Landcare Research, Lincoln, together with the book recording awards.

7. The recipient shall receive an appropriately inscribed certificate.

Acknowledgement
The committee thanks Peter Wardle for resurrecting the Allan Mere Award.

Jessica Beever, President, New Zealand Botanical Society

Regional Botanical Society News

■ Auckland Botanical Society

June Meeting
Dr David Williams, an independent researcher with interests in legal history and treaty claims, spoke on the Wai 262 Fauna and Flora Claim. This claim proposes that the Treaty of Waitangi confers on Maori priority rights to protect and use Aoteoroa's plants and animals. Although Dr Williams pointed out that Maori and Pakeha have different relationships with the land, particularly with regards to ownership, the general feeling of the meeting was one of frustration that the intentions of the claimants could not be clarified.

June Field Trip
Kauri Glen is an interesting kauri/podocarp/broadleaf forest surrounded on all sides by the suburbia of Northcote. A neighbour guided the party over the various tracks in the bush. While surprising that such a fine reserve exists in the city, it demonstrates well the problems that humans bring, with weeds, litter, and graffiti spray-painted on the kauri trees. Sharp eyes spotted the orchids, *Corybas cheesemanii* and *Pterostylis brumalis* in flower.

Lunch at the Fernglen gardens was followed by a tour of the botanical treasures collected by Muriel and Bill Fisher over many years. Three Kings endemics were thriving, as was an unusual sight in Auckland, *Cordyline indivisa*. Excitement prevailed when a speckled grey gecko was spied on the speckled grey bark of a coastal maire, *Nestegis apetala*.

July Meeting
A large gathering of 60 members enjoyed a tour of the new natural history galleries at the Auckland Museum. The four galleries cover Origins, Land, Oceans and Human Impacts. The hour or so available meant that only a superficial viewing was possible, but gave an overall picture of the layout and the variety of natural habitats represented. Of interest to a group with botanical leanings was the way that plant material had been preserved by various methods and used in the displays, from the cryptic alpine scree plants to a large kauri tree. For the children present the prize would have to go to the rock pool full of large crabs and starfish that, thanks to a sheet of very strong glass, could be walked over.

July Field Trip
Wet weather and copious weeds didn't dampen the enthusiasm for this outing to Auckland's rock forests. The steepest cliffs of Government House and Eden Gardens, having been modified so substantially over the years, are now being left to allow their natural rock forest covering to regenerate with only the minimal intervention of some judicious weeding. The mangeao seedlings were particularly prolific here and ferns were beginning to colonise again.

Withiel Thomas Reserve is the better preserved of the two remaining remnants of the original forested lava fields of the city. It has been lovingly tended and zealously protected by the owner for over half a century. Here mangeao, titoki, mahoe and houpara abound. Almorah Road rock forest is an old, neglected city garden

blanketed by wandering jew and with huge old flame trees falling into the ancient carriage way. Here were pigeonwood, kohekohe, puriri and several king ferns growing in an inhospitable jumble of rock.

These four remaining examples of Auckland's rock forest had everyone wishing that there was some way they could be better preserved and that they could be more accessible to those with an interest in them.

August Meeting

First, Dan Blanchon spoke on the work he did for his PhD on the genus *Libertia* in New Zealand, Australia, Chile and Papua New Guinea. He found that the Australian *L.. pulchella* was not the same as the New Zealand species of the same name. Three new species have been split off and have been named for three respected women botanists, the Lucies, Moore and Cranwell, and Elizabeth Edgar.

The second speaker, Revell Drummond, studied *Metrosideros bartlettii* for his Master's thesis. The only white-flowered tree rata in New Zealand was found in 1975 by John Bartlett near Te Paki, and to date only three populations have been located, at Te Paki, Kohuronaki, and the largest number at the Maori owned Unuwhao Bush. DNA tests have shown that *M. bartletti* is quite distinct from *M. excelsa* and *M. robusta* and is not hybridising with either.

August Field Trip

After a ferry trip to Islington Bay on Rangitoto Island, DOC worker Sandra Wotherspoon guided us for the day. A ride in 4WDs to the WWII gun emplacements started the outing, then it was on foot to view the native conservation plantings that have been undertaken largely by volunteers. The largest area of natural bush on the island was explored. Owing to the recent reduction in rabbit numbers the ground was covered with thickets of seedlings, mostly of kohekohe, mangeao and karaka. Some plants of *Hypolepis dicksonioides* were found. Back on Rangitoto there was time to hunt for old favourites *Psilotum nudum* and *Asplenium flabellifolium* before the ferry arrived.

Forthcoming Activities: Evening Meetings

1 September	Talk and book launch on Auckland orchids, Ian St George
6 October	Lucy Cranwell Lecture, Matt McGlone
3 November	Conservation in South America, Bec Stanley

Field Trips

18 September	Orchids on the Farley Track, Waitakere, Sandra Jones
16 October	Waikumete Cemetery wildflowers, Leslie Haines/Mike Wilcox
20 November	Ponui Island, Ewen Cameron

Maureen Young, 36 Alnwick Street, Warkworth

■ Wanganui Museum Botanical Group

November 1998 Field Trip: Tricker's (Leedstown) Bush and Gower's "Malvern Hills", Mount Curl

A party of seven visited these two patches of native bush. Leedstown Bush is privately-owned, about 2.5 ha and fenced from stock. Some 35 species of trees and shrubs and 22 ferns were listed. There was an unusually large number of pokaka (*Elaeocarpus hookerianus*) trees on the lower flat. Elderberry was widespread. Gower's Bush is some 10 ha. Near the track to the woolshed is a large northern rata tree that the owner says was 11.6 m in circumference in about 1996. The bush is electric fenced and lies in a basin on the western slopes of Mount Curl, at about 300 m above sea level. Two specimens of raukawa (*Raukaua edgerleyi*) were discovered. Kaikomako was in full flower and showy.

February 1999 Field Trip: Rotokura Lake, near Karioi and McConachies' garden near Ohakune

Seven members from Wanganui were joined by three more at the Rotokura Lake car park. We walked up the wide track, passing red beech in the valley on our right and had numerous stops to look at smaller shrubs etc on the banks. *Coprosma robusta, C. tenuifolia, C. propinqua, C. rhamnoides, C. grandifolia, C. rigida, C. lucida* and some hybrids, probably involving the first three species, were seen in this area. We passed the 'Dry Lake' which had water in it and it was disappointing to see a few plants of buddleia and heather (*Calluna*) in the open area. Into the bush again where some attractive groups of crown ferns grew and also *Alseuosmia turneri*, with berries just starting to colour, and we met the track that skirts Rotokura Lake. At groups of beech

seedlings, some of us learnt to distinguish red, silver and mountain beeches. *Dianella nigra* fruits were numerous, some white and others through shades of blue. New to us was the climbing fern, *Microsorum (=Phymatosorus) novae-zelandiae.* Following lunch, a visit to the McConachies' garden revealed a lot of plant treasures well adapted to the cold Ohakune climate. The large garden has a pond and an exciting roadside bank planted right to the edge of the seal.

March Field Trip to Barrett's forest, near Pukeiti on Carrington Road, New Plymouth

Four of us travelled from Wanganui to the Barrett's farm, where Stuart Collins, a friend from New Plymouth, joined our party. The Barrett forest is one of the largest patches outside the National Park on the Egmont ring plain. It had been recommended for protection in the 1986 PNAP survey, but no detailed inventory of plants had been made of it. Kamahi was mostly the dominant tree, with some emergent northern rata. Past logging had removed the expected podocarps, for we saw only a few rimu, Hall's totara and miro, all of them saplings or young trees. Ferns were particularly common, including 12 species of filmy ferns. Coming from Wanganui, we found *Trichomanes elongatum* the most novel of these. To see *Blechnum nigrum* as a locally common fern was unusual too. We explored just the upper end of the forest patch, at about 420 m. The forest we saw was a mix of species that included typical lowland forest plants and others of montane forest. The lowland *Collospermum hastatum* and upland *C. microspermum* grew side by side, with other lowland plants like mamaku, pukatea, rangiora, climbing blechnum, *Griselinia lucida,* rata vines and hangehange. More typical of montane forest in Taranaki were raukawa, Hall's totara, toro, *Coprosma tenuifolia, Viola filicaulis* and *Rubus australis.* It would be interesting to visit the lower end of the forest at 320 m, to see whether there are species changes with altitude.

We also paid a short visit to Stuart's garden in New Plymouth. Even from the street we could see that Stuart's a native plant enthusiast – how many other gardeners have their front entrance pergola covered in leafless lawyer (*Rubus squarrosus*)? There were many different divaricating shrubs, including *Coprosma obconica* and *Pittosporum obcordatum.* Quite a sight, in a province whose native vegetation is notable for the very few species that divaricate!

Early May Field Trip to Kawhatau Valley

Nine people went on this trip to the Abrahams' farm. Ted led us first to a paddock with a seemingly unpromising scatter of bedraggled native shrubs and trees. Up close, we found *Coprosma rigida* shrubs were the most numerous, and many were hosts to *Ileostylus micranthus. Ileostylus* had not been recorded this far inland in the district before. One *Ileostylus* was on lawyer, *Rubus schmidelioides.* One recently dead tree of *Pittosporum eugenioides*, possibly a victim of last summer's drought, supported a large shrub of *Tupeia antarctica*, also dead. *Korthalsella lindsayi* was found on four host species: *C rigida*, *C rubra*, rohutu and weeping mapou. After lunch with our hosts, we spent some time in two small patches of bush recently closed off from stock. In one, there is a stand of almost pure totara, varying in diameter from 15 cm to 30 cm. Regeneration of native species has begun but, rather worrying were the many young woody weeds, including Chinese privet, spindle-tree (*Euonymus europaeus*) and cotoneasters. There was a climbing spindle-berry (*Celastrus orbiculatus*) smothering a corner of the homestead garden. It's a vine that is causing great concern to reserve managers in the Central North Island, but there is no other record of it in the Rangitikei.

July 1999 Field Trip to Bason Botanical Reserve and Nga Rakau plant nursery

The District Council's Bason Reserve lies about 6 km towards Kai-iwi Beach from Wanganui city. It was a farm that is now being planted in exotic and native species, although there's no comprehensive list of these plantings. Eucalypts, conifers and camellias have been planted in separate groves, and there are scattered trees like *Melaleuca* and a lovely young *Brachychiton.* In one place, *Acacia elata* is naturalising quite happily. On a flat, water-logged terrace we debated about the site's suitability for the pohutukawa and other *Metrosideros* species and hybrids planted there, and we wondered why the rewarewa were planted in a grove with every tree about 4 m from its neighbour, just as had been done with puriri and pohutukawa. A planted grove of young native beeches looked very unhappy – the semi-coastal situation made us wonder why beeches were chosen. After lunch, we drove to Nga Rakau nursery, owned by one of our group's members, Fiona McGowan. She grows a good range of native and exotic plants, mostly trees and shrubs, and has an amazing collection of bonsai plants, some of them native species.

Late May Field Trip: Putiki, Wanganui

George Jones from the Wanganui Tree Trust led a party of eight to a fenced and covenanted forest remnant just outside the city boundary. George showed us the work that the Trust is doing in replanting damaged

areas, using local seed sources. Most notable in one remnant are two wharangi trees (*Melicope ternata*). These are the only known natural trees of the species in the Wanganui district between Waitotara in the north and Otaki in the south. *Doodia australis* grows below one wharangi and is also very rare in the district. This forest is on a steep slope with a dense ground cover of periwinkle (*Vinca major*) and patches of gorse, making the descent through the mostly scattered trees to the open valley below a perilous adventure. Despite the many vigorous adventive plants we identified over 50 species of native trees, shrubs, herbs, grasses and ferns, including several not observed when the original plant list was compiled in 1995. The remnant was mainly composed of mahoe, kohuhu, ngaio and kawakawa but a grove of brush wattle (*Paraserianthes lophantha*) should be dealt with before it spreads. Trees planted by the Trust were seen and appeared to be established, but only one planted wharangi, about 40 cm tall, was found, the rest probably having been eaten by possums. Some possum control has recently been carried out so hopefully the health of the remnant will improve.

Forthcoming Activities: Evening meetings
First Tuesday each month in the Wanganui Museum's Davis Lecture Theatre; commencing 8 p.m. daylight saving time; 7. 30 p.m. winter time.
7 September: George Jones: Wanganui Tree Trust
5 October: Workshop evening on Leguminosae: one family or three? Co-ordinator: Colin Ogle
2 November: Dr John Dawson: flora of New Caledonia
7 December: Christmas Social Evening
1 February 2000: Gary Clapperton: Eastwood Hill, Gisborne
7 March: Jocelyn and Ian Bell: Tasmania

Field Trips
Saturday 4 September – Junction Road, Kai-iwi.
Sunday 3 October – Lamb Hill and Oneida homestead gardens
Sunday 31 October – Castlecliff Dunes
Sunday 5 December – Anderson's Bush, Western Line, Westmere
Sunday 30 January 2000 – Mt Curl
Thursday 17 February – Picnic tea in Clive and Nicki Higgie's garden
Sunday 5 March – Paengaroa Scenic Reserve, Mataroa

The field trip reports above were paraphrased and condensed from members' trip reports.

