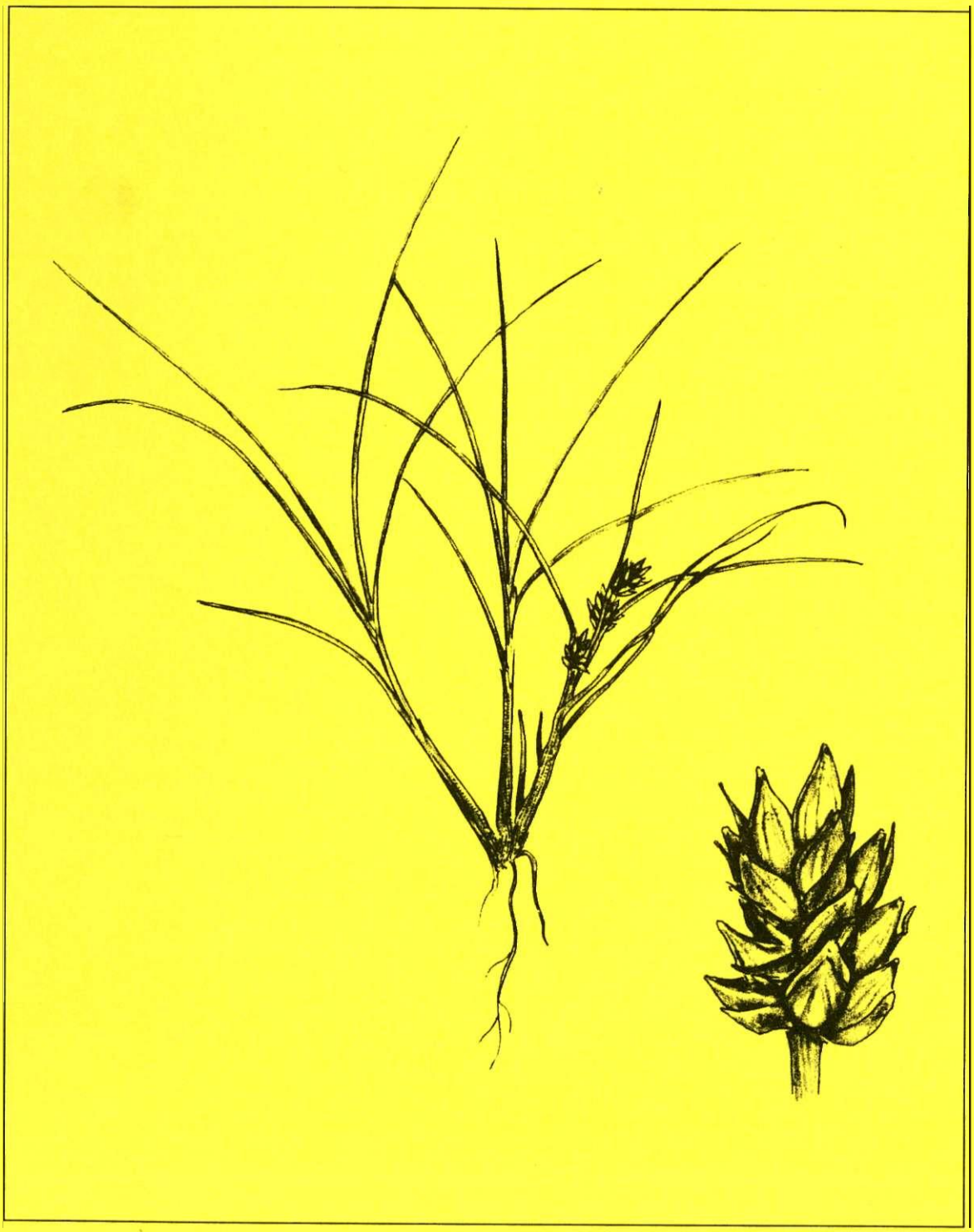
NEW ZEALAND BOTANICAL SOCIETY

NEWSLETTER

NUMBER 55 MARCH 1999



New Zealand Botanical Society

Subscriptions

The 1999 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 June 1999 issue (Number 56) is 28 May 1999.

Please forward contributions to:

Dr Carol J. West,
c/- Department of Conservation
PO Box 743
Invercargill

Contributions may be provided on an IBM compatible floppy disc (Word) or by e-mail to cwest@doc.govt.nz

Cover Illustration

Carex uncifolia, life-size with fruit details ×4. The specimen was grown in the Southland Threatened Plant Garden, Otatara, by Chris and Brian Rance, propagated from material collected at West Dome; drawn by **Lloyd Esler**.

NEW ZEALAND BOTANICAL SOCIETY
N E W S L E T T E R
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CONTENTS

Regional Botanical Society News

■ Auckland Botanical Society

December Meeting
The Regional Botanic Gardens at Manurewa were a pleasant and appropriate venue on a warm summer's evening for the annual pot luck dinner. Before and between courses, members were able to wander through the native section and enjoy the wide variety of plantings.

December Field Trip
Four members made the long trip to Iwi Tahi, near Taupo, to join in the annual outing of the native Orchid Group. The Saturday morning was taken up with counting the number of orchid plants in quadrats in *Pinus nigra* forest which has been reserved to protect the many species of orchids which grow there. The afternoon was spent exploring and becoming acquainted, or reacquainted, with orchids which don't grow in the north. *Thelymitra nervosa* (=*T. decora*) was one such species that was flowering beautifully. But the sight of the weekend was unanimously declared to be a patch of *Chiloglottis valida* (= *C. gunnii*) with the chocolate brown flowers held high on quite long stalks. In the evening the 4 a.m. departure from Auckland began to tell, and none was able to stay awake long enough to see the much anticipated 3D slide show. The Sunday drive home was a leisurely affair with some botanical stops along the way.

January Field Trip
The weather was unkind for the Anniversary Weekend trip to Cuvier Island, off the Coromandel Peninsula. The seas were not too rough at first, although the number of prostrate bodies belied that fact, but once the charter boat reached the island and three exciting trips ashore confirmed the fear that the wind was not from a favourable quarter, the decision was made to withdraw. The six people who landed briefly had a tantalising glimpse of kakariki, saddlebacks and skinks on shore. The disappointment of the whole group was tempered by the realisation that safety must come first, so prostrate bodies and rat-proof barrels were transported back to Whitianga. Some hurriedly organised accommodation on the peninsula meant that the holiday weekend was not completely spoiled.

February Field Trip
Mt William Walkway, on the south side of the Bombay Hills (yes, there is life there!) passes first through broadleaved forest with many epiphytes on the spreading branches overhead, and a carpet of *Asplenium lamprophyllum* on the ground. With Jessica Beever present, the upward climb was taken at a bryologist's pace, as we learned interesting diagnostic features of these smallest of plants. After lunch on a grassy hill, the descent was down a ridge with a complete contrast in vegetation, the kauri/hard beech mix that is only occasionally encountered. Although dry and rather eaten out by goats, plenty was found of interest, including a fern that was provisionally named as *Grammitis rawlingsii*. Near the foot of the walkway a splinter group headed to the next gully to see if the population of king fern, which was reported from there in 1979, was still present. Happily, many small plants were growing along the stream banks.

Forthcoming Activities: Evening Meetings
3 March – AGM. Historic and notable trees of Auckland (Lance Goffart-Hall).

Field Trips
13 March – Moturekareka and associated islands (Ewen Cameron)

Maureen Young, 36 Alnwick St, Warkworth

■ Wanganui Museum Botanical Group

March (1998) Field Trip: "The Lakes", Mangahoe Road, Hunterville

Nine of us spent the morning in bush on a fairly steep, north-facing slope. The main trees were titoki and kanuka with a couple of large northern rata, some mahoe and kahikatea. *Asplenium hookerianum* was common, in several forms. Unfortunately, there were also large patches of elderberry and some *Clematis vitalba.* Later, we botanised the western edge of Lake Maungaratanui. Among the many swamp plants were quite large patches of *Gratiola sexdentata.*

Early August Field Trip: Kitchener Park, Feilding and Mt Lees Reserve

As a group, we'd last visited Kitchener Park in 1993 when Gavin Scott showed us the impressive progress which had been made in controlling the wandering Jew (*Tradescantia fluminensis*) that a year or two earlier had covered almost the entire reserve. In 1993, the forest floor was almost entirely bare with just a few tiny seedlings of native trees and shrubs. Nine of us returned five years later and Gavin outlined his continuing work with the Manawatu District Council, using various community groups to further his aim of eradicating the weed from the reserve. This involves hand-weeding (mostly) and rescuing native seedlings from dense patches and replanting in some places. Several large bins had been made and the gathered *Tradescantia* is placed in these to decompose. Natural regrowth of kawakawa was especially dramatic, with some of it now head-high. From just two tree ferns seen five years ago there are now large numbers of mamaku, ponga and wheki. They still lack trunks. Of the trees, ribbonwood has probably the most seedlings. We found seedlings of some of the reserve's rare species such as pokaka and *Coprosma rotundifolia* and discovered a cluster of the orchid *Drymoanthus adversus* on a totara limb. We applaud Gavin's dedication to restoring this regionally valuable floodplain forest. After lunch, the group proceeded to the Mount Lees Reserve inland from Bulls. It was once the property of Ormond Wilson who donated it to the nation. The road in is through a field of daffodils, just coming into bloom when we visited, as were the eucalypts around the car park. The latter were the resort of numbers of tui. A track follows the main feature of this reserve, a gully where native trees and other plants occur naturally, with interplanted exotic species.

Late August Field Trip: St John's Hill walkways

Wanganui District Council has recently upgraded walking tracks along the scarp of St John's Hill overlooking the city, and made some new ones. These make it easy to see the extensive plantings of native and exotic trees that were done many years ago. Oak, elm, plane, scarlet gum, green wattle (*Acacia decurrens*), native beeches (four species and a hybrid), kauri, rimu, kahikatea, kowhai, black maire, toro and northern rata are just a few of the 110 exotic and 52 native tree and shrub species. Many are self-establishing, including the Australian palm, *Livistona australis*, and mangeao (*Litsea calicaris*) well south of its natural range. There are also some that seem to be survivors or descendants of the original native cover of the slopes and the swamps at the base of the hill: *Carex spinirostris*, *C. geminata* (the unnamed, robust, mostly coastal form), *Gahnia lacera*, and various ferns, including *Arthropteris tenella*, are some of these. Sadly, there are also huge numbers of weed species, including garden escapes, though it was good to see that the Council's control of old man's beard means that it is less rampant than several years ago. Evergreen buckthorn (*Rhamnus alaternus*) was controlled last winter, but there are still many untreated shrubs of it. Near the top of the deer park track, we found that the Queensland "gum vine" (*Aphanopetalum resinosum*) has spread more widely since reported in *NZBS Newsletter 42.* It is not known in cultivation or the wild anywhere else in NZ. We walked back via Peat Park where two wingnut trees (identified by Chris Ecroyd of FRI as *Pterocarya* ×*rehderiana*) had many seedlings among their roots although trampling and lawn mowing will ensure these never get more than ankle-high.