Colin Ogle, 4 Brassey Road, Wanganui

■ Nelson Botanical Society

This winter has been unusually wet for Nelson with the July and August field trips cancelled; hence there is only one to report on.

June Field Trip Report: Motueka Estuary
A large contingent set out from the end of the esplanade for the Kumaras on a brilliant winter morning. We were soon exploring the saltmarsh turf of glasswort (*Sarcocornia quinqueflora*) and *Suaeda novae-zelandiae*. Scattered amongst the dense mat were the odd *Spergularia rubra*, still in flower, and tufts of the common salt marsh grass, *Puccinellia stricta*. On the shore a huge range of weeds included patches of pampas. Fortunately recent plantings near the start of the walkway were of the native toetoe, ngaio, flax and a range of native shrubs; almost an island in a desert.

Even out on the spit the landscape was dominated by marram, introduced grasses and adventive weeds. At our lunch spot a clump of the native sand sedge, *Carex pumila* was another gem in an otherwise adventive-full landscape. After lunch the revegetation area, now mostly in tall ngaio was circumnavigated. Here we saw the first saltmarsh ribbonwood, at first in the distance and then later close at hand. Finally a freshwater swamp was explored. This was dominated by raupo but also contained *Mimulus repens* and *Bolboschoenus fluviatilis* and was fringed with recently planted salt marsh ribbonwood along with a range of other native shrubs and trees.

September 19	George Creek
October 17	South Branch Riwaka
November 21	Dew Lakes
December 19	Inwoods Lookout – Gordon's Knob

Graeme Jane, 136 Cleveland Terrace, Nelson

Obituary

■ Grace Marie Taylor – nee Bulmer (1930–1999)

Marie went to New Plymouth Girls' High, and early on she distinguished herself academically, and showed a special interest in science, enrolling as a astronomical sunspot observer, and going up to Duncan and Davies nursery to learn the names of native plants. She must have been captured by the fascination of plants early on as she enrolled at Victoria University for a BSc, and continued to do an MSc honours, specialising in botany, and writing a thesis on the life cycle of a species of *Ourisia*. She aimed to become a teacher, and completed her professional teacher's qualifications at Auckland Teachers College, a few years later. Teaching positions at Wellington Girls' College followed, a trip overseas, and then some lab demonstrating at Victoria University, which offered her the opportunity to do more field work, and rejoin the university botany scene. Marie quickly proved her worth, rising a year or two later to the position of lecturer in botany, a position that she held until the birth of her son Michael. During this time Marie's interest in native plants grew and flowered. She loved the field trips and took an active part in the botanical society. She wrote several taxonomic papers, and keys to the plant groups which have always been difficult to identify. Her key to the divaricating shrubs in the NZ flora is still an essential part of a plant student's resource kit, as also is her key to the important NZ genus *Coprosma*, which contains so many interesting endemic plants.

Marriage and children interrupted Marie's career for a few years, and during that time the family moved to Oamaru where they stayed 10 years and Marie did some teaching at local schools. Living in the South Island opened up new botanical areas to Marie, and the family spent time exploring and botanising in the forests and alpine areas. At this time Marie started on the studies which were to capture her interest for many years to come, the fungi, and in particular the mushroom group, the agarics.

When the family moved to Auckland in 1971, Marie obtained a position at Auckland University and she moved on to become senior tutor in the botany department, a position which she held for twenty years. She was well suited to this position; it demanded her teaching skills and her academic skills. As senior tutor she was in charge of the laboratory part of the courses at all levels. Marie's Stage 1 lab course in the 1970s had about 100 students, by the late 1980s there were over 700 students in the Stage 1 biology class. It was a challenge to teach such large numbers a comprehensive practical course, the logistics of just getting enough material, and organising meaningful experiments was difficult, and in addition there was the problem of making sure that inexperienced students did not wreck expensive equipment, such as the microscopes. She was a dedicated teacher who would spend endless time and effort with those students who did not have sufficient background for the rigours of university study and were having difficulties with the course. Her standards were high, however, and she did not brook sloppy careless work. In her own work she was meticulous, recording every detail in those beautiful, acutely observed drawings for which she became famous.

Apart from her teaching, Marie also followed her own research bent, and produced several specialist papers on the classification of fungi and a beautiful scholarly little book "The Mushrooms and Toadstools of New Zealand". This was followed a few years later by a field guide to the mushrooms and toadstools in the Mobil series. These books were particularly notable for being illustrated with Marie's own water colour paintings, which combined rigorous botanical accuracy with a delicate beauty making them works of art as well as valuable references. I think they also reveal that Marie's scientific skills were rooted in a deep love of the beauty and variety found in the natural world, and this also was the source of the enthusiasm which made her an inspirational teacher.

As a colleague, Marie was generous with her time and her knowledge. One of the communications which Lawre received during the last few weeks from Dr Ann Bell, her friend at Victoria University, recollected how Marie had spent one of her holidays collecting 'possum dung' for her friend's research. This was typical. As

recently as January this year, I spent a few days with Marie and a group of friends at the Forest and Bird Lodge at Mt Ruapehu. One of our missions was to find a certain little alpine plant, with flowers on, to send to one of Marie's former students now at the Royal Botanical Gardens in Sydney, who is studying the family Epacridaceae.

During the last two or three years, through her time of illness, Marie has struggled to complete her latest project – the editing of a new publication 'The botanical names of the NZ flora'. With her usual meticulous scholarship, she has completed this large project, and it will be published with the help of the Auckland Botanical Society during the next few months. There is also the possibility of a re-issue of her 'Mushrooms and Toadstools', with updated drawings and text. The scientific community will look forward to that.

A host of Marie's former students and colleagues, now spread all over the world, will remember her inspiration, her enthusiasm for the wonderful variety of life forms, and microscopic beauties. She influenced a whole generation of botanists to share her enthusiasms and enriched our lives in the process. She will be greatly missed.

Catherine Harvey, HortResearch, Private Bag 92170, Auckland

CONFERENCE/MEETING REVIEWS

■ New Zealand Botany at the End of the Millenium: a celebration of Eric Godley's contribution. Lincoln University 16–18 June 1999

It was our pleasure to be among the more than 110 botanists gathered at Lincoln University for the New Zealand Botany at the End of the Millennium Conference. This conference was organised by a special subcommittee of the New Zealand Botanical Society to celebrate Eric Godley's contribution to New Zealand botany on the occasion of his 80th birthday. Not since the joint conference with the Australian Systematic Botany Society, held in Auckland in November 1991 (see *New Zealand Botanical Society Newsletter 26*: 20–29), has there been such a congregation of New Zealand botanists. Excellent planning and organisation was the hallmark of this conference. From receipt of the Conference Abstracts well in advance of the conference, to a first class venue, exceptional catering, and a constant flow of well-prepared presentations, this conference rated as one of the best we have ever attended. Forget about the high budget conference (sometimes known as a WINZ conference) or the overseas conference with its numerous poor presentations from so called leaders in the field - this two day conference was superb. We cannot describe all the highlights as there were so many amongst the 32 presentations and eight poster papers (see list below). But *some* of the highlights were: the energetic and humorous delivery from the most senior presenter Geoff Baylis on what else but mycorrhizae; the exquisitely poetic and artistic contribution from Peter Johnson; Mary Kalin-Arroyo's courage and perseverance in the face of ill health to give us a thought-provoking address on biogeographical patterns and conservation of the central Chile flora; Phil Garnock-Jones' timely call for emphasis on evidence and explicit statements of species concepts; and Andy Thomson's carefully crafted and understated account of the achievements of New Zealand women in botany. Hopefully many of the presentations will eventually be published so that the wider botanical community can access them.

The conference dinner on the Tuesday night (attended by 90 people) provided a different kind of botanical treat as the younger generation of botanists was given an insight into the contribution of those who have led the way. Henry Connor, Geoff Baylis and Eric Godley all gave typically classic addresses that in essence illustrated the sheer joy that results from dedication to botanical research. We were left wondering why these presentations had not been recorded for perpetuity, but then perhaps this makes them even more memorable.

We eagerly look forward to the next New Zealand Botanical Society Conference. There will be other important occasions in the not too distant future, which will provide similar opportunities for the Society to organise botanical gatherings that are so essential for making and maintaining contact.

Oral and poster presentations were as follows. A file containing the conference abstracts is available upon request from either of the e-mail addresses given below.

Speakers

Day 1: 17 June 1999

Presidential Address		Jessica Beever: The South American connection—a bryologist's view
Biogeography		Chairperson: David Galloway
1.	Mary Kalin Arroyo	Biogeographical patterns and conservation of the Mediterranean-type climate flora of central Chile
2.	John Lovis	Long-distance dispersal reviewed in relation to the development of the New Zealand flora
3.	Matt McGlone	Rethinking 1985: landform, climate, and species distributions in New Zealand
4.	Peter Lockhart	Long distance dispersal and recent radiation of Australasian buttercups
5.	Peter Wardle	Following Eric Godley in the Beagle's wake; botanical relationships between southern South America and New Zealand revisited
6.	Bill Lee	Extinction events and synchronous radiations in the New Zealand flora – the role of environmental sieves and adaptive zones
Plant Systematics		Chairperson: Murray Parsons
1.	Phil Garnock-Jones	Systematics: opinions, ideas and tests
2.	Ilse Breitwieser	Systematics and evolution in New Zealand Gnaphalieae (Compositae)
3.	Peter Heenan	Reappraisal of the *Sophora microphylla* complex
4.	Wendy Nelson	Their names remain: acknowledging the collectors of New Zealand seaweeds 1769–1969
Reproductive Biology		Chairperson: Janet Wilmshurst
1.	Colin Webb	Progress toward understanding the reproductive biology of the New Zealand flora
2.	Colin Burrows	Experiments on the persistence of live seeds of New Zealand forest species in the soil
3.	John Braggins /Mark Large	The dioecious nature of *Dysoxylum spectabile* (Meliaceae) in New Zealand
4.	Alistair Robertson	Sexual promiscuity in our flora?: getting quantitative information on New Zealand plant-pollinator systems

Day 2: 18 June 1999

Conservation		Chairperson: Alan Mark
1.	Bruce Clarkson	Conservation at the end of the century: challenges, crises and contradictions
2.	Warwick Harris	Plant provenance variation and ecological restoration
3.	David Wardle	Plant species effects in ecosystems: the role of biotic interactions and feedbacks
4.	Carol West	Subantarctic botany: key players and issues
5.	Geoff Rogers	A taxonomic and ecological spectrum of plant rarity in NZ
6.	Ross Beever	Phytoplasmas: a new scourge of New Zealand plants?
7.	Peter Williams	Kanuka and gorse compared at close range
Botanical History/ Popular Botany		Chairperson: Hugh Wilson
1.	Peter Johnson	Botany for boffins: plants to the people
2.	David Galloway	William Jackson Hooker, botanical imperialist: his influence on New Zealand botany
3.	Brian Molloy	George Bennett: the forgotten collector
4.	Andy Thomson	Achievements of New Zealand women in botany
5.	Allan Fife	TWN Beckett, a neglected figure in New Zealand botany
Plant Morphology and Function		Chairperson: Wendy Nelson
1.	Kevin Gould	Moas to fairies: probing the design of New Zealand's more eccentric plants
2.	Geoff Baylis	From *Rhizophagus* to MD (Mycorrhizal Dependence)
3.	Jo Ward	The relevance of morphology in modern taxonomy

Posters

1. Wakelin, A.M.; Conner, A. J.; Reader, J. K.; Lister, C. E.: Inheritance of carotenoids in Californian poppy
2. Collins, L.; Merrett, M.: Ecology of the 'rare' small tree *Pomaderris hamiltonii*
3. Salter, J.: Comparative embryology and pollen hydrodynamics of matai (*Prumopitys taxifolia*) and miro (*P. ferruginea*), Podocarpaceae
4. Auckland Regional Botanic Gardens: New Zealand coastal *Lepidium*: a genus at risk
5. Wilson, H.: Hinewai Reserve — a decade of restoration
6. Merrett, M. F.; Clarkson, B. D.: Taxonomy and ecology of *Alseuosmia quercifolia*
7. Cliffin, P.: Rediscovering the urban forest: tree collections in Auckland
8. Outred, H.: Studies on epiphytic algae in the New Zealand flora

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■ The South American Connection – a bryologist's view

Edited version of NZ Botanical Society Presidential Address, Lincoln, 17 June 1999

In January 1997 I followed the footsteps of Eric Godley and journeyed to South America, to attend the Southern Connection conference in Valdivia, Chile. We stepped off the plane at the latitude of Palmerston North, and into a van for the run into town. I began to take an interest in our surroundings – and was overwhelmed by their familiarity. In those first impressions we were looking at exotic plants, gorse, blackberry and the same familiar European grasses on the roadside – in the paddocks lombardy poplars and macrocarpas. In the next few days Peter Johnson and Carol West made a list of cultivated ornamentals in the garden at their accommodation (13). They noted 106 species, all but three of which would be commonly found in gardens at comparable latitude in New Zealand. They also recorded the garden and wayside weeds in Valdivia: there were only seven which they did not immediately recognise as naturalised weeds also in New Zealand. We also saw plants that are exotic in Chile but indigenous to New Zealand, such as, *Phormium tenax*, growing vigorously with gorse on the coast near Valdivia. So the message that hit us, so strongly, even before we got into the Chilean indigenous vegetation – if a plant that grows well in New Zealand can get to Chile, it may well flourish here too.