October Field Trip: "Mainui", Kauarapaoa Road, inland Wanganui

A major reason for this trip was to see native orchids in some privately owned forest remnants and on adjoining roadside banks. A detailed account has appeared in *NZ Native Orchid Group Journal 69.* Prominent on some wet mudstone road banks were masses of *Corybas iridescens* among a sward of flowering mountain foxgloves (*Ourisia macrophylla*) and several

clumps of *Pterostylis* aff. *montana*. *C. macranthus* and *C. oblongus* had flower buds almost open. Nearby stands of mature black beech forest had a rusty hue this day, as the trees were in full bloom. Black beech and tawa predominate here, with kamahi, black maire, white maire, rewarewa and others. Of special note were six slender trees of NZ sandalwood (*Mida salicifolia*), a species not recorded in this part of the district. The land owner showed us patches of *C. trilobus* flowering under the beeches and some *Chiloglottis cornuta* and *Drymoanthus adversus*. The latter grew thickly on limbs of beech trees, on trunks of rewarewa and kamahi and the stems of mingimingi (*Leucopogon fasciculatus*). Most *Drymoanthus* plants had typical dull green purple-spotted flowers, but one beech tree had a patch of *Drymoanthus* plants with plain, pale yellow-green flowers. Fresh plants of each type were sent to Brian Molloy who reported that the yellowish flowers were unusual for *D. adversus* "but nevertheless do not seem to stray outside the boundaries of this tetraploid species". Was our *Drymoanthus* a one-off colour morph? All the 10 or so plants on one beech tree had the same flower colour. Maybe people have seen such flowers elsewhere but not reported them? The day was rounded off with a little history. Mainui School, built in 1920, catered for 11 pupils. We were shown inside the school building which closed in 1933.

November Field Trip: Lake Papaitonga

Five of us joined a party of the Wellington Botanical Society at this important scenic reserve. A detailed account is given in that Society's December 1998 newsletter. For us, being in a party of more than 50 botanists was quite a novelty. But such a large group made communication between people quite difficult on the reserve's narrow tracks, especially when something of note was being explained to people. Of particular interest to Wanganui botanists were the kohekohe and swamp maire trees, since we don't have these locally. Flowering kiekie was a special memory and seemingly an indicator of excellent control of possums in the reserve. Above all, the day was a rare chance to catch up with some old friends from the Wellington Society, and others from Horowhenua, Manawatu and the Rangitikei.

January Field Trip: Lake Wiritoa

Five of us, on a very wet but warm morning, explored the eastern margins of this dune lake with the landowner. One patch of raupo that grew in shallow water beyond the reach of cattle contained the regionally rare native grass, swamp millet (*Isachne globosa*). Dense patches of water lilies (maybe more than one species) with white, cream, pink, red and mauve flowers have spread from past plantings. Among them, the shallow water was choked with hornwort (*Ceratophyllum demersum*). The low summer lake level had exposed fringing mats of flowering native turf plants. Some of these we'd seen before on the opposite side of the lake, including *Crassula ruamahanga* well north of its type locality at Carterton. *Glossostigma elatinoides, Hydrocotyle hydrophila, Callitriche petriei* and *Pratia perpusilla* were others in these turfs. Several groves of native trees, dominated by titoki, lay in small gullies leading back from the lake. They had no native undergrowth or regeneration, because of grazing. Two massive fruiting vines of a lawyer were in one patch. Their yellow thorns and small leaves suggested they were hybrids, *Rubus schmidelioides* × *R. squarrosus*, but there was no sign of either suggested parent species. The last forest remnant we were shown had been fenced for decades and had a wider range of native species, including shrubs, ferns and sedges. The most unusual for this district was the fern *Adiantum viridescens*. *Robinia* and elderberry threaten the future of this remnant.

Forthcoming Activities: Evening Meetings

First Tuesday each month in the Museum's Davis Lecture Theatre; commencing 8 p.m. summer time; 7.30 p.m. winter time (April–October).

2 March – Graeme Platt on two themes: succession in New Zealand vegetation and *Araucarias*

6 April – Viv Nicholls: megaherbs of Campbell Island

4 May – Dr John Flenley: flowers of the rain forest

1 June – Jim and Diana Howard: Chatham Island (re-scheduled from February)

6 July – Vonnie Cave: alpine flowers of Europe

3 August – AGM

Field trips
27 February – Rotokura Lakes, Tongariro Nat. Park + McConachie's garden near Ohakune.
27 March (+ 28 March?) – New Plymouth. Barrett's forest near Pukeiti
1 May – Jo and Ted Abraham's farm, Kawhatau Valley
30 May – Putiki forest remnants with wharangi (*Melicope ternata*)
4 July – Bason Reserve and Fiona McGowan's nursery

Robyn Ogle, 4 Brassey Road, Wanganui

■ Nelson Botanical Society

December Field Trip: Red Hills
After all 25 people had been shuttled to the hut the serious botanising began. Near the hut there were large patches of *Pterostylis australis* in full flower in the manuka scrub and the odd *Thelymitra cyanea, T. decora* or *T. pauciflora.* Towards the rain gauge the local red sedges, *Carex uncifolia* and *C. traversii* and two striking astelias also attracted attention, the mineral belt variety of *A. graminea* and the local form of *A. nervosa.* Further along, a large population of *Myosotis laeta* was in full flower. After lunch we explored the wetland below the hut. Along the edge of the wetland a rock fall provided an interesting collection of species including *Hebe* sp. Aff. *carnosula, Pittosporum anomalum, Pimelea suteri, Aristotelia fruticosa* and *Melicytus alpinus*, several of which were in flower. A little further along, more *Myosotis laeta* and the first gentians of the season – probably *Gentiana bellidifolia* stood out in the tussock. Many people chose to walk down the hill and enjoy the views of the valley and the transition from ultramafic vegetation to rich beech forest.

January Field Trip: Mt Arthur
The jinx was broken! It was a beautiful day on Mt Arthur for a large contingent that moved quickly through the forest to the lowest alpines. At first, *Celmisia dallii, Aciphylla* aff. *glaucescens* and the snowgrasses (*Chionochloa pallens* and *C. australis*) put on a good show along with the cryptic *Aciphylla anomala.* In the mounds of *Hebe masoniae* the huge flowers of *Hebe macrantha* were also particularly evident. At the second level, *Celmisia sessiliflora* and *C. incana* provided a grand display along with edelweiss (*Leucogenes grandiceps), Raoulia grandiflora, Pterostylis tanypoda* and the first of the gentians. At the sinkholes *Ranunculus insignis* and *Celmisia traversii* were past their best but other plants provided interest here including *Coprosma atropurpurea, Hebe ochracea* and *Myosotis macrantha.* At the third level on the almost bare marble faces, the heavy scent of *Poranthera alpina* filled the air and *Epilobium vernicosum, Pratia macrodon* and *Anisotome pilifera* were particularly abundant and in full flower. In higher sinkholes *Ranunculus insignis* and odd large plants of *Cheesemania latesiliqua* were especially conspicuous.

Anniversary Weekend Camp: Dip Flat
On Saturday15 Botsoccers headed for the tussocklands at Lake Tennyson. Each patch of a few square metres contained a rich array of species among the profusely flowering snow tussocks. Five *Acaena* species were seen (*A. inermis, A, saccaticupula, A. fissistipula, A. profundeincisa,* and *A. caesiiglauca). Gingidia decipiens* also was quite abundant and readily distinguished from nearby *Anisotome aromatica* by its smell. Other plants of interest included *Aciphylla monroi, A. aurea* and gentians, especially the very robust *Gentiana corymbifera.* The next stop was at Island Saddle to see the scree plants. Near the vehicles *Gnaphalium nitidulum* warranted a stop and on the scree *E. pycnostachyum* was dominant. Then, looking more carefully, *Myosotis traversii, Lobelia roughii, Stellaria roughii* (mostly past flowering), *Lignocarpa carnosula* and *Wahlenbergia cartilaginea* (in flower) all became evident. Finally, at Berts Creek a waterfall close to the road had, as always, a good complement of species. Of particular interest here was *Dolichoglottis lyallii* (past flowering) and the local *Melicytus* aff. *alpinus* nicknamed the "pipe cleaner". Also, among the rocks were *Heliohebe hulkeana, Schizeilema roughii* and much snow totara in fruit (which was eagerly sampled and savoured).

Sunday brought rain off and on all day so there were only a few (sometimes very brief) forays outside to break the boredom. At mid morning a discussion (at times rather free running) was

held on the distinguishing characters of *Carex, Juncus*, and the grasses; the three largest groups of monocotyledons in New Zealand.

On Monday, getting to Rainbow skifield past a wind/rockfall, provided some entertainment. At the skifield we headed over the ridge for the sheltered northern basin of the skifield lease. On the ridge line *Raoulia bryoides* and *R. eximia* were quite common and scattered plants of *Chionohebe cheesemanii* (in flower) and *C. pulvinaris* were present. Below, and in the distance, *Haastia pulvinaris* was visible on the screes. On the descent to the tarn we refreshed on species seen on Saturday. *Pratia macrodon* was very abundant and in good flower. In the tarn the "forests" of *Myriophyllum triphyllum* were clearly visible along with *Isoetes alpinus* (later examined in detail at a small spring). Species in wet patches around the tarn included *Myosotis pygmaea, Plantago uniflora, P. triandra, Ranunculus amphitrichus, Schizeilema hydrocotyloides* and some *Euphrasia revoluta* still in flower. On the return, time was taken to examine plants such *Hebe* sp. "q" which were hastily passed on our ascent in the morning.

February Field Trips: Editor Hill & Moncrief SR

In spite of a brilliant day we had the worst turnout in five years. Only eight headed for Okiwi Bay and two visited Moncrief SR (initially) and six headed up the hill. At first, the track was through tall kanuka, gorse and regenerating forest with a varied understorey of ferns and young trees. Further up, the forest canopy was hard beech and the understorey almost absent due to high goat numbers. Later, silver beech appeared and a shrubby understorey of coprosmas gradually increased in density. In places there was a rich ground cover of filmy ferns, especially *Hymenophyllum demissum*. More open rocky areas in the upper forest had a cover of *Chionochloa cheesemanii* in full flower. On the bluffs at the summit *Chionochloa cheesemanii* was mixed with *C. flavescens* (both in prolific flower) *Hebe rigidula, Celmisia hieracifolia* and flowering *Gentiana bellidifolia*. A few minutes on from the summit we were out into a boggy area dominated by comb sedge *(Oreobolus pectinatus*), *Schoenus pauciflorus* and fringed by cedar forest. In places the ground was almost entirely bare, apart from a few epilobiums and *Juncus novae-zelandiae*.

For those who ventured to Moncrief Scenic Reserve there was a rich and varied piece of coastal forest. As we descended the hill the road passed through rather open hard beech forest containing kamahi, putaputaweta, tutu, and wineberry with *Echinopogon ovatus* on the road edge. At the foot of the hill the forest changed to tall tawa. Close to the access road there was a dense wall of shrubs including *Coprosma areolata* but further away the open forest had a rich ground cover of ferns, especially *Hymenophyllum demissum*. Along the streamside nikau, supplejack and kiekie formed a dense understorey beneath pukatea. Here *Danhatchia australis* was seen, with one plant not far past flowering. The large rimu and pukatea carried a dense load of epiphytes including *Collospermum hastatum, Astelia solandri,* and various shrubs including *Pittosporum cornifolium*, the last also being found on the shore nearby.

Forthcoming trips

March 21 – Delaware Bay

April 18 – Pelorus Bridge

Graeme Jane, 136 Cleveland Terrace, Nelson

Research News

■ Plant biosystematics research in New Zealand

From a recent article in this *Newsletter* (Breitwieser & Heenan 1997) the New Zealand National Herbarium Network (NZNHN) reordered the information on plant biosystematics research to produce an alphabetical list of taxa on which people were working or intending to work. This list was distributed to all New Zealand herbaria for their use, particularly so that the

"...members of the New Zealand Herbarium Network will see to the security of vouchers of unnamed taxa to ensure protection of the interests of the taxonomists who have declared that they will describe any of these taxa". (12th Annual Meeting held at Herbarium MPN, Massey University, 23 November 1994).

This compilation has been very useful for all herbarium curators. Occasionally, loans of taxa not on this list have been sent overseas before a request has been placed by a New Zealand researcher who subsequently found that all the material required for their studies was no longer immediately available; not a comfortable situation if Foundation contract deadlines are to be kept. All researchers in New Zealand are urged to add their taxa to this list so that all herbaria can be circulated with up-to-date information.

Please send your confirmations and alterations, both additions and removals to the 1997 list to Murray Parsons, Landcare Research, P.O. Box 69, Lincoln, Canterbury. Fax: 0-3-325 2418, E-mail: parsonsm@landcare.cri.nz. **Please note** that if you don't confirm that you are still working on these taxa, you may be removed from the listing.

Reference

Breitwieser, I.; Heenan, P. B. 1997: Plant biosystematics research in New Zealand. *New Zealand Botanical Society newsletter 48* (June 1997): 6–7.

A–Z List of taxa from Breitwieser and Heenan (1997)

Aciphylla: John Dawson, Victoria Univ., Wellington.
Alectryon: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Alseuosmia quercifolia: Merilyn Merritt, student, and Bruce Clarkson, Landcare Res., Hamilton.
Alseuosmiaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Anisotome: John Dawson, Victoria Univ., Wellington.
Araliaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Arthropodium: threatened and unnamed taxa, Peter de Lange, DoC, Auckland; Peter Heenan, Landcare Res., Lincoln.
Atriplex: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Beilschmiedia: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Bryophytes: Allan Fife, Landcare Res., Lincoln.
Campanulaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Cardamine: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Carex: threatened and unnamed taxa, Peter de Lange, DoC, Auckland; Peter Heenan and Kerry Ford, Landcare Res., Lincoln.
Carmichaelia complex: Peter Heenan, Landcare Res., Lincoln; molecular systematics, Steve Wagstaff, Landcare Res., Lincoln.
Celmisia, Compositae: Phil Garnock-Jones, Victoria Univ., Wellington.
Celmisia × *Olearia* hybrids: Bruce Clarkson, Landcare Res., Hamilton.
Cheesemania, Brassicaceae: Phil Garnock-Jones, Victoria Univ., Wellington.
Chenopodium: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Chionohebe: molecular systematics, Steve Wagstaff, Landcare Res., Lincoln.
Clianthus: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Colobanthus: Barry Sneddon, Victoria Univ., Wellington.
Conifers: Brian Molloy, Res. Assoc., Lincoln.
Coprosma: Rhys Gardner, Res. Assoc., Auckland Museum; Michael Heads, DoC, Whangarei; threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Corynocarpus: molecular systematics, Steve Wagstaff, Landcare Res., Lincoln.
Craspedia: Ilse Breitwieser, Landcare Res., Lincoln.
Ctenopteris: Barbara Parris, Fern Research Foundation, Kerikeri.
Cunoniaceae: Phil Garnock-Jones, Victoria Univ., Wellington.
Cytology: Murray Dawson, Landcare Res., Lincoln.
Dichondra: Rhys Gardner, Res. Assoc., Auckland Museum.
Dracophyllum: Rhys Gardner, Res. Assoc., Auckland Museum.
Escalloniaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Ferns (New Zealand): Patrick Brownsey, Te Papa, Wellington.
Festuca: Henry Connor, Res. Assoc., Landcare Res., Lincoln.
Fissidens: Jessica Beever, Res. Assoc., Landcare Res., Auckland.
Forstera: David Glenny, Landcare Res., Lincoln.
Galium: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.

Geniostoma: Phil Garnock-Jones, Victoria Univ., Wellington; threatened and unnamed taxa, Peter de Lange, DoC, Auckland; Rhys Gardner, Res. Assoc., Auckland Museum.
Gentiana: David Glenny, Landcare Res., Lincoln.
Grammitis, Grammitidaceae: Barbara Parris, Fern Research Foundation, Kerikeri.
Grass Flora: Elizabeth Edgar and Henry Connor, Res. Assoc., Landcare Res., Lincoln.
Gratiola: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Griseliniaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Hebe: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Hebe (northern): Bruce Clarkson, Landcare Res., Hamilton.
Hebe complex: Michael Bayly and Patrick Brownsey, Te Papa, Wellington; Phil Garnock-Jones, Victoria Univ., Wellington; molecular systematics, Steve Wagstaff, Landcare Res., Lincoln.
Hebe stricta complex: Cara Maher and Phil Garnock-Jones, Victoria Univ., Wellington.
Hebe rigidula complex: Gillian Harper and Phil Garnock-Jones, Victoria Univ., Wellington.
Hoheria: Rhys Gardner, Res. Assoc., Auckland Museum, threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Homalanthus: Rhys Gardner, Res. Assoc., Auckland Museum.
Hypericum: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Icacinaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Inuleae, New Zealand (Compositae): Josephine Ward, Univ. Canterbury, Christchurch; Ilse Breitwieser, Landcare Res., Lincoln. Micromorphology: Lynn Baxter and J. Ward, Univ. Canterbury, Christchurch. Hybridism: Robert McKenzie and J. Ward, Univ. Canterbury. Phenology, anatomy: Aaron Wilton and J. Ward, Univ. Canterbury, Christchurch. Molecular systematics, Steve Wagstaff, Landcare Res., Lincoln.
Ischnocarpus: Phil Garnock-Jones, Victoria Univ., Wellington. Threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Iti: Phil Garnock-Jones, Victoria Univ., Wellington.
Kirkianella: Murray Dawson, Landcare Res., Lincoln; David Glenny, Landcare Res., Lincoln.
Knightia: Phil Garnock-Jones, Victoria Univ., Wellington.
Lauraceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Lepidium oleraceum agg.: threatened and unnamed taxa, Peter de Lange, DoC, Auckland *Lepidium*: Phil Garnock-Jones, Victoria Univ., Wellington.
Leucopogon: Murray Dawson, Landcare Res., Lincoln; threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Lichens: David Galloway, Landcare Res., Dunedin.
Limestone flora: Brian Molloy, Res. Assoc., Lincoln.
Limosella: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Mazus: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Melicytus: threatened and unnamed taxa, Peter de Lange, DoC, Auckland; Brian Molloy, Res. Assoc., Lincoln.
Metrosideros: John Dawson, Victoria Univ., Wellington.
Myosotis: Alastair Robertson, Massey Univ., Palmerston North.
Myrsinaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Myrsine: threatened and unnamed taxa, Peter de Lange, DoC, Auckland, and Peter Heenan, Landcare Res., Lincoln.
Neopaxia: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Notothlaspi: Phil Garnock-Jones, Victoria Univ., Wellington.
Olearia (large-leaved): Rhys Gardner, Res. Assoc., Auckland Museum; Michael Heads, DoC, Whangarei.
Olearia complex: Phil Garnock-Jones, Victoria Univ., Wellington.
Orchids: Brian Molloy, Res. Assoc., Lincoln.
Ourisia: Phil Garnock-Jones, Victoria Univ., Wellington.
Oxalidaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Pachycladon: Phil Garnock-Jones, Victoria Univ., Wellington.
Parahebe catarractae complex: Bianca Maich and Phil Garnock-Jones, Victoria Univ., Wellington.
Parahebe: molecular systematics, Steve Wagstaff, Landcare Res., Lincoln.
Parsonsia: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Pennantia: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Peperomia: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Phormium: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Phyllocladus: molecular systematics, Steve Wagstaff, Landcare Res., Lincoln.
Picris: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Piperaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Pittosporaceae: Rhys Gardner, Res. Assoc., Auckland Museum.
Pittosporum: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.

Plagianthus: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Ranunculus recens agg.: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Schoenus: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Scleranthus: Rob Smissen and Phil Garnock-Jones, Victoria Univ., Wellington.
Senecio: threatened and unnamed taxa, Peter de Lange, DoC, Auckland.
Sonchus: Phil Garnock-Jones, Victoria Univ., Wellington.
Sophora: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Sporadanthus: Bruce Clarkson, Landcare Res., Hamilton; threatened and unnamed taxa, Peter de Lange, DoC, Auckland; Peter Heenan, Landcare Res., Lincoln.
Spergularia: Phil Garnock-Jones, Victoria Univ., Wellington.
Stellaria: threatened and unnamed taxa, Peter de Lange, DoC, Auckland, and Peter Heenan, Landcare Res., Lincoln.
Swainsona: molecular systematics, Steve Wagstaff, Landcare Res., Lincoln; threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Trisetum: Elizabeth Edgar, Res. Assoc., Landcare Res., Lincoln.
Uncinia: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.
Viola: threatened and unnamed taxa, Peter Heenan, Landcare Res., Lincoln.

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NOTES AND REPORTS

Plant Records

■ Kermadec koromiko (*Hebe breviracemosa*) comes back from the brink of extinction

The genus *Hebe* (Scrophulariaceae) is centred in the New Zealand archipelago with outlying occurrences in South America (2 species), New Guinea (1 species), Australia (1 species), and Rapa Island (1 species) (Garnock-Jones 1993; Heads 1993). Within New Zealand, it is now generally accepted that there are about 100 taxa, several of which still await formal taxonomic recognition (Eagle 1982; Garnock-Jones & Clarkson 1994; Clarkson & Garnock-Jones 1996; de Lange 1996, 1997, 1998; Norton & de Lange 1998). Within New Zealand, *Hebe* species are distributed throughout all the main islands of the archipelago with outlying occurrences on the Chatham Islands, the subantarctic islands, and at the other extreme, a single species on the semi-tropical Kermadec Islands (Oliver 1910; Sykes 1977).

The Kermadecs (lat. 29°S – 31° 5'S, long. 178° W – 179° W) are a widely scattered group of islands, islets and rock stacks (23 in total) located 976 km north of New Zealand (Sykes 1977). Volcanic in origin, several of the islands are still active, with the largest island, Raoul (Rangitahua) having erupted several times over the last century. The Islands are a Nature Reserve administered from New Zealand by the Department of Conservation. With respect to the flora and fauna of Raoul, the most serious impact resulting from past human occupation was the introduction of goats (*Capra hircus*) (in 1836), cats (*Felis catus*) and *rats (Rattus exulans*, *R. norvegicus*) (exact dates of introduction not known). Furthermore, a number of environmentally damaging weeds, e.g., Mysore thorn (*Caesalpina decapetala* (Fabaceae)), Brazilian buttercup (*Senna septemtrionalis* (Fabaceae)), and aroid lily (*Alocasia brisbanensis* (Araceae)), originating from the neglected gardens left during the various attempts at settlement, are still widespread on the island (Sykes 1977; Sykes & West 1996).

It was Oliver (1910) who first described the flora of the island in detail. Oliver also described several new plants form the island, one of which was an endemic shrubby koromiko. This he named *Veronica breviracemosa* W.R.B.Oliv. However, along with many other New Zealand *Veronica*, this species was transferred to the genus *Hebe*, as *H. breviracemosa* (W.R.B.Oliv.) Cockayne et Allan.