We soon did get into the indigenous vegetation, on a mid-conference field trip to the Valdivian rain-forest in Puyehue National Park. Here, on the big scale, it felt a lot like home. Thirty-eight per cent of native vascular plant genera found in New Zealand occur also in Chile (Table 1). At the species level, however, only 2% of the indigenous vascular plants found in New Zealand occur naturally also in Chile. But amongst the cryptogams, the situation is different. The moss flora in Chile was delightfully familiar to a New Zealand bryologist. Thirty-three per cent of New Zealand's native moss species are recorded in a recent moss checklist for Chile (11).

Table 1: Comparison of the Floras of New Zealand and Chile

	NZ total species	Chile total species	Species in common	Species in common (% NZ flora)	Genera in common (% NZ flora)
Vascular plants (native)	2085[19]	4672[17]	48[17]	2.3	38[17]
Flowering plants (native)	1873[19]	4538[17]	34[17]	1.8	36[17]
Gymnosperms (native)	20[19]	16[17]	0[17]	0	33[17]
Ferns (native)	192[4]	118[18]	14[18]	7	40[18]
Mosses (total)	523[8]	775[11]	176	34	64
Mosses (native)	511[8]	?*	169	33	64

* no distinction between indigenous and introduced

In the moss genus *Fissidens* 24 species are recognised in New Zealand, three of which are deemed to be introduced (1, 3, 8). Seven of the 21 New Zealand native *Fissidens* are recorded for Chile, namely *F. adianthoides, F. asplenioides, F. berteroi, F. curvatus, F. tenellus, F. oblongifolius*, and *F. rigidulus*. Thus, within this single genus also, one third of the species are in common between the two countries. The percentage of native species in common for mosses is comparable to the percentage of native genera in common for vascular plants (Table 1).

This high proportion of mosses in common between New Zealand and other land masses is a well established phenomenon. Our bryological literature has always been international. J.D. Hooker wrote in 1854 "I have endeavoured to give, in 'The Flora of New Zealand', accurate descriptions of all the Flowering Plants and Ferns. The Mosses, Hepaticae, Lichens, Fungi etc are so numerous....that they cannot all be described. As the greater proportion of them are common to other countries, and published in other works, few, except new species, will be characterised or figured here." (12).

Why then are there so many moss species in common between New Zealand and Chile, compared with vascular plants? I would like to discuss 3 possible hypotheses.

Firstly, it has been suggested (e.g., 5) that mosses are more slowly evolving than the vascular plant groups. Hence taxa with a common Gondwanic origin, that separated in the Cretaceous, 80 million years ago, are still conspecific. Currently a number of laboratories are accumulating molecular data pertinent to this question. These data will need correlation with the fossil record, which unfortunately is meagre for mosses. It provides some evidence for slower evolution, but so far does not indicate the existence of extant species 80 million years ago.

Secondly, long distance dispersal may occur more often for mosses than for vascular plants. *Entosthodon laxus* (Funariaceae) provides a convincing example of a moss that has dispersed between New Zealand and South America on the prevailing westerly winds (9). It also occurs on subantarctic archipelagos of Tertiary or Quaternary age, e.g., Kerguelen and Marion Islands, which must have been colonised since the break-up of Gondwanaland. The species is monoicous, so a sexually reproducing colony could be established from a single spore. It occupies bare humic soil in subalpine and alpine environments, sites which would allow relatively unimpeded spore ejection into the air streams, and settlement at the other end. How tough are moss spores? Van Zanten (21) measured the resistance to desiccation and freezing of spores of 156 taxa of New Zealand mosses. A correlation was found between resistance of the spores and the extent of the geographic range of the taxon. Least resistant were the taxa endemic to New Zealand, while most resistant were cosmopolitan species, such as *Bryum argenteum* and *Ceratodon purpureus*. This correlation is compelling evidence that long distance dispersal has occurred. In addition to spores, many species of moss have asexual brood bodies, such as the rhizoid gemmae found on *Fissidens taxifolius*. These resistant clusters of cells, c. 0.5 mm in diameter, produced on rhizoids in the soil, provide a soil-borne dispersal mechanism. Leaf gemmae are clusters of cells specialised for aerial dispersal, seen, for example, in *Calyptopogon mnioides*. Mosses regenerate readily from vegetative fragments. This totipotency must also be an important factor in dispersal. Many species are poikilohydric, remaining alive when dried out. *Grimmia pulvinata* has been reported to grow after 79 years in the herbarium (16). Thus, there is the potential for dispersal of mosses merely as dried fragments. Long distance dispersal need not occur only once for a given species. There is the possibility of continual gene flow, so that genetic similarity is maintained over geological time scales. The very small chance of a successful dispersal event should not be seen as an argument against this hypothesis – as John Lovis reminds us (15), we are trying to distinguish between "the highly improbable and the truly impossible".

A third hypothesis as to why moss species are more widespread than vascular plants is that more mosses may be introduced than we currently recognise. Perhaps the truly indigenous moss flora of New Zealand is a lot lower than the estimate of 511 species given in Table 1. The naturalised vascular plant species in New Zealand now exceed the native, 2109 to 2085, a 1:1 ratio (19). For mosses we are working on a ratio of 1: 30. Allan Fife listed 12 adventive mosses for New Zealand in 1995 (8), and two more have been recognised since: *Fissidens bryoides* (3) and *Rhytidiadelphus triquetrus* (7). Six of these are also recorded in Chile (11), and a seventh, *Pseudoscleropodium purum*, I collected there in 1997 (voucher CHR 531234), but whether these are introduced in Chile is unknown. While many of our naturalised vascular plants have indeed been introduced to New Zealand deliberately, for horticulture for example, and then escaped into the wild, this would not be the case for mosses. So, we should expect more vascular than bryophytic adventives. But there is good evidence that many of our alien vascular plants came to New Zealand accidentally. In 1896 Thomas Kirk recorded 104 species of plant sprouting in ship's ballast from Buenos Aires, unloaded at Wellington (14). This was the vascular plant total, but there were no doubt mosses as well. Alan Esler, in his study of naturalised vascular plants in urban Auckland (6), classified 322 of the 615 species as accidental immigrants, coming as impurities with seeds, or as passengers in soil and packing material around other plants. So too, mosses must have arrived. The numerous diaspore types available for natural dispersal are, of course, also

eminently suitable for human-assisted dispersal. Spores, gemmae and plant fragments are all potential agents.

It is not easy to judge whether a moss species is introduced, and I am suggesting we err on the conservative side. In the genus *Fissidens* the evidence for *F. taxifolius* being introduced is compelling (2), less so the evidence for *F. bryoides* and *F. exilis*. But perhaps other widespread taxa that have never been considered as adventives should be, such as *F. adianthoides* and *F. curvatus*. The latter occurs on naturally generated bare soil in New Zealand forests, and is also common in human modified habitats. But perhaps it has moved into the natural habitats from the anthropogenic, rather than the converse.

Molecular data indicating close genetic similarity is good evidence of recent movement of plants. Examples from the flowering plants are the two species of *Hebe* which occur in both New Zealand and Chile, *Hebe salicifolia* and *Hebe elliptica*. These have almost identical sequences in the ITS region of their ribosomal DNA (20), indicating that dispersal has occurred relatively recently, as indeed Eric Godley postulated for these taxa 30 years ago (10). However, such genetic similarity is insufficient evidence in itself to distinguish between natural and human-assisted dispersal.

The observations of jet-lagged botanists on arrival in South America indicated that we had come to a botanical environment much like that we had left in New Zealand – plants that could make the journey should thrive. For the mosses, many do thrive on both these land masses – but how they made their journeys is yet to be elucidated.

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NOTES AND REPORTS

Plant Records

■ *Aciphylla leighii* – a nival zone speargrass from the Darran Mountains, Fiordland

Introduction
Aciphylla leighii is a poorly known cushion speargrass from the Darran Mountains, between Milford Sound and the Hollyford Valley, Fiordland. Collections are few, perhaps because of remoteness and the precipitous terrain of its habitat, and little is known of its ecology and biogeography. Following recent fieldwork we now have greater knowledge of this species throughout the Darran Mountains.

Taxonomy

The species was discovered in the 1930s by D. Leigh on a climb in the Darran Mountains. He described cushions to six feet in diameter (Allan 1939). However, the scientific origin of this species was less than auspicious. The type consists of a male inflorescence only (CHR 19011), apparently because the vegetative portion of the original collection was misplaced during taxonomic description (Allan 1939). *A. leighii* is a blunt-tipped and rigid-leaved speargrass, with rosettes compressed into low, tight cushions. Leaves are shiny, dark-green and with lateral veinlets conspicuous around the margins. Senescent leaves, along with the cartilaginous margins of fresh leaves are coloured yellow and orange. Inflorescences are compound umbels, and at approximately 100 mm tall are twice the stature of the foliage.

Previous records

There were three herbarium records before the present survey. The type was collected by D. Leigh from Mt Milne in the 1930s (CHR 19011). A second collection by David Lyttle in 1969 (OTA 27476) from the head of the Taoka Icefall on a col between Mt Patuki and Mt Karetai forms the basis of the illustration in Mark and Adams (1973). Peter Johnson collected a third specimen from a col south of Waitiri Peak above the Tutoko bench in 1977 (CHR 511255) (Johnson 1977). These three collections spanned 5 km of summit ridgeline in the central Darran Mountains.

Present survey

Our survey extended from Ongaruanuka and Puketuroto Peak in the north to Barrier Peak and Mt Gunn, 24 km to the south. We surveyed accessible portions on foot and made observations from helicopters over inaccessible sections.

Physiography

Geologically, the Darran Mountains are composed of coarsely-crystalline and slow-weathering diorite and granodiorite (Wood 1962). Mt Tutoko (2608 m) and Mt Madeline (2536 m) are the highest peaks on this range and in Fiordland, although summit accordance throughout has a succession of peaks and intervening ridges consistently above 1800 m. Valley slopes are mostly near-vertical and separate U-shaped glacial valleys. Large cirque-basin lakes occupy hanging valleys. Angular, blocky talus dominates the crests of ridges and spurs, which are often less than 5 m wide. In the alpine zone, extensive névés, icefields, ice-avalanche slopes, and steep ice-sculpted bluffs devoid of micro-relief render much of the terrain unsuitable for the survival of vascular plants. Opportunities for accumulation of mineral soil in the coarsely-crystalline and slow-weathering diorite are also limited.

Biogeography

Aciphylla leighii is now known from 15 general locations (Table 1). Some, but not all, are supported by herbarium records (OTA and CHR). Populations of several hundred at some locations are known, and the cushions of individual plants range up to 1 m in diameter.

Table 1. Historical and recent records, arranged north to south, of *Aciphylla leighii* from the Darran Mountains, Fiordland.

Location (arranged north to south)	Grid reference (NZMS 260 D40)	Estimated number of plants	Estimated span of population (m)	Type of record
Ridge between Mt Dot and Alice Peak and the ridge to the east of Alice Peak	173152 to 168129	not estimated	not estimated	Observed from helicopter
Southeast flank of Mt Grave	098116	not estimated	not estimated	Observed from helicopter
Ridge between Mts Tutoko and Madeline	145119 to 172098	c. 1000	not estimated	Observed from helicopter
Southeast ridge off Mt Madeline	175089 to 189086	not estimated	not estimated	Observed from helicopter
Ridge north of Mt Syme to Mt Madeline	163087 to 161084	c. 900	300 x 400	Ground observation 1999
Below and northwest of Mt Syme in previous icefield	159084	3	100 x 100	Ground observation 1994 and 1999
Mt Milne	156079	1	0.5 x 0.5	Ground observation 1930s
Col south of Watiri Peak	152060	1	0.5 x 0.5	Ground observation 1977
Ridge north of Mt Te Wera	177055	c. 290	300 x 100	Ground observation 1999
Shelf on western face Mt Te Wera	174051	2	3 x 1	Ground observation 1999
Saddle north of Mt Patuki	152049	1	0.5 x 0.5	Ground observation 1999
Above Taoka Icefall on col between Mts Karetai and Patuki	167037 to 167038	c. 300	300 x 100	Ground observation 1969 and 1999
Ridge east of Mt Patuki	164037	68	20 x 8	Ground observation 1999
Cirque basin between Mts Patuki and Underwood	149034 and 145034	9	10 x 40 and 1 x 1	Ground observation 1999
Ridge between Mts Patuki and Underwood	154031	c. 100	70 x 30	Ground observation 1999

The present survey has extended the known range of *A. leighii* 6 km north and 6 km west from the previous three records. For the time being, *A. leighii* remains a Darran Mountains endemic, with the narrowest of ranges in the genus. Adjacent and poorly botanised heights of similar substrate worthy of inspection include Llawrenny Peaks between Poison Bay and Milford Sound and the Wick Mountains southwest of the Darran Mountains.

Habitat

Aciphylla leighii occupies deep narrow crevices within the massive bedrock and the interstices of coarse angular talus along and just below summit ridges in the most exposed of topography. Crevices deflect the damage of ice and snow avalanche. Apparently deep taproots permit survival in these humid recesses, thereby avoiding competition from its faster-growing associates on soil accumulations. A quite precise physical arrangement of talus in terms of block size, shape, depth of accumulation, and stability seems to characterise its habitat. Sub-rounded blocks rather than sharply-angular, testify to the need for stable solifluction debris as optimum habitat along ridges and spurs. Unstable talus would not provide the plant's need for reliable subterranean humidity, sustained buffering of desiccating winds, and deflection of mobile ice and snow. *A. leighii* seems to be out-competed by *Ranunculus sericophyllus* and *Aciphylla congesta*, its most common associates, in the limited pockets of finely comminuted diorite that approximate a mineral soil at these altitudes. Records of *A. leighii* range from 1650 m to over 2000 m in altitude. Nevertheless, altitude is less of a guide to its presence in the nival zone than its precise habitat of stable talus and crevices above the altitudinal limits of the tussock grasses, *Chionochloa pallens*, *C. oreophila* and *C. crassiuscula*.

The clumped distribution of *A. leighii* suggests that seed is conservatively dispersed, and chance is an important factor in its patchy distribution. Despite this patchiness, local abundance demonstrates adaptation to the most extreme of alpine conditions.

Hybridism

A few plants at one site had pointed leaf apices, rather than the characteristic blunt leaves, yet retained the rigid-leaves and cushion form. Hybridisation with sympatric *Aciphylla congesta*, with its pointed and soft leaves, is a possible explanation for this variation.

Conservation status

Aciphylla leighii is ranked as Insufficiently Known by Cameron et al. (1995). Our expanded knowledge of its distribution and numbers, and our conclusion that it is not under threat from introduced or unnatural agents, leads us to recommend revision to the rank of Local.

Congeners

Aciphylla leighii is part of a group of high alpine, rigid-leaved, cushion-forming, and low-stature speargrasses of the southern South Island. *Aciphylla crosby-smithii*, *A. dobsonii*, *A. simplex*, and *A. leighii* constitute this broadly allopatric and geologically divergent group (Table 2). The adoption of these shared traits suggests conservative energetics and investment in longevity in this low-productivity and seasonally-unpredictable environment. All four species receive no micro-climatic buffering from communal tussocks and herbs, and avoid competition by occupying skeletal soils or fissures in their rock-dominated landscapes.

Table 2. Southern South Island species of *Aciphylla* which have rigid leaves and more or less cushion form

Species	*Aciphylla dobsonii*	*Aciphylla simplex*	*Aciphylla leighii*	*Aciphylla crosby-smithii*
Distribution	south Canterbury and north and north-west Otago	Central Otago and north Southland	main spine of Darran Mountains, north Fiordland	central and south Fiordland
Geological Habitat	greywacke fellfield*	schist fellfield and ledges and crevices in bluffs	diorite blocky talus and crevices in rock bluffs along ridges and	gneiss and granite rock slopes in short snow tussock-herbfield*

*Mark & Adams (1973)

Acknowledgements

We thank Peter Johnson for discussion and useful comments on a draft.

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■ *Geranium aequale* (Bab.) Aedo in New Zealand

A recent treatment of part of the genus *Geranium* (Aedo et al. 1998) gives this name to the taxon that has until now been known as a variety of *G. molle*, the dove's-foot cranesbill.

Like G. *molle* in the strict sense, *G. aequale* is of European origin. Both are annual species; they have a rather slender taproot, leaves lobed to about halfway or slightly more, axes with patent millimetre-long slender hairs over a shorter cover of glandular and eglandular hairs, very shortly clawed and strongly emarginate pinkish to purplish petals, bluish pollen, and smooth brownish seeds.

The revision offers as principal distinguishing features:

> Mericarps smooth, densely ciliate, not completely covering the seed; testa comparatively thick ..... *G. aequale*
> Mericarps transversely rugose, glabrous except for a few cilia at base; testa comparatively thin ..... *G. molle*

For the basis of *G. aequale* being adventive to New Zealand, Aedo et al. (1998) cite material from Kew: "New Zealand, NORTH ISLAND, Colenso, 39°44' S, 17°4' E[sic], 1821, *Anonymous s. n.*". Obviously, some explanation is required.

I am grateful to Professor S. J. Owens, Keeper of the Herbarium, Kew, for sending photocopies of three relevant K sheets. The first of these carries (as well as two pieces of *G. solanderi)* a piece tagged "1821 *Geranium*" in Colenso's hand (Fig. 1); this was annotated by R. Carolin in 1963 as *G. molle* var. *aequale.* The second sheet carries a single specimen, without original tag or label but with "New Zealand, Colenso" in J. D. Hooker's hand; this is annotated by Aedo as *G. aequale.* The third sheet bears a piece tagged "415 *Geranium* ?n.sp." (Fig. 1), and though not annotated by Carolin or Aedo this and perhaps the sheet's other two pieces do appear to be either *G. aequale* or *G. molle.*

On the paper tag at the base of the "415" piece there is also the number "1847", not in Colenso's hand. For help in understanding these numbers I am grateful to Patrick Brownsey, who informs me that the latter is almost certainly a date, relating to the year "415" was received or curated into Herb. Hook. at Kew (see Hamlin, *NZ J. Bot. 9*: 695-698 1971; Brownsey, *Rec. Nat. Mus NZ 1*: Z43-Z69). He writes (P. J. Brownsey, pers. comm.):

> "WELT contains an extensive set of notes by Hamlin on Colenso's itinerary and labelling. The numbers 415 and 1821 relate to long lists of specimens that Colenso recorded in letters to the Hookers.
>
> The specimen with number 415 is listed in a letter to W.J. Hooker in July 1846. The entry reads "415. *Geranium*, ?n.sp. - distinct, I think, from "pilosum"[solanderi], in its leaves being 7-lobed, petals bifid and of very different colour - I send all I have; grassy spots in this neighbourhood [almost certainly Ahuriri near Napier].
>
> The specimen with number 1821 is included in a letter to W J. Hooker that was begun in July 1848 and finished in September of that year. The entry reads "1821. *Geranium*, Wellington. Both [this and the previous specimen of this letter] probably emigrants".

Knowing all this we can see how Aedo et al. might well have gone astray.

Another geranium adventive to New Zealand was long ago also mishandled, though because of poor rather than excessive label data. This is *Geranium homeanum* Turcz., whose type was collected in 1845 by Sir James Everard Home at a place supposedly called "Perakiteri". No such locality is known. But Home, a

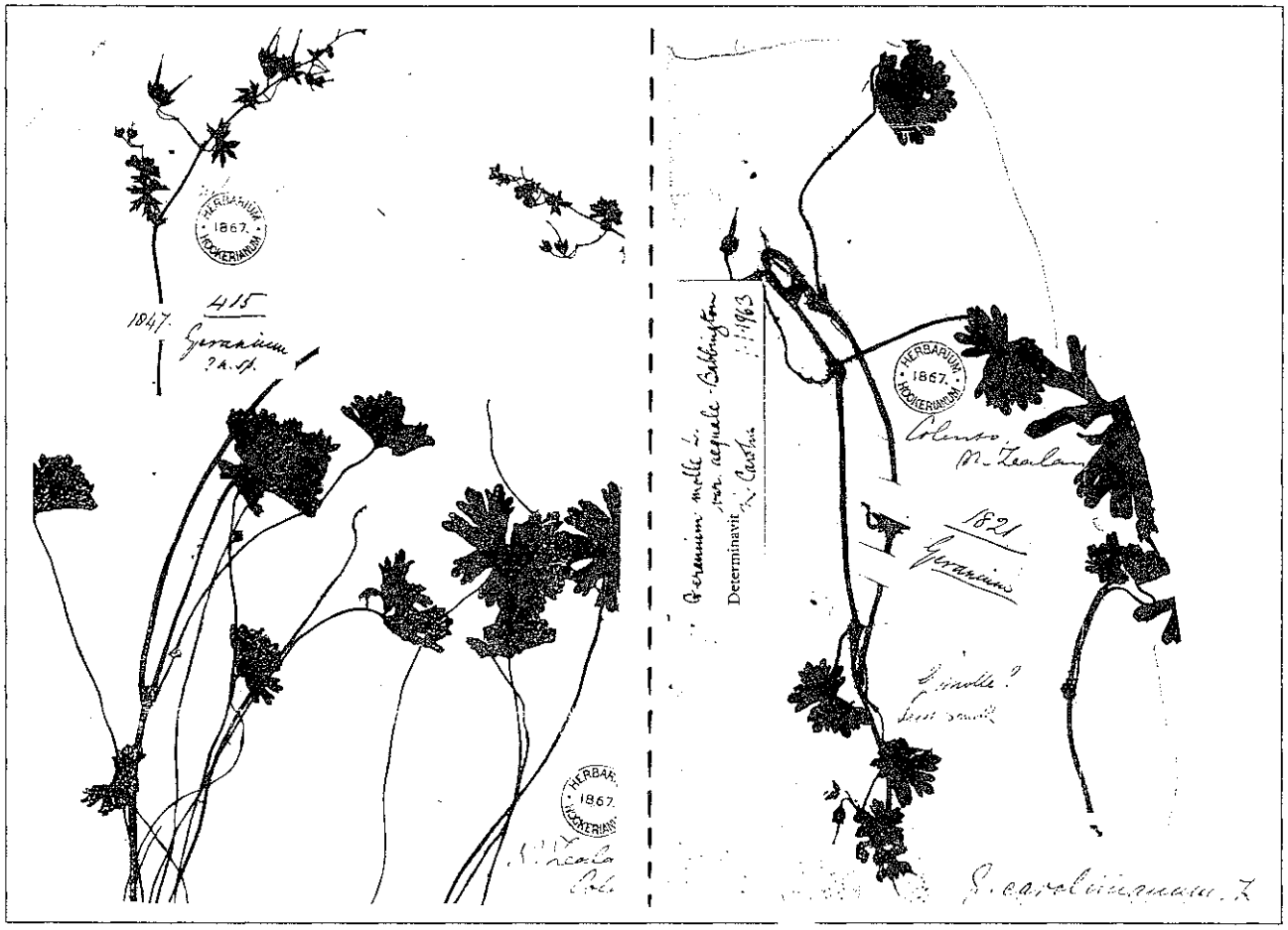

Fig. 1. Portions of Colenso 415 and Colenso 1821, K.

British naval officer and captain of H.M.S. *North Star,* was taking part in military operations in the Bay of Islands in that year, and it can be assumed that his plant was got somewhere near the Punakitere River.

Acknowledgements
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A new population of *Hebe speciosa* (titirangi) on the Waikato coast

Introduction
Hebe speciosa is an attractive coastal plant that produces racemes of dark reddish flowers. It is included in the "vulnerable" category of the New Zealand threatened plant list (Cameron et al. 1995). During February 1999, one of us (Ganley) found a previously unrecorded population of *Hebe speciosa* on the Waikato Coast north of Aotea Harbour (AK 236757). The plants are on private land at the mouth of the Rengaren stream on Taranaki Point. In August 1999, the landowner extended the new population by finding more *H. speciosa* immediately south of Rengaren stream. In July and August 1999, we recorded the features of the population of *Hebe speciosa*, the associated vegetation and the physical features of each site.

Distribution of *Hebe speciosa*

Hebe speciosa has been recorded on the West coast of the North Island between Northland and Taranaki, on the Kapiti/Wellington Coast and in the Marlborough Sounds (Figure 1). On the Waikato coast, Dieffenbach (1843) recorded *Veronica speciosa* (as *Hebe speciosa* was formerly known) north of Raglan Harbour. Some 150 years later, de Lange and Cameron (1992) recorded only one extant population *of H. speciosa* on the Waikato coast, at Mokau, and a second at Ngatutara Point that became extinct between 1988 and 1992 (ibid). However, they did state that "further populations of titirangi will be discovered along the northwestern coastline of the northern North Island".