Kermadec koromiko forms a small shrub (1–2 m × 2 m), with bright green to yellow green, broadly lanceolate leaves. The lilac to pale lavender flowers, with their characteristically strongly recurved corolla lobes are borne on a short, leafy raceme, usually buried within the

foliage (Fig. 1). It is this short raceme from which the species earns its specific epithet "*breviracemosa*".

During Oliver's visit to the islands, he noted that *H. breviracemosa* (hereafter Kermadec koromiko) was already becoming uncommon, on account of the fact that it "has been almost killed out by goats". Oliver noted that it was "now only found in cliffs and other places inaccessible to these animals". Sixty-nine years later, following several field surveys, Sykes (1977) reported that it was "now probably extinct" and it was listed as such by Given (1981).

Weed and animal control measures on Raoul Island were first initiated in the early 1970's, as a result of concerns over the demise of endemic flora and fauna (Sykes 1977). Goats were amongst the first animals to be targeted (systematic hunting began in 1971). As a result, there was an almost immediate improvement in the condition of the flora of the island, in particular, the status of the Island's more seriously threatened endemic plants (Sykes 1977; Sykes & West 1996). Goats were finally eradicated in 1984. During 1983, goat hunter Ray Scrimgeour, whilst tracking a lone goat across Hutchinson Bluff, was surprised to stumble upon a single Kermadec koromiko sapling. Until 1997 this solitary plant was the only known wild example of this critically endangered species, and the source of all material held in cultivation in New Zealand.

Since 1983, conservation measures for Kermadec koromiko undertaken on Raoul have involved sporadic survey for further plants, attempts to germinate seed from the wild plant, and the planting out of cutting grown specimens. Although germination of seed proved easy, the difficulty of maintaining the seedlings to a stage suitable for planting out, meant that, until recently, only cutting grown material has persisted in the wild. Back in New Zealand, the future of Kermadec koromiko remained far from assured. As a species, Kermadec koromiko is not especially attractive, and as such is not widely grown, with only a few specimens being held by several botanic gardens, universities and interested gardeners. Even more disturbing was the discovery in 1995 of the first evidence of spontaneous hybridism between this species and *Hebe diosmifolia* within gardens (P.J. de Lange unpubl. data). This discovery now means that unless strict measures are adopted to prevent further hybridism events, ex situ stocks of the Kermadec koromiko may eventually become unsuitable as a safeguard for the species. Faced with these problems the Department of Conservation set about planning a more thorough survey of Raoul Island. We knew that additional plants must exist, for the seed of this *Hebe* has short-term viability (6–18 months), so it was very unlikely that the only known wild plant had germinated from seed deposited 75 years ago.

Good surveys usually require a reasonable amount of autecological information about the target species. However, our knowledge of this species' ecology was limited to the few written accounts available and the study of garden plants. The literature dealing with the species was first written 74 years after goats had become well established on Raoul. Thus, as implied by Oliver (1910), the cliff habitat the species apparently favoured may easily have been a refugium, rather than a preferred habitat. However, experience of the Kermadec koromiko in cultivation, as well as studies of likely analogue *Hebe* species from northern New Zealand, suggested that the Kermadec koromiko would prefer seral habitats. Therefore cliff habitats, with their attendant instability, were probably typical haunts for the species. Observations of cultivated plants also showed that they grew and flowered better in dappled light, rather than full sun, and soon became etiolated in heavy shade. This suggested that plants were likely to be found only under taller, but not too dense vegetation, and not directly in the open. Armed with this information it was left to conservation staff to identify suitable sites on the island for survey. In the past the more accessible places on Raoul had already been extensively surveyed for the species (Sykes 1977; W.R. Sykes pers. comm., 1991). However, although some areas of cliffs had been searched, this was through the use of binoculars. Because the cliffs are often dotted with thickets of *Metrosideros*, and *Myoporum*, staff using binoculars could not accurately identify what grew beneath these trees. Furthermore, as the cliffs range from 200–400 m in height and are composed of unstable tuffaceous materials, survey proved difficult and hazardous. Despite these problems, it seemed likely that these cliffs held the key to discovering further specimens of Kermadec koromiko.

In 1997 plans were made to coordinate the weed survey and eradication programme with searches for the Kermadec koromiko. In particular the eradication programme for Mysore thorn and Brazilian buttercup had changed focus to the cliff tops, where isolated plants of these aggressive species still remained. As a result of these weed surveys, and the dedication and bravery of the weed management staff on the island, a small seedling Kermadec koromiko was discovered on the Denham Bay cliffs in December 1997. Later, in early 1998, the same staff discovered a further 50 plants, comprising adults and juveniles, between Western Spring and Hutchinson Bluff. All of these specimens have been located only through the use of ropes. Shortly after the discovery of these new populations of Kermadec koromiko, the original 1983 plant was found to be dead. It is survived, in situ, by a layered cutting which was made in July 1993 (C.J. West pers. comm., 1999).

These recent discoveries have helped reduce some of the urgency for the Department to prepare a recovery plan for the species. However, we are still a long way from removing the Kermadec koromiko from the National Threatened and Local Plant list (Cameron et al. 1995). Furthermore, the discoveries are still the accidental by-products of weed survey and control, serving to highlight the need for a specific Kermadec koromiko survey in other likely cliff habitats. In addition, although seedlings have been found on the cliff faces, natural recruitment

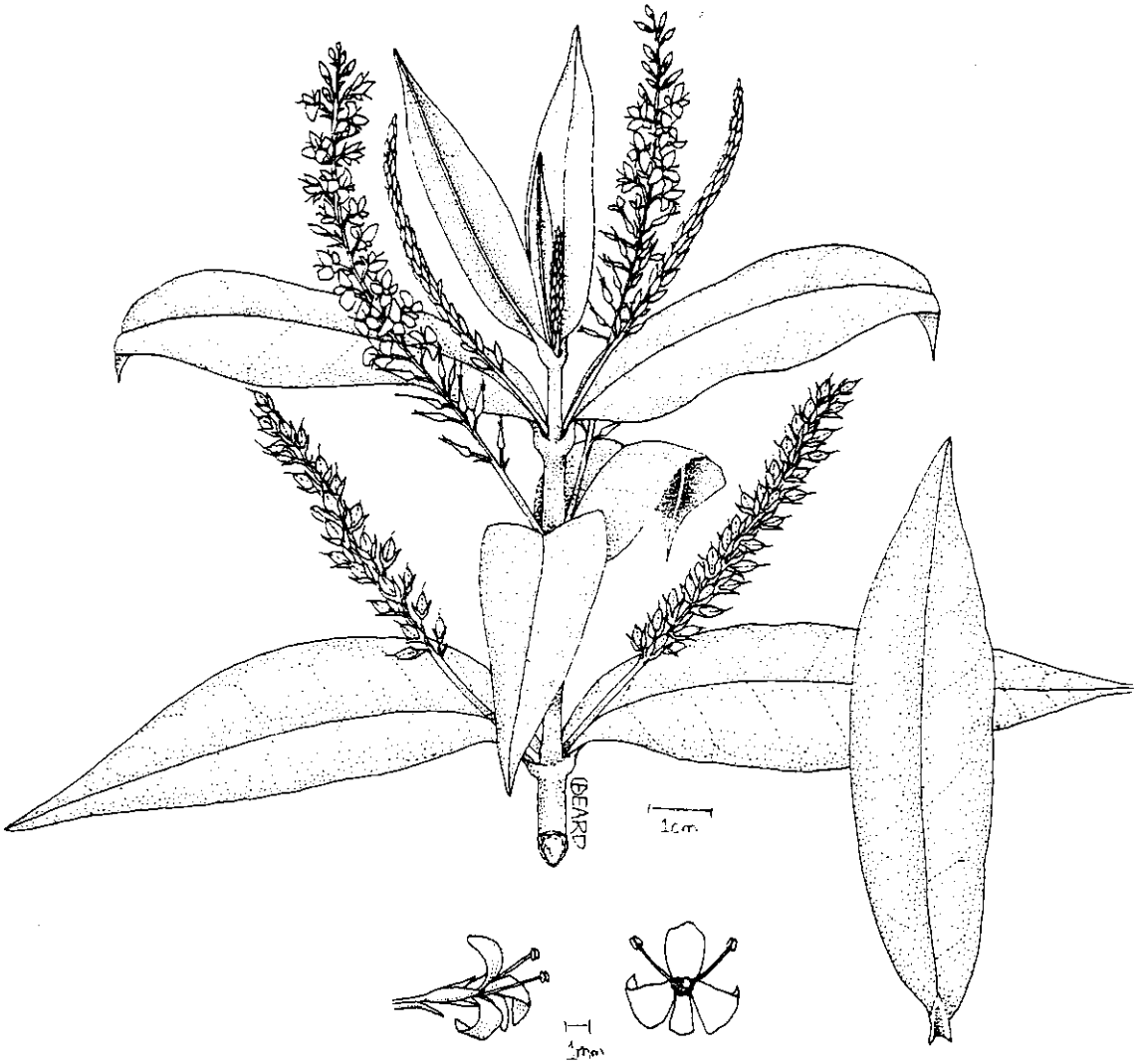

Fig. 1. Kermadec koromiko (*Hebe breviracemosa*). Drawn by Catherine Beard from a specimen cultivated in the senior author's garden at Mt Albert, Auckland. The plant on which this drawing is based is from a cutting-grown specimen derived from the original 1983 Raoul Island plant.

from the original 1983 plant (which produced viable seed) was never observed. Field inspections of that plant in 1993, suggested that rats may be responsible for this, as they could eat seedlings (West 1996; C.J. West pers. comm., 1993). Presently rats are widespread on Raoul, and they continue to have a major impact on the island's flora and fauna. Although plans to eradicate rats are well underway, control is unlikely to start until sometime after the year 2000. In the meantime it is imperative that weed control measures increase prior to rodent control, as it is likely that rats also suppress the spread of these species, and so following their removal we may face an even more serious weed problem. Lastly, there is a need to obtain seed and/or cuttings from the newly discovered plants, both to supplement the limited ex situ gene pool, as well as to provide insurance should these populations be destroyed through natural stochastic events, e.g., volcanic eruptions and associated earthquakes, cyclonic storms, and slips.

Despite these problems it is fair to say that the future of this species is looking better than ever. There are now 15 cutting grown plants established in the wild, and plans are underway to plant between 25–30 seedlings currently held in the island nursery, during the winter of 1999.

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■ *Myricaria germanica* (Tamaricaceae) wild in New Zealand

Introduction
Tamaricaceae is a rather small family which occurs naturally in Eurasia and northern Africa and is concentrated in the Mediterranean region eastwards to central Asia. Typically its

members are xerophytic or halophytic shrubs inhabiting dry sandy or saline places. All have an ericoid habit with small scale-like and often salt-excreting glandular leaves.

Tamarix L. is easily the largest of the four genera in the family and several of its 50 or so species are cultivated in New Zealand as ornamentals, as well as having been planted for soil stabilisation in open sandy or stony areas such as river banks, shingle slopes, and coastal sands. Tamarisks have only become adventive to a minor degree, mainly in coastal areas such as on sand dunes, especially around river mouths. Volume IV of *Flora of New Zealand* treats two species, the commonest and most widespread one being *Tamarix chinensis* Lour. This summer-flowering tree is also the usual species in cultivation here, whereas the rarer *T. parviflora* DC is a spring-flowering shrub, mainly grown in colder parts of the country.