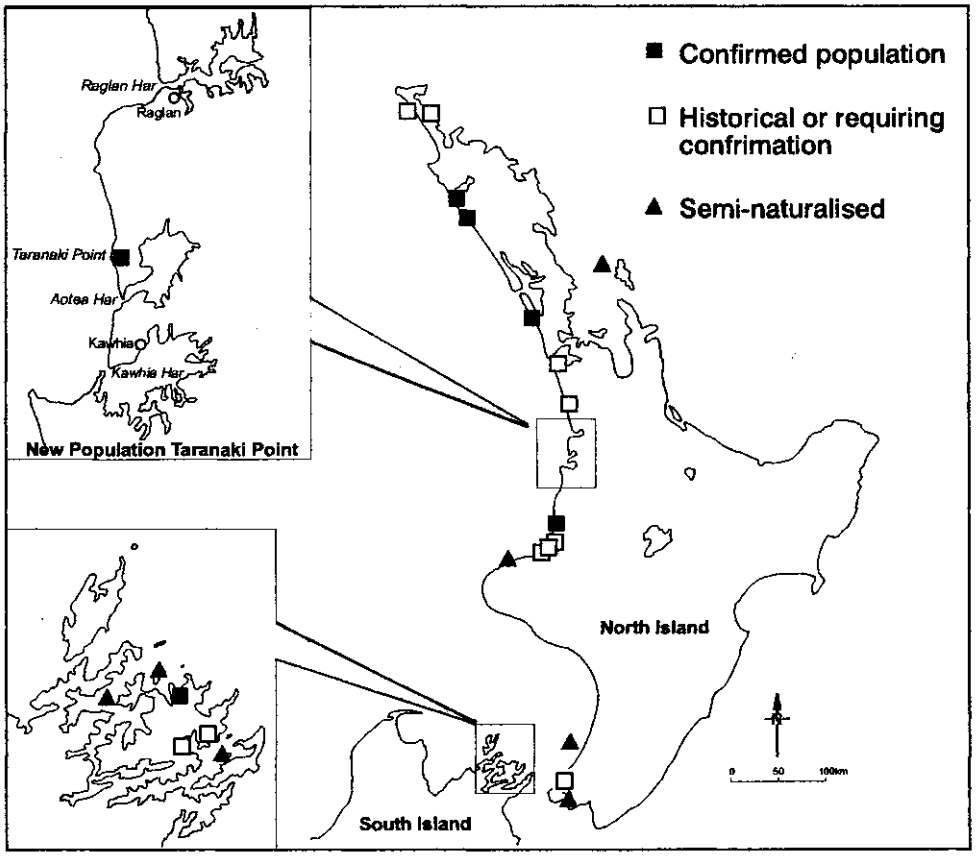

Fig. 1. Distribution of *Hebe speciosa*, including the newly discovered population at Taranaki Point (adapted from de Lange and Cameron 1992)

Physiography and edaphic factors.

Hebe speciosa plants are growing around the Rengaren stream and on the coast immediately to the south. The Rengaren stream forms a steep-sided (approximately 40°) gully that extends inland for perhaps 300 m. The plants are growing on both sides of the stream, towards its western end. To the south of Rengaren stream is a coastal cliff that has eroded back from the sea to produce a steep-sided amphitheatre. *Hebe speciosa* plants are growing on the steep faces, with a west to south-west aspect, and in the base of the amphitheatre.

The underlying rocks are weathered, late Pleistocene sands that overlie Oligocene calcareous limestone. This geology is characterised by spectacular karst features and coastal outcrops that are of regional significance (Abrahamson 1990). The Rengaren stream gully and the amphitheatre are moist due to seepage from the surrounding higher ground. The gully and cliff tops have been fenced from surrounding farmland for erosion control (D. Peacocke, pers.comm.) but the fence is not goat or sheep proof.

Vegetation

Hebe speciosa is growing at the western end of the Rengaren Stream where the understorey is dominated by *Cyperus ustulatus* and *Carex testacea* beneath a relatively open canopy of pohutukawa (*Metrosideros excelsa)*. Taxa on the northern face (true right of stream) include common shield fern *(Polystichum richardii)*, shining spleenwort *(Asplenium oblongifolium)*, the uncommon *A. obtusatum* subsp. *northlandicum,* mamaku *(Cyathea medullaris)*, kawakawa *(Macropiper excelsum)*, *Olearia solandri*, maidenhair (*Adiantum*

cunninghamii), Apium prostratum, hangehange *(Genistoma rupestre* var. *ligustrifolium*) and native spinach *(Tetragonia trigyna*). The southern face of the gully (true left of stream) has areas of bracken *(Pteridium esculentum*), harekeke/NZ flax *(Phormium tenax)* and exotic pasture grasses, e.g., Yorkshire fog (*Holcus lanatus*). Both sides of the eastern end of the gully have been partly planted in the exotic conifer macrocarpa *(Cupressus macrocarpa*) interspersed amongst pohutukawa, kohekohe *(Dysoxylum spectabile*), karaka *(Corynocarpus laevigatus*), puriri *(Vitex lucens*) and rewarewa *(Knightia excelsa*).

In the amphitheatre, *Hebe speciosa* plants are growing either in isolation on the steep faces or with shrubs and low-growing plants, including harakeke/flax, *Apium prostratum,* native spinach, *Cyperus ustulatus,* tauhinu (*Ozothamnus leptophyllus*), pohuehue (*Muehlenbeckia complexa*), *Olearia solandri* and taupata (*Coprosma repens*). In the base of the amphitheatre there are swards of pasture grasses (e.g., yorkhire fog, *Holcus lanatus*).

Features of the population of *Hebe speciosa*

Hebe speciosa plants are growing on the bank of the Rengaren stream to as far as 25 m above the stream. All are growing on steep slopes though some are on small terraces formed by the roots or branches of pohutukawa trees. In the amphitheatre, *H. speciosa* plants are growing along the margins of a small seepage in the base of the amphitheatre and on the surrounding steep faces.

The population of *H. speciosa* at Rengaren stream consists of at least six adult plants (> 0.5 m tall), five large seedlings (>0.2 m tall) and 30 small seedlings (<0.2 m tall). The largest plant is approximately 1.5 m tall and 1 m wide. All of the adult plants were bearing fruit and four were flowering. In the amphitheatre there are approximately a further 20–30 plants, including adults and seedlings. It is harder to count the individuals here because of the inaccessibility of many of the plants. Only one plant was flowering, but most bore fruit.

All of the plants appeared healthy, though some show evidence of browsing and cicada damage. In the Rengaren stream, pohutukawa are suffering from possum browse and twigs and branches that have fallen from them may have caused physical damage to some *H. speciosa* plants.

Conservation

The plants are on private land so any approach to conservation management requires a cooperative approach between the Department of Conservation and the landowner. A bait station operation to control possums has been initiated and the fencing of Rengaren stream will be improved. There are also plans to monitor the population and establish an *ex-situ* collection that could be used to augment the existing population.

Acknowledgements

Thanks to David Peacocke for access to Te Rete Station, for finding the plants in the amphitheatre and for being enthusiastic about becoming involved in the conservation of the *Hebe speciosa*. The authors are grateful for the comments received from Ewen Cameron (AK) and Shane Wright (University of Auckland). Bev Taylor (Department of Conservation, Waikato) drew the map. Eamonn Ganley would like to acknowledge the support he has received from Bec Stanley and Peter de Lange (Department of Conservation, Auckland) during his thesis research.

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■ Recent botanical finds from Southland

Boyd Creek tops

These are on the south-eastern slopes of the Countess Range above the Eglinton Valley, to the east of Fiordland. The tops consist of an alpine basin above the silver beech treeline. Red tussock and wetlands dominate the floor of the basin, and narrow-leaved snow tussock and scree dominate the upper slopes. Observations are from two field trips undertaken on 13th March and 3-4th April 1999.

A feature of the area is the diversity of wetlands and alpine tarns. Most of these tarns are associated with cushion bog, however at least two were within tussockland. These two tarns are of particular note for their threatened plant species. The first tarn of was circular, c. 30 m across and had an abundance of *Isolepis basilaris* around its shore, on the lower portion of the edge sequence.

The second tarn was larger (c. 250 x 50 m) and located at the back of the basin. It had a distinct shore zonation sequence. The southern end of this tarn contained an abundance of *Iti lacustris* in the lower part of the shore vegetation sequence. This species attained a density of >25 plants per 10 cm^2 for much of the core area of its distribution. This is the first record outside of the Te Anau and Manapouri lakeshores and the first record above tree-line for this species. The other threatened species associated with this tarn was *Deschampsia caespitosa* (scattered around the margin of the lakeshore vegetation) and there were a few plants of the uncommon sedge *Carex carsei*.

Other species of note in the alpine basin were *Senecio dunedinensis* which was in the lower altitude scree and *Uncinia purpurata* scattered through red tussock. In the mountain beech forest, *Alepis flavida* was occasional along the track.

Waituna Lagoon

Waituna Lagoon is a large (c. 1200 ha) lagoon which is periodically, artificially opened to the sea. The lagoon is included within the Waituna Wetlands Scientific Reserve, which is designated as a Ramsar Wetland of International Importance. The lagoon, its associated wildlife and extensive peatland communities comprise the major values of this wetland reserve. On a recent (24 August 1999) inspection of Waituna Lagoon, *Urtica linearifolia* was recorded for the first time. This is a rediscovery for Southland following an old record with no specific locality given. Up to 100 plants were observed in the jointed rush zone on the north-western section of shore, with a few additional plants observed on the north-eastern shore adjacent to the mouth of Currans Creek. There is c. 7 km of similar and potentially suitable habitat between these two sites so the area could contain several hundred plants. The sites occupied are probably tidal when the lagoon is open to the sea (as it currently is). The lagoon has been open for an unusually long period of time and shows no sign of closing, at present.

Deschampsia caespitosa has previously been recorded from the margin of Waituna Lagoon. However during the recent inspection of the north-western shore, several hundred plants were observed. The total population was estimated at several thousand plants making this a key site for this species. Another threatened species, which has previously been recorded by P. N. Johnson, is *Isolepis basilaris* but this sedge was not observed during this inspection.

Acknowledgements

Thanks to Eric Edwards, Geoff Rogers, Chris Rance and Carol West for their assistance during the fieldwork and for commenting on the text of this article.

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■ Confirmations and additional host species for green mistletoe (*Ileostylus micranthus*) from Norfolk Island

During the process of compiling host information for New Zealand's seven loranthaceous mistletoes (see de Lange *et al.*, 1996, 1997a), three Norfolk Island endemics, *Coprosma pilosa*, *Melicytus ramiflorus* subsp. *oblongifolius*, and *Pittosporum bracteolatum* were reported as host species for green mistletoe (*Ileostylus micranthus*). Of these, *Coprosma pilosa* was verified by a specimen of both host and mistletoe gathered from near the summit of Mt Pitt by J.E. Braggins (AK 223922!). However, the Norfolk Island green mistletoe specimens recording the hosts *Pittosporum bracteolatum* (CHR 229838!) and *Melicytus ramiflorus* subsp. *oblongifolius* (CHR 224194!) lacked host verification (see de Lange *et al.* 1997a), and so for the purposes of our research (e.g., de Lange *et al.*, 1996, 1997a; Norton & de Lange *in press*) remained unsubstantiated. Thus, during a November 1998 visit to Norfolk Island (de Lange & Crowcroft 1999), we specifically searched for green mistletoe to try and verify these associations as well as ascertain if other host associations were present.

As observed by Barlow (1966)*, and Green (1994), we confirm that green mistletoe is uncommon and virtually confined to the vicinity of Mt Pitt and Mt Bates, within the Mt Pitt National Park. In this area the

principal host is *Coprosma pilosa*, especially along the roadside leading up to Mt Pitt. However, diligent searching of the low forest and shrubland bordering this peak confirmed green mistletoe parasitic on *Pittosporum bracteolatum* (*de Lange NF35 & Crowcroft*, AK 237460). We also discovered the following new host associations (all verified):

Achyranthes arborescens (*de Lange NF36 & Crowcroft*, AK 237461)
Jasminum simplicifolium subsp. *australiense* (*de Lange NF42 & Crowcroft*, AK 237470)
Melodinus baueri (*de Lange NF163 & Crowcroft*, AK 237708).

Barlow (1966) considers the Norfolk Island green mistletoe occurrence as adventive although the arguments he uses are difficult to support. Therefore, as with Molloy (1990), Green (1994) and de Lange *et al.* (1997b) we consider the species indigenous to the island.

In total we observed nine instances of green mistletoe in association with *Coprosma pilosa*, two for *Pittosporum bracteolatum*, and one of each for *Achyranthes arborescens*, *Jasminum simplicifolium* subsp. *australiense*, and *Melodinus baueri*. The *Melicytus* association remains unsubstantiated. As with New Zealand, the pattern of host utilisation is the same (Norton & de Lange *in press*), with *Coprosma* (Rubiaceae) the favoured host. As regards the new and verified records, both *Jasminum* (Oleaceae) and *Pittosporum* (Pittosporaceae), belong to families commonly associated with in New Zealand (de Lange *et al.* 1997a), whilst *Achyranthes* (Amaranthaceae) and *Melodinus* (Apocynaceae) are new genera and family additions to the ever expanding list of taxa parasitised by green mistletoe.

Acknowledgements
We thank Margaret Christian (APNWS) for field assistance, permits, and transport during our stay on Norfolk Island. We also thank John Braggins for going out of his way to verify the *Coprosma pilosa*/green mistletoe host/parasite association with an appropriate herbarium sample during his visit to Norfolk Island in 1996.

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Research Reports

■ Viruses affecting indigenous plants: a note on the susceptibility of *Sicyos australis* Endl. to cucumber mosaic virus

Introduction
In 1992 Mr E.K. Cameron in requesting a copy of Dr L.B. Moore's brief general article (4) on mawhai (*Sicyos australis* Endl.) commented (see 2), as did Moore, on the decline in its occurrence. This climbing plant is New Zealand's only native member of the Cucurbitaceae and is now included in the Auckland regional threatened plant list (3). It was suggested (8) that the decline might be due to the susceptibility of the plant to cucumber mosaic virus, a widespread aphid-transmitted virus. During the progress of European settlement in New Zealand, as the frequency of the interface (7) between *Sicyos* and virus-infected introduced species increased, so too would the likelihood of disease transmission to *Sicyos*. This note records the susceptibility of *Sicyos australis* to cucumber mosaic virus.

Materials and Methods
Seed of *Sicyos australis* was provided by Mr E.K. Cameron and was collected in 1992 from Little Barrier Island. Vigorous young seedlings were grown in a glasshouse and were mechanically inoculated with an

isolate of cucumber mosaic virus provided by Mr J.D. Fletcher of Crop & Food Research, Lincoln. This isolate was originally obtained from a crop of *Capsicum* growing in Gisborne.

Results and Discussion

The initial symptoms induced by cucumber mosaic virus included a yellowing along the leaf veins on young leaves accompanied by some leaf distortion and puckering. Later, a fine mottle developed on the leaves. Infected plants were stunted. Clearly then, *Sicyos australis* is susceptible to cucumber mosaic virus, though like many diseases caused by viruses, the infection with this isolate is not lethal. However, infection does debilitate plants and this could affect their survival and susceptibility to other diseases.

The search for viruses affecting New Zealand indigenous plants commenced with the discovery of tomato spotted with virus affecting *Solanum laciniatum* Ait. in Riccarton Bush, Christchurch in 1957 (5) and the project was reviewed by Thomson (7). A total of nine different viruses (including one yet to be identified), and one possible virus, infect six different indigenous plant species. Six different viruses have been recorded from just one species, *S. laciniatum*. This compilation includes the recent discovery of cucumber mosaic virus causing stunting and leaf mottle on an *Arthropodium cirratum* (Forst.f.) R.Br. plant growing in Christchurch (Thomson, unpublished data). Little is known about the incidence of the above viruses affecting New Zealand indigenous plants, though some seem to be very restricted in their occurrence. Thus the record of cucumber mosaic virus affecting *Corynocarpus laevigatus* J.R. et G. Forst. (1) was found in just one infected tree growing in Christchurch. However, though only one infected tree has been identified, there is the potential for widespread infection in this species.

All the viruses so far recorded from New Zealand indigenous plants are likely to be similar to those affecting introduced species, many of the viruses no doubt coming to this country during the early days of European settlement. However, one suspected virus disease which may qualify as a candidate for being an indigenous virus is a disease causing typical virus-like ring and line patterns on the leaves of *Senecio bennettii* Simpson et Thomson growing in Governor's Bush, Mount Cook National Park (6). First discovered in 1980 affecting two plants at 975 m altitude among subalpine shrubs, the location was again examined in September 1998 and the disease was re-discovered in six plants adjacent to the original diseased *S. bennettii* plants. The identity of this disease has yet to be determined, but the symptoms have the hallmark of a virus infection.

Acknowledgements

We thank Mr E.K. Cameron, Curator of Botany, Auckland Institute and Museum and Mr C. Smuts-Kennedy, Ranger, Little Barrier Island for the seed of *Sicyos australis* and Mr J.D. Fletcher, Crop & Food Research, Lincoln for the isolate of cucumber mosaic virus. Dr R.E. Falloon, Crop & Food Research, Lincoln kindly gave permission for the use of glasshouse facilities for this work and Dr Falloon and Mr Fletcher checked the paper.

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Comment

A proposal to amend the Native Plants Protection Act 1934

The following is the text of a proposal to amend the Native Plants Protection Act 1934 which was presented orally to a General Meeting of the New Zealand Botanical Society Incorporated in Room 1, James Stewart Building, Lincoln University, Lincoln at 5.30-6.30 p.m. on Thursday, 17 June 1999.

I have submitted it for publication in the Society's Newsletter to serve as a permanent record of the proposal, and as a first step towards its promotion and implementation.

> ""During the 1930s the Native Plant Protection Society was established to investigate and protect plants believed to be rare or depleted..... The Society was largely responsible for the promotion of the Native Plants Protection Act (1934) which remains the only New Zealand legislation dealing exclusively with conservation of indigenous plant species".

These statements are direct quotes from one of Dr David Given's seminal papers, almost 25 years ago, on the rare and endangered indigenous plants in New Zealand (Given 1976). In a previous paper, David Given pointed out certain deficiencies in the Native Plants Protection Act 1934, and the need for its revision (Given 1975). He went on further to say that:

> "Few countries have evolved effective legislation protecting rare or endangered plants, and in those which have, selection of taxa for inclusion in schedules has often been on an arbitrary and unscientific basis".

He also reminded us that:

> "There is an urgent need in New Zealand for effective unambiguous legislation giving protection to rare and endangered plant taxa independent of that offered through National Park, Scenic Reserve and allied legislation". (Given 1975)

To these last statutes we can now add in a similar vein more recent legislation such as the Reserves Act 1977, the Queen Elizabeth The Second National Trust Act 1977, the National Parks Act 1980, the Conservation Act 1987, the Trade in Endangered Species Act 1989, the Resource Management Act 1991, and the Crown Pastoral Land Act 1999.

It was David Given who initiated and updated the first comprehensive lists of New Zealand indigenous plants at risk, and I acknowledge his significant contribution in that respect (Given 1976; 1979; 1981; 1990).

From 1991, following a threatened plant symposium at Kaitoke, Upper Hutt, convened jointly by the Department of Conservation and DSIR Land Resources, the lists of New Zealand threatened plants have been reviewed by an independent committee of experts (see review by de Lange & Taylor 1991). This committee was appointed by the New Zealand Botanical Society and was serviced by the Department of Conservation, which has the statutory role to safeguard our rare and threatened flora and fauna. Since then, and based largely on IUCN threat categories (e.g., IUCN 1994), two such revisions have been published in the New Zealand Botanical Society Newsletter (Cameron et al. 1993; 1995).

More recently, the New Zealand threatened plants lists have been rigorously reviewed by the current threatened plants committee, using threat categories considered to reflect more accurately the nature of rarity as manifested by New Zealand's uncommon plants (see especially de Lange & Norton 1998). It was planned to submit the latest revision for publication in a refereed journal, and one with a much wider circulation, both here and abroad, than the Society's Newsletter. Accordingly, the revision was submitted to the *New Zealand Journal of Botany* for consideration. The editor of the journal, Dr Frances Kell, advises (pers. comm.) that the revision has been accepted for publication, and will appear in the December 1999 issue (volume 37 (4)).

Among other things, the revised list of threatened and uncommon plants of New Zealand (de Lange et al. in press) identifies 108 taxa of threatened vascular plants, comprising 25 taxa Critically Endangered, 31 taxa Endangered, and 52 taxa considered Vulnerable. If we add the five taxa presumed to be Extinct, our core list of threatened vascular plants is 113.

We calculate that 19% of these taxa occur on Crown land, 20% on freehold land, with 61% shared, although with many taxa in the shared category (e.g., *Metrosideros bartlettii* in the north and *Muehlenbeckia astonii* in the south), the largest and/or the majority of the known populations are found on freehold land. In effect this means that currently we have full management authority over only 19% of our most threatened vascular plants. Without effective legislation to help, we may not be able to prevent extinctions and significant range contractions from taking place in the future.

I believe the time is right to advance the case for protecting our most endangered vascular plants, and thereby give them the high public and political profile they deserve, and to help generate much needed resources, both human and fiscal, to achieve this.

We don't need new legislation. We have an existing statute, the Native Plants Protection Act 1934, which, since the Conservation Act 1987, is administered by the Department of Conservation. Up till now, this Act has virtually lain in limbo and been ignored, possibly because of its known or perceived deficiencies. However, all

it requires is an appropriate amendment to bring it into line with current needs and public thinking and support. Its first schedule of protected plants could be the core list of 113 threatened taxa identified by the threatened plants committee.

Such an amendment is not a task to be undertaken lightly, and we would need to make a very good job of it. In this respect I suggest that the Wildlife Act 1953 and its amendments might serve as a useful model to follow, especially the additional schedules that could be promoted by further amendments to add to, or subtract from, lists of protected plants, including for example, threatened non-vascular plants.

In summary, I believe that a much-needed amendment to the Native Plants Protection Act 1934 is long overdue and timely, and we now have a soundly based and realistic list of New Zealand's most threatened vascular plants to present to the legislators for their support and action. I can think of no better botanical project to herald in the new millennium, and no better way to focus on New Zealand's endemic biodiversity. Likewise, I can think of no better way to celebrate the botanical contribution of Dr Eric Godley, whom we acknowledge on this particular occasion, and indeed the contributions of all our botanical colleagues, past and present. And finally, I can think of no better organisation than the New Zealand Botanical Society to actively promote this amendment.

In conclusion, my motion for the meeting to consider:

> "That the New Zealand Botanical Society actively promote the Native Plants Protection Amendment Act to include a schedule of New Zealand's most threatened vascular plant taxa and other matters considered appropriate".

Acknowledgements

I would like to thank all my botanical friends and colleagues for helping to shape my appreciation of New Zealand's threatened plants – in particular Eric Godley, David Given, Peter Johnson and the late Tony Druce in earlier times, and more recently Bruce Clarkson, Peter de Lange, Peter Heenan and David Norton.

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BIOGRAPHY/BIBLIOGRAPHY

■ Biographical Notes (35): Frederick Neve MA LIB. BSc (1871–1945)

Frederick Neve was the author of a highly successful textbook of elementary botany widely used in New Zealand between the two World Wars. It ran to five editions and was a worthy successor to G.M. Thomson's "Introductory Class-book of Botany for use in New Zealand Schools" (1891, 1906). I first used Neve's excellent little book in Fifth Form (1935) at the Takapuna Grammar School where it was the prescribed text for Matriculation Botany; and I have admired it ever since.

Fred Neve (as his relatives call him) was born in Nelson in 1871 the second child of Augustus and Annie Neve. His father, Augustus Neve (M.A. (London) (1829–1911), had come to New Zealand at age 21 and in 1867 he married Annie, his second wife. He first appears in the Electoral Roll for Nelson in 1871, where his residence is Waimea Rd, but no occupation is given. This continues until 1902 when the occupation "gardener" is added. Neve's mother, born Anne Margret Haase, was a descendant of Frederick William

Haase (1812–1872) who arrived in Nelson with a party of German immigrants on 14 June 1843, aboard the "Saint-Pauli" (I,2).

From 1886 to 1889 Neve attended Nelson College, playing in the First XI (1886–89) and the First XV (1888-89) (3); and on 29 October, 1890, he married Elizabeth Ward at the Nelson Registry Office (2). The "Cyclopedia of New Zealand" (4) states that Neve "was educated at the Nelson College, where he graduated B.A. in 1891, and M.A. with honours in English and Latin, in the following year". This implies study for University terms in Nelson, as was available to H.H. Allan a decade later (5). Neve's parent University for all his degrees was Auckland University College. But note that the University Calendars give his B.A. as 1892 and his M.A. as 1902 (6).

Neve then spent about five years as headmaster of the Riwaka Public School until he was appointed headmaster of the Westport District High School in 1899 (4). The latter is given as Technical School Westport in (3). In 1909 Neve graduated LI. B. (6).

At the beginning of 1910 Neve was appointed to the Te Aroha District High School; and on 22 November, 1910 T.F. Cheeseman, Curator of the Auckland Museum, read a paper which included a record of *Geranium robertianum* collected by Neve on the slopes of Mount Eden, Auckland (*TNZI 43*: 185). From Te Aroha Neve sent three letters to Cheeseman.