Discussion

At the beginning of this year a specimen (CHR 518509) from large wild populations near the confluence of the Kowai and Waimakariri rivers in the middle of the Canterbury Plains was collected by one of us (P.A.W.) and it represents *Myricaria germanica* (L.) Desv., false tamarisk. Furthermore, an examination of the specimens in CHR labelled *Tamarix chinensis* showed that two from the Rakaia River bed, not far from the State Highway One bridge, also belonged to *M. germanica*. The first was collected in 1986 and has capsules *c.* 8 mm long which unfortunately formed the basis for the description of *T. chinensis* fruit in Volume IV, p. 1255, compiled by one of us (W.R.S.). Recognition of this now does, however, remove an anomaly in the account of this species because it is apparent that there are no capsules on any specimens of it which means that it is almost certainly sterile throughout New Zealand as it often seems to be elsewhere.

Myricaria and *Tamarix* are closely related and superficially can be easily confused. However, the former has 10 stamens with their filaments united to nearly halfway and forming a membranous sheath, whereas in *Tamarix* the usually 4–6 stamens are free or nearly so. Also, although both genera have seeds with conspicuous long white hairs, these are sessile in *Tamarix* but attached to a long stalk or rachis in *Myricaria*. In addition, *Myricaria germanica* has sepals and petals nearly twice the size of *Tamarix chinensis* and *T. parviflora*. Of less taxonomic significance are the more conspicuous white salt glands on the glaucous leaves of *M. germanica*. *M. germanica* is a shrub up to 2 m high and thus more like *T. parviflora* in this respect, whereas *T. chinensis* is usually a tree 4–5 m high. The large terminal panicles of small pink flowers of *T. chinensis* contrast with the much smaller terminal racemes of *M. germanica* and with the axillary racemes produced before the leaves in *T. parviflora*.

Myricaria Desv. is a small genus of 10 species from temperate Eurasia. We have no reports of any species being cultivated or adventive in New Zealand, although it would be surprising if the attractive prostrate and glaucous *M. rosea* W.W.Sm. from the Himalaya is not grown somewhere in the country. *M. germanica* is distributed naturally from the Mediterranean region northwards to Scandinavia and eastwards to Pakistan, easily the most widespread species in the genus. In flower it is not as attractive as the two *Tamarix* species above and therefore it seems more likely to have been introduced for a utilitarian purpose such as combating soil erosion although it has been grown as an ornamental shrub in Europe. Conversely, *Myricaria germanica* may have mistakenly been introduced into this country as *Tamarix*. Be that as it may, it is noteworthy that false tamarisk is a river bed plant elsewhere as well, at least in the western part of its natural range, i.e., it has the same habitat there as in New Zealand. However, it seems that in countries such as Germany and Finland it has become a rare plant because of human interference with the natural flow of the river systems, whereas it used to be a characteristic plant of such habitats.

In Canterbury, *Myricaria germanica* is confined to the Rakaia and Waimakariri river beds as far as we know. We do not know how large the population in the Rakaia is, but that in the Waimakariri seems to consist of thousands of plants and these grow in at least four places on the true right bank. The westernmost found is just upstream from the junction with the Kowai River, i.e., upstream from the Waimakariri Gorge Bridge, and the easternmost site, with what seems to be the smallest population, is below Darfield. The total distance is about 25 km. At

least one population is in a moist side channel, but other populations are in drier sites. The plants fruit freely with apparently fertile seed formed, but it seems that much of its spread is vegetatively from roots and suckering shoots buried in the sand or gravel. This obviously forms a very a suitable substrate for such increase but it may well reproduce from seed when conditions are moister than in the early part of 1999. Whether or not false tamarisk is likely to become a threat to the flora of these river beds is difficult to predict, but it can form dense stands which could inhibit other plants, especially smaller indigenous species.

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■ Update on *Gunnera hamiltonii*

Gunnera hamiltonii Kirk is a dioecious, rosette forming, creeping herb, endemic to coastal areas near Invercargill and along the western side of Stewart Island. It lives within dune systems, either at the dune edge or on stable substrate within the dune system. Since an earlier report on the status of this species (Rance and Rance 1996), another population has been discovered and more is known about each population.

The species was first discovered and reported by W.S. Hamilton (1885) and the undated type specimen, collected by Hamiliton, has the locality recorded as "New River Heads, 300 ft" (P.J. Brownsey pers. comm.). In his formal description of the species, Kirk gave the type locality as on "hills near the mouth of the Oreti River, Southland 300 ft" (Kirk, 1895). Interestingly, Hamilton (1885) described male flowers as well as bright red drupes. This indicates that male plants were a component of the populations known to Hamilton, as he describes the species as "very local, occurring in patches on the hills near the New River Heads". When Kirk (1895) formally described the species he stated "Male not seen".

The next recorded location came shortly after Hamilton's record; a Traill collection from Mason Bay, Stewart Island (Webb and Webb, 1976). Kirk (1899) saw, and records, a specimen from Mason Bay collected by W. Traill.

The original Oreti (New River Heads) plant was then lost for many years, until the 1920s when Mr C.M. Smith found a location near the Oreti River at Otatara (Fisher, 1972). This population was assumed to be that of the original Hamilton location. Logan and Holloway (1933) in their paper on sand dune succession on the eastern bank of the Oreti River, give a description of the plant and its habitat, along with a photograph and illustration. By 1978, this population at the mouth of the Oreti River, Otatara, had become extinct (Webb and Loh, 1978). At the time this was thought to be the only female plant and mainland population. Material that had been gathered and cultivated from this site was later planted at Sandy Point on the opposite side of the Oreti River to the extinct population. This plant continues to survive.

For many years the Sandy Point and Mason Bay plants were the only two populations known, although there is some evidence that there may have been more than one plant at Mason Bay (Webb and Webb, 1978). In recent years plants have been discovered at several new sites. In 1986 a plant was found at Doughboy Bay, Stewart Island and it was later found to be male (the same as the Mason Bay plant). In 1987 a plant was found in a very exposed area of dune on the Omaui Peninsula, Southland. This plant was later found to be a female plant (like the original Otatara plant). This Omaui population is the only known site that fits W.S. Hamilton's locality description, as it is elevated on a hill slope, at New River Heads, unlike the Otatara population which was near sea level. This raises the interesting question of whether the Omaui Peninsula site was known to early botanists then lost from memory with the Otatara site later being assumed to be the type.

The next discovery was from West Ruggedy Beach, Stewart Island, in 1989. Vegetative material from this plant has been grown in cultivation since its discovery. It first flowered in

October 1998, confirming the population to be female. In 1995 a second plant was discovered at Doughboy Bay. This plant was quickly confirmed as being female. Doughboy Bay was therefore the only site with more than one plant and the only site with both sexes present. The most recent discovery was a third plant from Doughboy Bay in June 1998. Material from this plant has also been taken into cultivation, however the sex remains to be determined. At Doughboy Bay, the plants are separated by at least 280 m, therefore sexual reproduction is unlikely. The discovery of five plants of *G. hamiltonii* in the past 12 years clearly indicates that the true extent of *G. hamiltonii* distribution and abundance is still in question.

The size of individual plants varies considerably, from less than 10 m^2 at West Ruggedy to greater than 300 m^2 for the Doughboy Bay male plant. Although most of the plants are considered healthy and secure there has been concern over the security of the female plant at Doughboy Bay. As a consequence of northward migration of the mouth of Doughboy River this plant has been partly eroded. In June 1998 it was confirmed that a large portion of the plant had been eroded away. Fortunately, the river has migrated back to the south and so does not currently threaten the plant. However, some minor erosion is expected to continue because of the over-steepened nature of the coastal bank that this plant grows on the edge of.

Transplants of both male and female plants were undertaken at Doughboy Bay in October 1995, and January and August 1997 by various people. The fate of these transplanted clumps was investigated in June 1998. The 1995 male transplant consisted of a 350 mm × 150 mm piece, containing 26 rosettes. When remeasured this transplant had grown to a maximum of 1.95 m × 1.23 m and contained 217 rosettes. The 1995 female transplant consisted of a 250 mm × 120 mm piece, but the number of rosettes was not counted. When remeasured this transplant had grown to a maximum of 1.88 m × 1.37 m and contained 303 rosettes. The January 1997 transplant was from a piece of the female *G. hamiltonii* that had been eroded down onto the beach. When checked in August 1997 this plant had died and was replaced with another piece of the female plant. This transplant had grown to a maximum of 1.09 m × 0.74 m and had 87 rosettes in June 1998.

Two pieces of the Doughboy female were transplanted to Sydney Cove, Ulva Island, Paterson Inlet, in 1997. This action was taken partly to safeguard the population in another location but also to allow the many visitors to the island to see *Gunnera hamiltonii*. The transplants have not been checked, to record their growth, recently.

In June 1998 some transplant experimentation was established using both the male and female plants at Doughboy Bay with the intention of establishing a sexually reproducing population as well as testing transplant survivorship using 5 cm (single rosette), 10 cm and 20 cm diameter pieces. This work will provide information to assist with future transplants as part of the recovery of the species.

At West Ruggedy Beach, two sets of transplants were undertaken in February 1997. In the time available in June 1998 only one set of transplants was located. This consisted of two transplants (360 mm × 230 mm and 230 mm × 230 mm) and these transplants were found to have made limited growth.

The new discoveries, improved sex ratio, success of transplant experiments and monitoring indicate that the species is relatively secure in the wild and more abundant than earlier thought. The plant can maintain itself through strong vegetative growth even in semi-shaded sites, but no seedlings have ever been confirmed in the wild. In the future, transplants may be required to establish additional mixed sex populations. However, it is apparent from the frequency of recent discoveries and the observations of mixed sex populations by W.S. Hamilton, the species' discoverer, that the likelihood of further populations being discovered is real. Clearly, Mason Bay is a locality that should be targetted.

Acknowledgements
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■ Notes on the rare button daisy *Leptinella filiformis* (Hook. f.) D.G. Lloyd & C.J. Webb

On 17th November 1998, while visiting Hanmer Forest in pursuit of native orchids, I spent some time examining the grounds of the vacant Hanmer Lodge where the diminutive button daisy *Leptinella filiformis* had been collected by A.J. Healy on 19th February 1975 (CHR 326301). At that time, Healy described his find as a "troublesome weed on shingle paths: large colonies on paths and over rocks at path edges". Healy's specimens, easily the largest I have seen, support his comments.

As far as I could see, *L. filiformis* no longer occupies the shingle paths, which have become neglected and smothered with introduced grasses and other herbs. However, elsewhere in the hotel grounds, beneath a canopy of evergreen Douglas fir and deciduous larch, silver birch, liquidamber, laburnum, chestnut and plum, patches of *L. filiformis* extend over a total area of c. 70 m × 15 m, with the species showing a preference for bare soils and lightly vegetated sites. Almost pure patches of *L. filiformis* are relatively common, in places intermingled with *L. pusilla* and the mosses *Hypnum cupressiforme*, *Thuidium furfurosum* and *Tortula* sp. Apart from *Rytidosperma clavatum*, *Dichelachne crinita*, *Carex breviculmis*, *Oxalis exilis* and *Dichondra repens*, most of the groundlayer associates of *L. filiformis* are common introduced pasture and lawn species such as ryegrass, cocksfoot, sweet vernal, browntop, chewings fescue, annual poa, white and suckling clovers, lucerne, catsear, field daisy, yarrow, narrow-leaved plantain, mouse-ear hawkweed, mouse-ear chickweed and St Johns wort.