1. 12 December, 1910

Neve acknowledges Cheeseman's suggestion of a botanical survey of the Te Aroha district and says that after being at Te Aroha for about a year he has made a fairly exhaustive exploration of the hills and swamps from Wairongomai to the Tui pa and had taken fairly complete notes; and that about once a week he had published brief accounts of the results of his explorations in the "Te Aroha News" of which he filled the office of editor in addition to his other positions as teacher of the secondary classes at the District High School. Neve also reported that in *Ixerba brexioides* the flower buds are formed in profusion in May but do not expand until the middle of December; and that he was writing this up at the suggestion of Mr Petrie. Neve also reported that *Melicope ternata* appeared to be mainly hermaphrodite, with the purely male and purely female plants very rare indeed.

2. 9 January 1911

At Waitoa, Neve had noted that the river was full of *Myosotis palustris* and the backwaters choked with it.

3. 5 February 1911

Neve sends specimens of *Hydrocleys nymphoides* from a "kind of lagoon" at the back of the Post Office and reports other populations in the district. This new record for New Zealand was published by Cheeseman as well as records by Neve from Te Aroha (*Eichhornia crassipes*) and the slopes of Mount Eden (*Reseda lutea, Verbena bonariensis*) (*TNZI 46*: 1–9). Neve also collected *Aponogeton distachyon* at Te Aroha (10).

At the beginning of 1912, Neve began his long association with the Seddon Memorial Technical College in Wellesley Street east, Auckland. He first taught Agriculture, Hygiene, Human Physiology and Plant and Animal Life (7). And in 1913 he graduated B.Sc. (6).

Neve's textbook was published by Whitcombe and Tombs in the following editions (8):

1. 1916 (1550 copies): "Botany: specially written to meet the requirements of Teachers' D, Matriculation, Public Service Entrance, Intermediate and Pharmacy A examinations".
2. 1918 (2000 copies): same title .
3. 1920 (3000 copies): same title.
4. 1924 (5000 copies); same title.
5. 1938 (? copies): "Botany: specially written to meet the requirements of teachers and of candidates for public examinations".
6. 1940: a reissue with 8 pages bound in as an appendix on the gymnosperms.

In the National Bibliography (8) the entry for the first edition has two asterisks meaning "copy not seen". It is surprising that this edition should be uncommon, if not rare, considering the number printed and the durable material used (if later editions are any indication). However, Mr Ewen Cameron tells me that the library of the Auckland War Memorial Museum has a copy accessioned in 1918 which is without a date [a common W & T

practice] and without an edition number. It looks as if this is a first edition. I have only seen the last three editions but all internal evidence shows that the first edition was simply reprinted except for minor changes in the Preface and the Definition of Botany in Public Examinations.

The following quotes are from Neve's Preface.

> "English text-books, designed to meet English needs, and dealing almost exclusively with English plants, are unsuited to the requirements of New Zealand students; while such New Zealand text-books as deal with the subject treat almost exclusively of Morphology and Classification, and thus leave practically untouched the important branches of Ecology and Physiology, so that the student is left without guidance in such matters as the "Struggle for Existence," "Adaptation to Surroundings," "Plant Societies", "Germination", and "Nutrition". There are, of course, admirable works, like those of Dr Cockayne, which deal with one or more branches of New Zealand Botany; but these are not written nor are they intended for school purposes."
>
> "The student should realise at the outset that Botany is pre-eminently a subject demanding, in all its branches, personal investigation of things, not words. Merely to read the description of an experiment is a proceeding barren of useful result, but to carry it out with one's own hands, and thus directly to verify or discover, is to open a door of knowledge that can never again be shut."
>
> "In any satisfactory Botany course field-work is of the first importance; for it is by the study of plants when growing under natural conditions that the student acquires a living interest, and at the same time obtains that broad and comprehensive view, which alone can illuminate the investigation of detail that must be carried out in the laboratory. In short, field-work vitalises the whole subject."

Neve thanks Dr L. Cockayne, who contributed 12 photos, and Mr T. L. Lancaster, lecturer in Botany at Auckland University College, who contributed four photos. The excellent illustrations were drawn by Mr J.W. Ash, Chief Art Instructor at Seddon Memorial Technical College.

Neve taught at the Technical College until at least 1924 (9) by which time he was Head of the Department of Natural Sciences. He then practised as a barrister and solicitor in Auckland (3). His usual place of residence in retirement was Muriwai, but he died at Godley Road, Titirangi, on 24 June, 1945, and was buried in the Waikumete Cemetery (1).

Acknowledgements

I am particularly grateful to Mrs Connie Gledhill (Whangaparaoa), whose mother-in-law was Fred Neve's cousin, for information on family history. Hilda Godley (Devonport) and Josie Wade (Milford) kindly drew my attention to Mrs Gledhill. I am very grateful to Mr Ewen Cameron and the Librarian, Auckland War Memorial Museum, for copies of the Neve letters. Mrs P.M. Englefield (Christchurch) kindly searched the Electoral Rolls; Dr A.D. Thomson (Christchurch) helped with University Calendars; and Shahzad Ghahrernan (Auckland Institute of Technology) sent prospectuses.

References

(1) Death certificate; (2) Family records; (3) J.G. McKay and H.F. Allan 1956; The Nelson College Old Boys' Register, 4 Edn.; (4) Anon. 1906: Cyclopedia of New Zealand 5. Nelson, Marlborough & Westland; (5) E.J. Godley 1993: Biographical Notes (10) Harry Howard Barton Allan (1882-1957) The early years. N.Z. Bot. Soc. Newsletter, 32; (6) Anon. 1906–1928: New Zealand University Calendars; (7) Seddon Memorial Technical College. Prospectus for the session commencing Monday, February 19th, 1912; (8) A.G. Bagnall (Ed.) 1972, 1985: New Zealand National Bibliography; (9) Seddon Technical College. Auckland. Prospectus of the Technical High School, 1924; (10) T.F. Cheeseman 1925: Manual of the New Zealand Flora (Edn 2).

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PUBLICATIONS

■ Book review

"Flora of Australia 48 – Ferns, Gymnosperms and Allied Groups" [21 contributing authors, including M. D. Tindale, P. D. Bostock, D. L. Jones, K. D. Hill & R. S. Hill]. 1998. Australian Biological Resources Study/CSIRO [CSIRO Publishing], Collingwood, Victoria. xxi [+i], 766 pp. Price unknown.

This is the 21st of an anticipated 59 volumes, and though one tends to think of Australia as having only a modest amount of ferns, fern-allies ("allied groups" of the title) and gymnosperms this is in fact the largest volume so far, quite a bit larger than the one on eucalypts and the two on oceanic-island floras. The earliest pages make this clear, with 6 species of *Tmesipteris*, 14 of *Isoetes*, 9 native selaginellas, and so on through 390 native pteridophyte species and 10 naturalised ones. Then follow a lesser, but still respectable, number of conifers (44 spp. native, 14 naturalised), and a wealth of cycads (69 native spp). New Zealanders are well- represented both as taxa and as authors, with accounts of their groups

by Pat Brownsey, Barbara Parris, Carrick Chambers and Bob Chinnock, and with illustrations by Tim Galloway. The two watercolour plates featured at the front of the book are both of ferns found in New Zealand, *Doodia aspera* and the naturalised *Cyathea cooperi*.

I admire this Flora Series very much. The design is great, right from the traditional green and yellow jacket framing a watercolour depiction of some favoured plant. The layout is generous and in shapely and diverse typefaces; the bibliographic data, typification of names including the most relevant synonyms, and derivations of the generic names, are all valuable information; the colour plates and the line illustrations are invariably excellent; the mapping of each taxon and the citation of specimens with quite good locality information (but Australia is a large country) must be of considerable practical value.

The job here, then, is to make some criticisms. To begin, the work is a heavy one, 2 kg in fact. Not that one always wants to take a Flora to bed, but I wonder how it will stand up to a few years performing under pressure in a busy Australian herbarium. It contains some material that might be slightly extraneous to a Flora – an essay on gymnosperm classification, for example, and another on the fossil history of these plants. But they widen the interest of the book and cutting them out would not trim much. It seems strange to me though that there are not two volumes here – ferns & fern-allies, conifers & cycads – are there not enough cycad-collectors in Germany alone to make this an economic proposition? Perhaps market research has already proved me wrong, or perhaps the editors have simply been told to keep to 59 volumes. But the result is not likely to be a field-worker's constant companion.

Within the families of the three major groups the genera are arranged in some phylogenetic order, and the species then by alphabet. The running head with family and number/genus assists navigation but the very useful device of having taxa indexed on the rear endpapers (as in the two lichen volumes) has been neglected, and we get only an admittedly rather attractive gold and brown umbrella-fern kind of patterning.

The next criticism I would make is that although the work is a large one I would have preferred it even larger. It seems that in this Flora series there has been a strong desire to make something irresistible to botanists and to book-buyers, and in my opinion the taxonomic detail is only just sufficient to satisfy the former, particularly the crustier herbarium worker. The keys are very brief and will often not cope with worst-case scenarios; they may even be too brief to be able to get one in roughly the right group. The generic keys quite often do not give a good idea of the diagnostic characters e.g., *Sundacarpus* is keyed apart from *Prumnopitys* just on leaf size (though at least the brevity of the generic descriptions let one find such characters for oneself fairly easily). In the species descriptions there is not room for very much more once the key characters are repeated. Of course, when identifying a plant it is routine to match it to an authentic specimen, if one can, but before doing so users of this book might quite often find themselves going first to the relevant journals and monographs.

A second major criticism, particularly with respect to this volume, concerns the line illustrations. These are arranged in more than a hundred page-size figures, some of the entire plant but mostly of pinnae, sori, cones, etc. Done by a number of well-known botanical artists, some Australian and some not, all are handsome and the differences in artistic styles are not so strong as to mar the book's appearance. Most, but alas not all, of the described taxa, including subspecies, are illustrated, e.g., only 5 of the 19 *Hymenophyllum* spp. and 2 of 8 *Microsorum* spp. are shown, while even some genera miss out, e.g., *Trichomanes* (5 spp.), *Sphaerocionium* (2), *Taenitis* (2), etc. To be fair, the choice may have fallen on ones representative of their groups, but even so I doubt that plant-identifiers would disagree that illustration of all taxa, even if only of the diagnostic parts, or especially of them, should be a priority.

Such a complete picture is presented for a number of groups, in particular Gilbert Dashorst's entrancing aggregations of Psilotaceae, Ophioglossaceae, and Gleicheniaceae, Azollaceae, Schizaeaceae, Lygodiaceae and Davalliaceae, and also for Dennstaedtiaceae, Asplenium, Doodia and Grammitidaceae (Tim Galloway), Cheilanthes (Kevin Thiele); Blechnum (Penny Farrant & Kevin Thiele), Marsileaceae (nearly, Chris Payne), and a few others. The illustrations are very full of good things – that of *Tmesipteris* for example looks like the most interesting tree-fern trunk in the world, but during working hours I might want something a bit more practical. In fact it is only for the three families of tree ferns (actually, not quite for *Cyathea*) that we see a well-laid out set of pinnae, one for each species, showing scales, sporangia, etc.

And especially with respect to the more crowded plates, instead of calling the illustrations of species 1 as A, B, and of sp. 2 as C, D, E, etc, wouldn't it be helpful to use superscripts A^1, A^2; B^1, B^2, B^3 ... ? Or, use the letters of the name: *Davallia solida* Ds, etc.?

A last whinge for a bit, but a basic one. Several specimens are cited for each species or subspecies; for naturalised ones it is by no means clear that these include the earliest specimen seen by the contributor or otherwise known of, nor is the date of any such specimen given.

Now for a more objective consideration of the contents of the "ferns" part of this Flora, that is, beyond the useful introductory essays on morphology, ecology in Australia, classification, and the fossil record:

– Six *Tmesipteris* spp. occur in Australia, including *T. elongata* and *T. lanceolata*; in contrast, the 14 spp. of *Isoetes* apparently include none of ours.
– Some of the 9 native *Selaginella* spp. grow in heathlands such as our country provides, and the lack of the genus on Lord Howe and Norfolk Islands as well as in NZ seemingly indicates some dispersal incapacity in these heterosporous plants. This is especially remarkable considering that fossils much like one of the present-day heathland species are known in Australia from as long ago as the Permian.
– *Lycopodium* is cut into three genera. Australia has all our taxa except *L. ramulosum*; *L. volubile* is known from a single old collection (and is illustrated here from an NZ collection of John Bartlett's). *Phylloglossum drummondii* is apparently widespread and not especially endangered (the good habitat and distribution notes usually imply the conservation status of a taxon, but comment is sometimes given).
– *Equisetum arvense* is known only from one Sydney suburb but there are rumours of *E. hyemale* in the country too. A plea is made for people to look out for this pest but perhaps to avoid panic it has not been illustrated.
– *Ophioglossum reticulatum* and *O. lusitanicum* are both treated in the broad sense, the former therefore including *O. petiolatum* and the latter *0. coriaceum*. The key is:
Sterile lamina thin, rarely fleshy, narrow to broadly ovate or round; base us. rounded to truncate, rarely broadly cuneate; venation obvious ... *O. reticulatum*
Sterile lamina thick and fleshy, sometimes thin in moist shaded situations, variable in shape, but us. narrowly to broadly elliptic, tapering basally; venation obscure ... *O. lusitanicum*
– We can note at this point that Australians do not have *Osmunda* as a naturalised species.
– Hymenophyllaceae here comprise four genera. In *Hymenophyllum* we are said to share with Australia *H. australe* (into which *H. atrovirens* is sunk), *H. bivalve*, *H. cupressiforme*, *H. flabellatum*, *H. peltatum* and *H. rarum*. For the last of these it is noted that the fronds of the Australian plant have a "peculiar" odour and less-imbricated pinnae. The single AK sheet from Tasmania certainly did have a distinct ferny ("dried blood" to some) fragrance, which scarcely comes across in native material.
– Peter Green is given a flick of the cane for not noting in his Norfolk & Lord Howe Island Flora that *Crepidomanes endlicherianum* occurs in Australia, but the author of the present account himself omits to say that the plant occurs in New Zealand, nor is Norfolk I. noted in the range of *Crepidomanes saxifragoides*.
– In Gleicheniaceae, we are informed that the umbrella fern *Sticherus tener* of Tasmania and Victoria has been "recently found at Dusky Sound". No date for this musical phrase is given, despite this being the first record of the plant in NZ. (It is a collection made by Alan Mark in 1984.)
– The Australians have the same pair of *Azolla* species that we have, with *A. pinnata* treated like *A. filiculoides* as native to that country. Fertile material can readily be distinguished by the barbs on the massulae (aggregations of spores) in the microsporangia of the latter species.
– *Schizaea bifida* and *S. fistulosa* are each treated *sensu lato*, and here, as sometimes happens, the responsibility for settling how many species there really are is put onto the country across the Tasman – how many New Zealand, or Australian, revisions would ever actually get finished if regretful phrases like "much more variable in Australia/NZ; needs to be studied in the field there" were not acceptable currency?
– *Cyathea* in Australia has 12 species; *C. australis* is also found on Norfolk Is. (as an endemic subsp.) but this is not mentioned. Curiously, the other Norfolk tree-fern, *C. brownii*, though presumably cultivated widely in Australia as it is in New Zealand, has apparently not naturalised.
– *Hypolepis amaurorachis*, *H. dicksonioides* and *H. distans*, *Pteridium esculentum*, *Histiopteris incisa*, *Lindsaea linearis* and *L. trichomanoides*, and *Anogramma leptophylla* are all maintained for Australia.
– Of the eight species of *Pteris* in Australia we share *P. tremula* and *P. comans*.
Adiantum contains eight spp. in Australia, all, including *A. capillis-veneris*, being regarded as native. Again, it is curious that the commonly cultivated *A. raddianum* has not been seen to naturalise. *Adiantum aethiopicum* is split, with *A. atroviride* a newly described endemic of eastern Australia and Lord Howe I.; it lacks stolons. There is nice habit-note concerning *Adiantum formosum*, a plant that grows best on alluvial ground, where its rhizomes are said to be sometimes 30-60 cm below the surface. *Adiantum hispidulum* is treated in varieties, but Australia does not have the variety we sometimes call *A. pubescens*. *Adiantum silvaticum* of Queensland and New South Wales has often been misidentified as our *A. cunninghamii*, but the latter differs particularly in the conspicuous (x10) fibre-cells on the adaxial surface of the lamina.
– *Pellaea* is cut up finely but the end is still not in sight.
– *Cheilanthes sieberi* (*C.humilis* auct.) and *C. distans* are found in Australia along with 13 other native species.
– *Asplenium* has a synopsis, the work's single example and very welcome in this large group. Among the 30 species, the presence in Australia is established of our *A. obtusatum* subsp. *northlandicum*, *A. flaccidum* subsp. *flaccidum* (but spores differ from NZ plants), *A. appendiculatum* (this name replacing *A. terrestre* subsp. *terrestre*), and the more straightforward *A. bulbiferum* subsp. *gracillimum*, *A. flabellifolium*, *A. hookerianum*, *A. polyodon*, and *A. trichomanes*.
– Given the extent of tropical and subtropical Australia the presence of Thelypteridaceae is not an especially strong one. Users of this work may care to note that *Macrothelypteris torresiana* has now been found on the New Zealand mainland (*NZ J. Bot. 35*: 555-8 1997). *Cyclosorus interruptus* and *Thelypteris confluens* are both present in Australia. There is an interesting note on the thelypterid *Chingia australis*, whose fronds have a "spicy odour" and a glandular secretion that apparently irritates the mucous membranes. No mention is made under *Christella dentata s. l.* of its occurring on the Kermadecs and the New Zealand mainland.
– *Blechnum chambersii*, *B. fluviatile*, *B. penna-marina* and *B. vulcanicum* occur in Australia, along with 14 other species. *B. nudum* is clearly distinguished from *B. discolor*.

– *Doodia aspera* and *D. australis* (*D. media* subsp. *australis*) occur in Australia along with 6 other species. Line drawings are credited to Barbara Parris but they are Tim Galloway's. The jazzy *Doodia aspera* depicted by David Mackay on page [i] is not referred to.
– As in New Zealand, *Rumohra adiantiformis* and *Cystopteris tasmanica* are the only representatives of their genera in Australia. *Lastreopsis hispida* and *L. microsora* are the only ones we have of 15 Australian species.
– *Deparia petersenii* subsp. *congrua* is treated as a native Australian, and no mention is made of its presence in New Zealand (though I believe from the lack of early collections that it may be a post-European arrival – this work notes that it naturalises readily from cultivation).
– We have none of Australia's four *Davallia* spp.; the references here to the taxa of Dashorst's plate have with one exception been omitted. No mention is made of the native form of *Nephrolepis cordifolia* in New Zealand.
– *Arthropteris tenella* is found in Australia along with 3 other congeners.
– *Grammitis* we share with Australia are: *G. billardierei*, *G. pseudociliata*, *G. magellanica* subsp. *nothofageti*, *G. poeppigiana*, and a new species, *G. gunnii*, found in Tasmania and also on the summit of Mt Burnett in NW Nelson. The transposed captions to *G. albosetosa* and *G. wurunan*, when corrected, will agree with Tim Galloway's shading of personal details here (B. S. Parris pers. comm. to P. J. Lange, R.O.G).
– A broad genus concept is taken in the microsoroid ferns. Among the 8 Australian species in *Microsorum s. l.* our *M. scandens* and *M. pustulatum* (*Phymatosorus diversifolius*) are "properly" distinguished, i.e., for both field and herbarium worker:

Rhizome scales squarrose; rhizome rarely glaucous; lamina dark green, often with a distinct musky aroma when fresh or freshly dried; venation us. with 1 series of areoles between midvein and margin of a laminal lobe ... *M. scandens*
Rhizome scales appressed with ± spreading, deciduous tips; rhizome often glaucous; lamina pale green, lacking musky aroma; venation with us. at least 2 series of areoles between midvein and margin of a laminal lobe ... *M. pustulatum*

My remarks on the 'gymnosperm' part of the work have to start in curmudgeonly vein. This taxon name appears in the title of Ken Hill's introductory essay in the single quote-marks, and goes on coming up between them. We are not told why this perfectly normal word is treated like this but it probably has something to do with the group being paraphyletic, that is, disreputable in its phylogenetic delineation. Another cry, not chauvinistic in impulse though convergent with that, can be made over Hill's citing a secondary reference to pollination-drop mechanisms, instead of the classic article by Barry Tomlinson and his two NZ associates (*Am. J. Bot. 78:* 1289–1303, 1991).

The taxonomic part of conifers-cycads is preceded by essays on the fossil history of these groups. As have sung generations of geology classes, God makes the best jokes: understanding the reasons for a marvellous sequence of changes in fossil *Dacrycarpus* leaves is not helped by the modern absence of this genus from Australia; *Callitris* is now diversified and widespread but has sprung from an extraordinarily poor fossil record; the ancient group of cycads (including a fossil genus *Pterostoma*, formerly widespread but recently extinguished!) is known only from the last 65 million years of Australia's history.

The Podocarpaceae are the first of the four conifer families treated. Australia has the endemic *Prumnopitys ladei*, the widespread *Sundacarpus amara*, the African yellow-wood *Afrocarpus falcata*, which is sparingly naturalised near Sydney (it is grown in NZ too), and seven species of *Podocarpus*, all endemic if one does not accept that *P. elatus* occurs in New Guinea. *Phyllocladus asplenifolius* of Tasmania is treated as being endemic to that island.

It is with the imbricate-leaved conifer genera, *Lagarostrobus*, *Microcachrys* and *Microstrobus*, together with the cupressoid look-alikes *Arthrotaxis* and *Diselma*, that there could well be problems in specimen identification. The illustrations are just not sufficiently diagnostic, especially if one has to work with vegetative material only. More detailed drawings, or what is not generally found in this series (but see a single plate of seed photos in vol. 45!), black and white macro photographs, would have been a very practical addition. It is also disappointing not to get a habit photo for each of these genera (and for the others too). A similar comment could be made for *Callitris*, where only 5 of the 17 taxa get line illustrations.

As everybody knows, there is a remarkable new Australian tree *Wollemia*, placed between *Agathis* and *Araucaria* – this would have been perfect for the dust-jacket watercolour of a separate gymnosperms volume. As it is the line illustrations are of only a few bits of it, and there is no photo.

Araucaria in Australia has the two well-known native species *A. bidwillii* and *A. cunninghamii*. Also noted in the key are *A. heterophylla* of Norfolk Island and *A. columnaris* of New Caledonia, just on the basis of their being much cultivated (strangely, neither have naturalised). My own sporadic observations of various-aged trees of these around Auckland give me little faith in the habit and leaf size characters used to key these latter two species. Again, I would have liked to have seen photographs of all the araucariads, in the wild or in the city – they are well-known to us Antipodeans but book-buyers elsewhere may feel they've missed out.

Eleven species of *Pinus* are naturalised in Australia, mostly common species, without providing any surprises except for the literary one of *Pinus pinaster* having "milk chocolate-colored" cones. More virile is the account of *Pinus brutia* (*P. halepensis* var. *brutia*) of the eastern Mediterranean, the species that we should be calling the Anzac pine though here it

keeps its identity as Calabrian pine. It is probably this tree that is frequently planted on RSAs and memorial sites in both our countries. Its distribution map has been omitted from this work, perhaps for security reasons.

Similarly the map for the last conifer, *Picea abies*, has gone astray as has the list of its voucher specimens. We might guess that Ken Hill found the proximity of the next and final group to be treated, his cycads, too hypnotic, and rightly so – with three genera and 69 species Australia has very satisfactory biodiversity here. But for a last time it has to be said, the drawings are excellent but only just encompass the range of variation in the group. We do get as compensation three pages of very good habit photos from the ubiquitous-lensed David Jones.

The work ends with a good but not quite complete glossary (cataphyll, cladistic...). The definition: acroscopic "pointing towards the apex" would have been better as "located on the apical (distal) side".

I want to congratulate the contributors to this volume for a work many will use and many more will enjoy. I have not ascertained its price in New Zealand, but this series, presumably because of its wide market-appeal (I have to rather shamefacedly admit) always provides exceptional value.

Rhys Gardner, Auckland Museum, Private Bag 92018, Auckland

■ Journals received

New Zealand Native Orchid Group Journal 71
(June 1999; ISSN 1170-4543) Edited by Ian St George. 35 p.

Original papers in this issue are: J. Bruce Irwin – Update on *Thelymitra* "Whakapapa"; Patricia Aspin – Awhitu Chronicle; Trevor Nicholls – Iwitahi happenings; Iwitahi 1999; E.D. Hatch – The NZ genera 8: *Acianthus*, *Townsonia*, *Genoplesium*; Graeme Jane – Observations on orchid distribution and flowering times in Nelson and Marlborough; Graeme Jane & Gael Donaghy – *Pterostylis montana* and "non-montana"; Gael Donaghy – *P.* aff. *obtusa*:1999 photographs.

New Zealand Native Orchid Group Journal 72
(September 1999; ISSN 1170-4543) Edited by Ian St George. 39 p.

Original papers in this issue are: E.D. Hatch – The NZ genera 9: *Gastrodia*; E.D. Hatch – Structure and development in the New Zealand terrestrial orchids; Gael Donaghy & Graeme Jane – *Pterostylis alveata* = *P.* aff. *obtusa* – an update.

Editor

CORRIGENDUM

■ Anthony Peter (Tony) Druce (1920–1999)

In my haste to prepare a brief obituary for Tony, the number of plant collections that Tony made was incorrectly calculated as 424,844. A few people noticed that this figure is almost greater than the total holdings of CHR! Helen Druce has since provided the final total of 37,794 specimens collected and deposited in CHR at Landcare Research.

Editor

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