As far as I know, this is the only site where *L. filiformis* has been seen in recent times. Unfortunately, since the Hanmer Lodge and its grounds are scheduled for re-development, the continued survival of *L. filiformis* there is doubtful without some meaningful negotiation. Although the species was formerly considered to be rare in the wild, and vulnerable (Given 1976, 1981), it is currently listed in the New Zealand Botanical Society's Threatened and Local Plant Lists as "Insufficiently known" (Cameron et al. 1995). These notes may help to reassess its rarity and category of threat, and stimulate an active conservation programme.

Taxonomic status
Leptinella filiformis (as *Cotula filiformis*) was named and described by Hooker (1864), based on specimens collected from the "Canterbury plains, amongst grass" by Haast in 1862. The species was accepted by Kirk (1899) and Cheeseman (1906, 1925) without either author having seen specimens, and was later upheld by Allan (1961) who provided an extended description based on additional material seen.

In his revision of *Cotula* Section *Leptinella*, Lloyd (1972a) retained *Cotula filiformis* and its close allopatric relative *C. minor* as separate species, although not without some reservation.

Later, Lloyd and Webb (1987) restored *Leptinella* to generic rank, made the necessary transfer and new combination *Leptinella filiformis*, among others, and reinstated *Leptinella minor* which had previously been described by Hooker (1853), and subsequently redefined by Lloyd (1972a) to include plants assigned to *Cotula haastii* by Kirk (1899).

I support the recognition of *L. filiformis* and *L. minor* as separate species. *L. filiformis* (Fig. 1) is readily distinguished from *L. minor* by its consistently smaller size overall, its far-spreading rhizomatous habit, bright green, rarely brown, foliage, and deeply dissected leaves where the pinnae are distant and not overlapping, and very rarely toothed.

Historical collections

Haast's original gathering, now at K (*J. von Haast 594*), has been designated the lectotype of *Cotula filiformis* (*fide* Lloyd 1972a). It is the only specimen of the species known to have been collected from the Canterbury Plains.

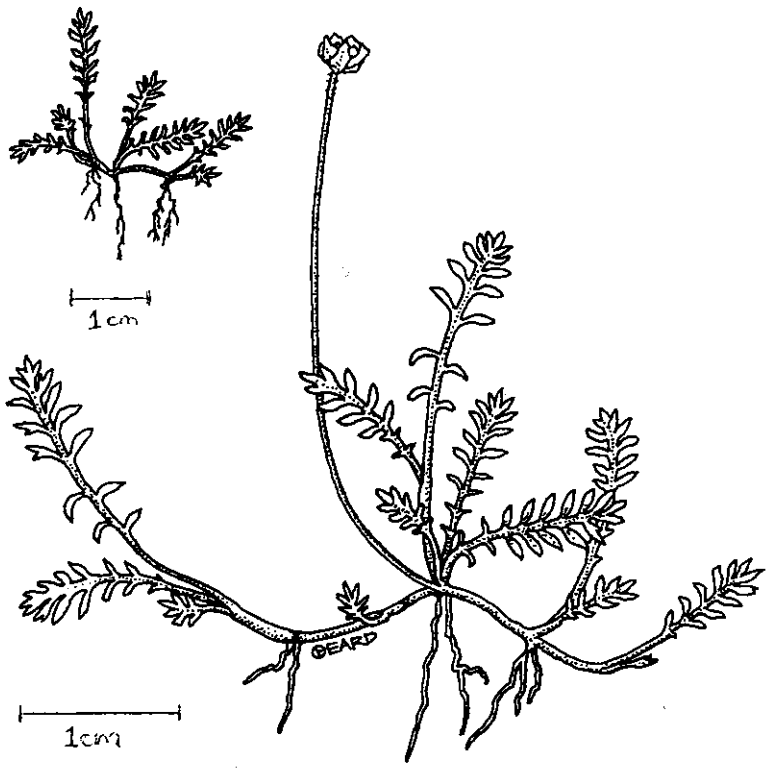

Fig. 1. *Leptinella filiformis* **with an old flower head. Drawn by Catherine Beard.**

Cotula filiformis was listed later by Armstrong (1880) in his catalogue of Canterbury plants, with symbols indicating that it was collected from the lowland or middle district, was comparatively rare, and was cultivated in the Christchurch Public Gardens. In the Armstrong Herbarium at Landcare Research, Lincoln (CHR), there are three specimens of *Cotula* worthy of note in this respect. One was collected from Harewood in 1864 and can be identified as *Leptinella serrulata*, and another was obtained from Hagley Park in 1879 and is most probably *L. pusilla*. The third, labelled "*Cotula* Arthurs Pass JBA" was annotated by Lloyd in 1971 as follows: "*C. minor* Hook. f. subsp. *filiformis* (Hook. f.) Lloyd. A lax form, teeth unusually common on pinnae. The locality seems wrong". While I agree that the locality given seems wrong, in my opinion, the specimen is a small plant of *L. minor* and not *L. filiformis.*

Later still Cockayne wrote: "*Cotula filiformis* until a year or two ago had been seen by no living New Zealand botanist, though it was known that Haast collected it on the Canterbury Plain. Thanks, however, to its rediscovery by Mr C.E. Christensen, it has since proved to be fairly common on the Hanmer Plain" (Cockayne 1919, p.197). As far as I can ascertain, the earliest specimen collected by Christensen from the Hanmer Plain is dated Nov. 1912, which is about the time he shifted to Hanmer as "Government masseur" and began his long association with Cockayne (see especially Godley 1994).

Cockayne, surprisingly, seemed to have been completely unaware of his own discovery when he collected the same taxon (as *Cotula minor*, CHR 68191, WELT SP057517, and *Cotula haastii*, WELT SP057516) almost a year earlier on a visit to the upper Awatere basin with C.E. Foweraker in Dec. 1911 and Jan. 1912 (Cockayne 1915; see also Hamlin 1967).

Subsequent collections of *L. filiformis* have been very few indeed and confined to the same two locations, Hanmer and the Awatere valley, except for one specimen collected by Wall in 1917 from the Balmoral scrub (Culverden Basin), about 40 km from Hanmer. The specimens of *L. filiformis* held at AK, WELT, CHR and CANU are listed below to help relocate original sites, or locate new populations of this elusive button daisy.

Awatere Valley: Upper Awatere, CHR 68191, *L. Cockayne*, no date (1911–12?); Upper Awatere, WELT SP057517, *L. Cockayne*, no date (1911–12?); Upper Awatere, WELT SP057516, *L. Cockayne*, no date (1911–12?); Upcot Saddle, on clay spaces among tussocks, WELT SP057518, *B.C. Aston*, Feb. 1916; Molesworth, CHR 35433, *H.H. Allan*, Nov. 1943; Langridge Stn, Upper Awatere, seepage (aerial sowing), CHR 87211, *L.B. Moore*, Apr. 1954; Home Ridge, Molesworth, CHR 102258, *M.J.A. Simpson*, Mar. 1955 (cult. at Lincoln, duplicate material cult. at University of Canterbury, CANU 17099); Nr. Awatere R. 4 miles N of Molesworth, CANU 17098, *N.C. Lambrechtsen*, Feb. 1968 (cult. at University of Canterbury).

Hanmer: Hanmer Plains, CHR 68190, *C. Christensen*, Nov. 1912; Hanmer Plain, CANU 4672, *C. Christensen*, Feb. 1914; Hanmer Plain, WELT SP057519, *C. Christensen*, no date; Hanmer Plains CHR 290465, *A. Wall,* Jan. 1919; Hanmer Plains, CHR 290473, *A. Wall* & *C.E. Christensen*, Jan. 1919; Hanmer, WELT SP057520, *L. Cockayne*, no date; Hanmer Plains, AK 32067, *E. Phillips Turner*, presented Mar. 1934; Hanmer Lodge, CHR 326301, *A.J. Healy* 75/112, Feb. 1975; Hanmer Lodge, CHR 518282, *B.P.J. Molloy*, Nov. 1998 (cult. at Landcare Research, Lincoln and University of Canterbury).

Culverden Basin: Balmoral scrub, damp place, CHR 290474, *A. Wall*, Nov. 1917.

Habitat and ecology

Information on herbarium labels is scanty, and tells us very little about precise localities and the natural habitat and ecology of *Leptinella filiformis*. What little there is seems to indicate that the species is a basicole (sensu Molloy 1994) and favours bare, relatively fertile soils, and open vegetation where competition is absent or negligible. These characteristics are shared with its close relative *L. minor*, and other patch-forming basicolous species such as *L. nana*, *L. serrulata*, *L. calcarea*, *L. rotundata*, and *L. pusilla*; some equally rare in the wild.

In this respect, the description of the upper Awatere habitat of *L. filiformis* in 1911–1912 by Cockayne (1915) is most instructive: "In some places the plant covering has been almost completely destroyed through the attacks of rabbits. Here, on the bare ground, the small grass *Poa maniototo*, so common in similar situations in Central Otago, is abundant, though not noted elsewhere: also a slender form of *Cotula haastii* is present [= *L. filiformis*, WELT SP057516]. One may perhaps suspect that neither of these plants belonged to the primitive association .....".

From this observation it seems that many native basicolous species, including naturally rare ones like *L. filiformis*, were able to expand and thrive temporarily in depleted habitats promoted by "rabbits in excess", only to contract and decline with the removal of the rabbit and the recovery of the vegetation. The composition of the vegetation in the upper Awatere Valley and on the Hanmer Plain has changed substantially since the first collections of *L. filiformis* were made. The likelihood of further discoveries there under the present conditions seems rather remote.

The surviving population in the grounds of the Hanmer Lodge may be regarded as atypical, and not unlike populations of other species of *Leptinella* found in urban lawns and sports turfs. The possible origin of the Hanmer Lodge population would make an interesting study on its own. For example, is it a natural remnant; was it planted there by Christensen; or is it simply a chance introduction? More importantly, are there any other populations in similar situations in Hanmer?

Conservation

It is highly probable that *L. filiformis* will be confirmed as rare and threatened in the wild, and will move out of the "Insufficiently known" bracket into a threat category considered by consensus to be the most appropriate. The discovery of other extant populations in the wild, while still worth pursuing, is becoming more remote with the passage of time and the continuing changes in the vegetation of potential habitats through intensive farming, afforestation, the spread of aggressive hawkweeds, and the current dominance of competitive introduced grasses.

Meantime, the surviving population at Hanmer offers considerable scope for the active conservation of *L. filiformis*, both in cultivation and in the wild. Like many of its relatives, *L. filiformis* grows readily in cultivation, forming large patches by vegetative extension. According to Lloyd (1972b, c), the species is monoecious and self compatible, and the bisexual heads can have a high seed set through either self- or cross-pollinations, or both; seed germination can also be high. My own limited observations over the last season (Nov–Feb) confirm this behaviour.

Clearly, *L. filiformis* is not constrained by its reproductive biology, and is more likely to be limited in the wild by its habitat requirements and management, which at this stage fall largely into the "suck-it-and-see" basket.

As much material as is necessary should be propagated from the Hanmer population and dispersed to selected public and private gardens and research institutions, including the return of material to the Hanmer Lodge once its re-development is completed. Like its relatives, *L. filiformis* is not without merit as a ground cover plant, with the added ability to persist in a managed, short, grass turf. These options could also be considered.

Leptinella filiformis is also a prime candidate for a recovery programme involving trans-plantation into suitable sites in the wild. Two such areas are the Crown owned Culverden and Medbury Scientific Reserves in the Culverden basin. Both support kanuka shrubland and grassland comparable to the Balmoral scrub in the same area, whence Wall collected his specimen in 1917 (CHR 290474). Other comparable sites might also be considered, e.g., the Bankside Scientific Reserve on the central Canterbury Plains.

Acknowledgements

My thanks to the herbarium curators and collections managers at AK, WELT, CHR and CANU for information on specimens of *L. filiformis*; Tekla Kriddle for permission to collect material of *L. filiformis* from the grounds of Hanmer Lodge, and Allan Fife for his identification of mosses. Sincere thanks also to Peter de Lange and Nick Head, Department of Conservation, who visited the Hanmer Lodge and the Culverden and Medbury Reserves with me on 10th February 1999 to collect additional material for propagation and discuss the conservation of this rare button daisy. I thank Catherine Beard for her illustration of *L. filiformis*.

Dedication

These modest notes are dedicated to my friend and fellow student, Professor David Lloyd FRS, in recognition of his outstanding contribution to our knowledge of the systematics and reproductive biology of New Zealand representatives of *Cotula*.

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BIOGRAPHY/BIBLIOGRAPHY

■ A brief tribute to Sir Otto Frankel (1900–1998), including a perspective on his time in N.Z.

Sir Otto Herzberg Frankel F.R.S. was born in Vienna on 4 November 1900 and died in Canberra on 21 November 1998. Otto came to N.Z. via Cambridge, England in 1929 and was appointed geneticist at the Wheat Research Institute which was then located at Lincoln Agricultural College with F.W. Hilgendorf (1874–1943) as Director. Otto became Chief Executive Officer of the Institute in 1942 and then Director in 1950 of the new DSIR Crop Research Division formed by a merger of the earlier Agronomy Division of DSIR and the wheat breeding part of the Wheat Research Institute. He left N.Z. in 1951 to become Chief of the Australian CSIRO's Division of Plant Industry.

Otto was a world pioneer in genetics research, close to its very foundation. It was in N.Z. that he established and developed his international reputation in genetics and was by far N.Z.'s greatest pioneer researcher in this field. His work in N.Z. was primarily concerned with wheat, but extended to embrace the genetics of *Hebe* and other species. Otto was the pioneer in plant cytogenetics research in N.Z. The doyen of N.Z. cytologists, Dr J.B. Hair (1909–1979), commenced his M.Sc. research on *Hebe* in 1932 and his research was supervised by Otto at the Wheat Research Institute. Leonard Cockayne (1855–1934) had originally suggested that Otto work on *Hebe* (9,11). John Hair graduated M.Sc. with First Class Honours from Canterbury University College in 1934 and his thesis was published with Otto in 1937 (13). Otto corresponded with Cockayne and I have summarised and annotated their correspondence (16). Otto told me (11) that he suggested to Mr James McPherson (1900–1980) that the N.Z. Section of the Christchurch Botanic Gardens should be called the Cockayne Memorial Garden and he established the *Hebe* garden there (11). During a visit to the Memorial Garden, Otto noted that the original labelling of the *Hebe* plants had changed. A photograph of Otto with Dr Eric Godley in the Memorial Garden was published in 1979 (17).

Otto was Dr John Hair's mentor and over the years they developed a close rapport. The correspondence between these pioneer plant scientists is retained in my Centre archives (18). The correspondence includes 78 letters from Otto to John over the period 1949–64 and many were written when John was doing his Ph.D. research at the old John Innes Horticultural Institute in England. The correspondence is primarily of a personal nature and is an excellent example of this type of correspondence from a teaching scientist to an old, trusted and like-minded friend and colleague. I believe this type of correspondence is especially significant as

a resource for science history. The correspondence is relevant to an important era in N.Z. science history just before Otto left N.Z. for Australia in 1951. There is not much data relating to research in cytology and genetics though there is discussion relating to the genus *Hebe* and N.Z. studies initiated by Otto and John and also Mr T.W. Rawson (1910–1993), but to me it is the routine administration and outlook of a notable scientist such as Otto that is especially interesting.

The correspondence between Otto and John Hair provides information on the early days when Otto commenced work at the CSIRO's Division of Plant Industry. The letters help to document aspects of some of the radical changes and the disruption of long-established research projects when Otto swept into Canberra. A personal tribute to Otto at the time of his appointment as a member of the CSIRO's Executive in 1962 after his retirement as chief of the Division of Plant Industry, put it this way (1), "The Division was soon disarmed by his energy, his candour, and his obvious desire to do his very best for Plant Industry and to get the very best from Plant Industry. Some people were shaken by the inevitable challenge to explain (and sometimes, to defend) the line of their researches, but most were grateful for his personal interest, and encouragement."

Otto's participation in genetics included one of the most significant upheavals in biology in the 20th century – the Lysenko episode. Otto visited the former Soviet Union in 1935 (7) when the Russian botanist and geneticist N.I. Vavilov (1887–1943) was at the zenith of his career. S.C. Harland (1891–1982) and C.D. Darlington (1903–1981) also visited USSR in 1933 and 1934 respectively and as well as Otto they also reported on the great achievements of Vavilov and the potential of his work for the improvement of Russian agriculture. However, the charlatan T.D. Lysenko (1898–1976) whose work was supported by Stalin and Vavilov was arrested in 1940 and died in a Siberian labour camp. Incidentally, C.D. Darlington from the beginning was a supporter of Vavilov and a critic of Lysenko and the trends in Soviet genetics and agriculture, and had the final say in an obituary to Lysenko (6).

Otto and his second wife Margaret (1902–1997) were married in 1939. Margaret was from a well-known Christchurch family (Anderson), noted for their contribution to engineering in N.Z. Margaret was a great supporter and helpmate for Otto. She was active in artistic circles and had been an art teacher in various Christchurch Secondary Schools in the days when art was rarely taught in schools. Margaret once averred that she was the only member of her family to work for a living (12). She helped to establish the Group of artists in Christchurch in the 1920s and their number included Ngaio Marsh and Evelyn Page (2). Otto was in Christchurch in 1986 to open a retrospective exhibition of paintings by his old friend Evelyn Page. Otto and his first wife Tilli were close friends of Evelyn. At the opening of the exhibition Otto remarked about his earlier era in Christchurch when art played a significant part in his life (3), "We were all young - at 30 you were still young in those days. Life didn't start so early. We were very poor because it was the Depression of course, and very happy." Dr Lloyd Evans (b.1927), a distinguished plant scientist and graduate from Lincoln (1951), who, like Otto, also became Chief of the CSIRO's Division of Plant Industry (1971–78) is Otto's executor. In N.Z., as well as John Hair, Otto had a close rapport with Mr Les Copp (1914–1987), Dr Eric Godley (b.1919), and Sir Toss Woollaston (1910–1998). I understand (5) Otto and Margaret gifted two paintings by Sir Toss to the Australian National Gallery. I also understand (5), Otto has made a major bequest to the ANG to build up its N.Z. collection of paintings.

Otto was, with F.W.Dry (1891–1979), a founder of the N.Z. Genetical Society in 1949 (19) and was an Honorary Life Member of the Society. In international forums Otto was in a way the N.Z. Genetical Society's man-at-court in the International Genetics Federation with which he had a long association (1966–83) as Treasurer, President, and Secretary.

During the meetings my wife and I had with Otto in the Christchurch Botanic Gardens (often with Margaret), Otto spoke about his early formative years. He was born in Vienna and graduated with a doctorate in agriculture from Berlin and worked under E. Bauer (1875–1933). Otto said he milked cows as a youngster and also said, surprisingly, that he was never competent at mathematics, nor did he use a computer (12). Otto commented that he had no

University training (11). He was accepted as a research student by Bauer, but apparently took no formal lectures and he suggested that this absence of a formal education hampered his work in later years. Otto tended to obtain knowledge from others, and used talk to mask his lack of knowledge (11).

An important aspect of Otto's early days in N.Z. was his passion for skiing. He was a pioneer skier in Canterbury and I believe continued skiing into his early 80s. In the early 1930s he helped establish the Christchurch Ski Club and also helped establish the pioneer skiing facilities at Temple Basin, Arthur's Pass. Otto is reported to have commented that when he first came to Christchurch (4), "He was not in tune with Christchurch, later writing 'I always felt a foreigner and was made to feel that. Only in the ski huts was I accepted.' ".

A feature of Otto's long life was his active research in old age and he remained bright, independent in his views, and argumentative. These characters were still evident at our last meeting with Otto and Margaret in the Christchurch Botanic Gardens Kiosk on 16 February 1996. Long after his official retirement, Otto continued to research as a Senior Research Fellow in the CSIRO's Division of Plant Industry and at the age of 95 published a major work (20). Even in his 80s he was "rucked into" molecular genetics (8) and surprised an audience in Japan by giving a seminar on his work on molecular genetics (10).

Stories relating to Otto at Lincoln abound and some of these have been recorded by Dr J.D. Ferguson in his contribution to the history of the former DSIR at Lincoln (A.D. Thomson, to be published). The farm staff at Lincoln in the 1940s and 1950s were renowned for their practical jokes and Otto was the butt of some of these. Dr Ferguson refers to Otto's two dogs, Joe an old spaniel and Toshi, a white terrier, "...though they tended to soothe the Director [Otto] they rather irked the staff. Being a sparky little terrier type Toshi was everywhere and drew retaliation from those affected...when their master transferred to Australia they accompanied him, in a wooden crate especially built....".

Otto and Margaret had an affection for N.Z.; my wife and I will miss what became their annual visit to Christchurch.

Acknowledgements

I thank Dr Eric Godley for the generous gift of literature relating to the Lysenko episode in Soviet genetics including "The Situation in Biological Science: Proceedings of the Lenin Academy of Agricultural Sciences of the U.S.S.R., Session: July 31–August 7, 1948. Verbatim Report." (Moscow, Foreign Languages Publishing House. 1949. 631pp). I also thank Mr Ernst Beuzenberg for the gift in 1982 of the correspondence between Sir Otto Frankel and Dr John Hair.

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■ Biographical Notes (33): John Francis Armstrong (1820–1902) and Joseph Beattie Armstrong (1850–1926)

The Armstrongs, father and son, came from the far north-west of England where John Armstrong, a farmer's son, was born at Longtown in Cumberland (1). This town lies just on the Scottish border and matches in position the birth place given by Armstrong in an account of his early life. "I was born in November 1820, on the Netherby Estate, belonging to the late Sir James Graham, on the borders of Scotland, not far from Gretna Green—within three miles of it. I commenced my first apprenticeship when twelve years old, and served three years with a market gardener and seedsman. Then I served two years under the forester on the Netherby Estate. After that I was transferred to the gardens, and remained there for five years – the last two years as foreman. I then entered the late Mr Thomas Hartley's service at Gillfoot, near Whitehaven, Cumberlandshire, and served under him for ten years, when I emigrated to the Victorian goldfields, leaving my wife and son in England."(2). John Armstrong had married Ann Bowman at Egremont, Cumberland, when aged 24, and in 1850 their son, Joseph, was born at Whitehaven (1, 3).

"On the goldfields"—Armstrong continued—"I worked for three years, and returned Home again. I had had very indifferent luck. I got good ground occasionally, but lost it through drunken mates. I don't remember any specific incidents on the goldfields; there were a great many robberies committed, but I was never robbed. I was teetotal all the time and the other diggers were generally drunkards. After I got Home in 1857, I entered the service of Mr Rawson, Washdale Hall, in the Cumberland Lake district, and had charge of the place for some years working as gardener and looking after the plantations. I came out to Canterbury in 1862." In answer to a question as to what induced him to come out, Mr Armstrong said: "Well, after being in Australia I could not bear to see the poverty and wretchedness stalking about in the Old Country. After seeing Australia, I felt dissatisfied with England."(2)

It was on 26 September 1862, that John Armstrong arrived in Canterbury with his wife and two children on the "Mersey" (4). He became gardener to Mr George Gould (1823–89) who had a property on the corner of Springfield Road and the North Belt (Bealey Avenue) which he called "Hambleden" after his birthplace on the Thames in Buckinghamshire. Gould had come to Christchurch in 1851 and made a fortune in exports, imports, and land. He gave generously to help education in the young settlement—to libraries, for instance, and to Haast for the Museum. His eldest son was one of the founders of Pyne, Gould and Guiness. In Gould's glasshouses Armstrong grew collections of ferns which became a feature at the Horticultural Show. But despite such excellent gardeners as Armstrong, Gould could never quite win the prize for the best garden in Christchurch donated by Wynn Williams (2, 5).

The Electoral Roll for 1865–67 gives John Armstrong's place of abode as "Hambledon [sic] Cottage" but also shows that he owned a sixth-acre in Tuam Street east. During his four years at "Hambledon" (a spelling error now well established and which I follow) Armstrong studied the local flora in his spare time, helped by his son. In 1868 Haast wrote: "I may be here allowed to state, that for more than four years Mr Armstrong, and his son Mr J. B. Armstrong, have assisted me in collecting our indigenous vegetation, for the herbarium of our Museum, and for making exchange; and both have also given me great help in arranging the botanical collections belonging to the province. In fact, whilst I was collecting and investigating the alpine and sub-alpine Flora of New Zealand, my two botanical assistants did the same work in the neighbourhood of Christchurch, and contributed several complete sets of plants to the Museum, which, however, like the great bulk of our botanical collections, have hitherto been inaccessible to the public, for want of space to exhibit them in." (*TNZI 2:* 118).

Young Joseph Armstrong's considerable talents as a botanist had become obvious at an early age. He was 18 years old when Haast reported as above; and in that same year, when describing their joint work, John Armstrong could acknowledge that "my son, who for several years has almost exclusively occupied himself with botany, has rendered me most effectual help, in naming the mosses, ferns, fungi, etc." (*TNZI 2:* 119) Indeed, the year before, in 1867, Joseph had discovered a new filmy fern, the tiny *Trichomanes armstrongii*, when accompanying Haast to the headwaters of the Waimakariri. And Joseph's herbarium shows that he was collecting when 13 or 14 (6). I expect that this talented young man was encouraged by both Haast and the benevolent Gould. We could note here that Joseph had a tag-name, "*Cordyline barkeri* var. *gouldiana*", for a cabbage tree on the West Coast (*Gdnrs Chron. 20*: 299).

In 1867 John Armstrong was appointed Government Gardener, Canterbury, in succession to Enoch Barker who had asked to be relieved of his duties. "Mr Armstrong acted as curator till 1889 and during the greater part of his 22 years service he was assisted by his son, Mr J.B. Armstrong, who had charge of the nursery work." (7). They continued to live at Hambledon Cottage, some 25 minutes walk to work along Bealey Avenue and the Avon. In addition to the Tuam Street section John now owned a piece of land just across Springfield Road; and when Joseph married Annie Elizabeth Abbot in 1871 he leased it to Joseph. The designation was: "part rural section 257, house and ½ acre, Springfield Road, Papanui provincial district". John finally left Hambledon Cottage *c.* 1880 when he moved to a cottage in the Government Domain (8).

In 1868 John Armstrong was elected a member of the Philosophical Institute of Canterbury; and on 2 December, with encouragement from Haast and a request to his fellow members to "kindly grant me your indulgence for this my first Essay," Armstrong spoke "On the vegetation of the neighbourhood of Christchurch, including Riccarton, Dry Bush, etc.". This valuable paper was prefaced by Haast's classification of the vegetation of the Province of Canterbury (which then included Westland) and included Armstrong's notes on the local vegetation, and his species lists for Riccarton Bush, Dry Bush, Mount Pleasant Bush, Port Hills and Sumner, swamps, and sandhills. It marks the beginnings of plant ecology in Canterbury. The main species list is subdivided as follows: forest trees (22), shrubs and small trees (57), parasites (3), creepers (15), herbaceous plants (149), with the addition, by Joseph Armstrong, of ferns (36), mosses (12), lichens (4), *Chara* (1), and fungi (9).

In 1869 John Armstrong collected in the Upper Rangitata with William Gray (*TZNI 4:* 290). Gray, who was gardener to T.H. Potts of Governors Bay (9) is later referred to erroneously as W. Grey by Joseph Armstrong, who also described *Veronica greyi* (*NZ Ctry J. 3:* 57).

A feeling for the New Zealand scene in 1871 can be obtained from the following letter written on 18 January by John Armstrong to T.F. Cheeseman, Auckland Museum.

> Dear Sir,
> I regret that bad health prevented my acknowledging the receipt of your letter in due time. Many thanks for your beautiful new fern which is I think quite distinct. *H. minimum* and *H. wilsonii* are vars. of *H. tunbridgense*. My friend Dr Haast desired me to send the ferns you asked him for but he is from home on a geological trip and I don't know where his ferns are. I will enclose some of our own in this letter. Also a scrap of our new fern *Trichomanes armstrongii* Hook. f. and we will endeavour to get better specimens for you and Mr. Kirk.
>
> It will afford me pleasure to forward you specimens of Canterbury plants but as I don't know what you desire let me have your list of desiderata, and I shall be happy to reduce it.
>
> I am much obliged for your kind offer to supply Northern Island plants though I think we have most of them. However, I will ask my son to make a list for you. We require two or three ferns to complete our set. Indigenous and exotic grasses are especially wanted, as we are getting up a collection for our Museum. Awaiting your list I am, Dear Sir,

Yours truly, John F. Armstrong

List of plants wanted from Mr Cheeseman: *Dactylanthus taylori, Barbarea vulgaris, Melicytus micranthus, Hymenanthera crassifolia, Drosera pygmea, Myrtus bullata, M. ralphii, Sicyos angulatus, Olearia albida, Colensoa physaloides, Calceolaria* any, *Atherosperma novaezelandiae, Nephrolepis tuberosa, Nephrodium molle, Pteris endlicheriana.*
J. B. Armstrong.

This is the only Armstrong letter in the Auckland Museum Collection.

In 1872 J.F. Armstrong published the first list of the naturalised plants of Canterbury. The 171 species are annotated for habitat and abundance and several general points are made, including a reminder to "the botanists in the Middle Island that now is the time to determine the date of introduction of foreign plants into the country." In the same year a report appeared dealing with native and introduced grasses (*TNZI 4:* 292–310), prepared by a committee of the Philosophical Institute of Canterbury (R. Wilkin, T. Kirk, J.F. Armstrong, J.B. Armstrong, J.C. Boys, M. Dixon, S.D. Glyde, A. Duncan) and to this J. F. Armstrong contributed a list of naturalised grasses growing in Canterbury and with his son "Notes on Grasses Indigenous to the Province of Canterbury." One of the Committee's activities was to import seeds of grasses, and a collection from Vienna (no doubt requested by Haast) was reared by Armstrong. Other plants were also grown, and by 1881 it was estimated that 694,972 young trees had been distributed by the Christchurch Gardens to public bodies throughout New Zealand (7).

Joseph Armstrong commenced independent publication in 1879 with the first of his several papers in the "New Zealand Country Journal". It described 10 new species of *Veronica* and one each of *Senecio* and *Aciphylla.* Then in 1880 he published an ambitious paper entitled "A Short Sketch of the Flora of the Province of Canterbury, with Catalogue of Species", which includes a classification of Canterbury vegetation. This paper gives an extensive list of indigenous seed-plants (580) and ferns (107), as well as a list of 76 naturalised plants introduced since 1871. But it also includes 214 mosses, 106 liverworts, 4 Characeae, 95 lichens, 91 fungi, and 107 algae. These latter lists are puzzling because it is hard to credit the Armstrongs with such a wide and authoritative knowledge of such groups. J.B. Armstrong wrote "The catalogue attached to this paper I have made as complete as possible. The whole of the species enumerated have been collected by my father and myself and the identification may be relied upon as correct." However, only the seed plants and ferns have locality notes. An explanation is obtained from the following comment in one of Laing's first seaweed papers (*TNZI 18:* 304). "In the Transactions of the New Zealand Institute for 1879 there appeared a list of the seaweeds of Canterbury, but as it was evidently only a compilation from Hooker, I will not refer to it further." Despite this, the paper was favourably reviewed in the "Gardeners Chronicle" and also in the "New Zealand Country Journal" (5: 77) which stated "we are informed that the Catalogue of Plants was originally prepared for incorporation with Dr. Haast's work on the geology of Canterbury, but was from some cause or other omitted."

But among the 14 papers that Joseph published from 1879 to 1884 the most important is surely his "bold and excellent paper" on the New Zealand species of *Veronica* as Cockayne described it (10). In his introduction Joseph proposes that the variability seen in *Veronica* was not due to hybridisation but to "sports", thus foreshadowing the mutation theory of De Vries as Cockayne pointed out in 1911 (10). Joseph considered that the great majority of the species were self-fertile and wrote:

> "At some very distant date there were probably only two or three, perhaps only one, species existing within the limits of the colony; but, on account of the extreme local variations of climate and varied geological formation of surface, certain variations occurred, and the sport so produced, being self-fertile, and having within itself all the elements required for reproduction, naturally reproduced its like until another such sport occurred, and thus the forms gradually became differentiated from the type, and by a long series of such sports our large family of *Veronicas* has been formed."

Armstrong's synopsis involved 60 species, 12 of them new, classified in two subgenera each divided into series or sections. Wall (11) commented later however: "it is a great pity that this herbarium [of J.B. Armstrong] was not open to T.F. Cheeseman when he wrote his Manual, or to Drs Cockayne and Allan when they published their revision of *Veronica* (or *Hebe*) a few years ago. Many doubts and misconceptions would have been cleared away, for these authorities, by the inspection of the Armstrong collections."

One of the important contributions made by the Armstrongs to the Botanic Gardens was to collect native species (particularly in the mountains), introduce them to horticulture, and make them easily available for education, research, and exchange. In the introduction to his *Veronica* paper Joseph wrote: "it must be admitted that whenever possible living plants should be studied in preference to dried ones by all persons attempting to write on the flora of a country." The collection that he used had been assembled by his father, and was "the largest existing living collection of species belonging to this genus." Unfortunately we have only one account of these collecting expeditions. This was in the autumn of 1883 when Joseph and "a Christchurch nurseryman" collected some 2000 specimens in Arthurs Pass and its neighbourhood. The "Lyttelton Times" reporter concluded the article by saying: "That the collector should have had to gather his specimens at his own expense must, to a considerable extent, have interfered with the completeness of his research; possibly, this obstacle may be removed before he makes his next expedition." (12).

In 1889 the Armstrongs resigned. Their disagreement with the Domain Board was not made public until "The Press" noticed an advertisement for a new Head Gardener. We can best quote from that newspaper for 10 October: "From what can be learned, it appears that the Board issued regulations some two months since, in which they desired that a certain class of work should be done. It was, in effect, that a diary should be kept; that an account should be given of each man's work, and that a programme should be submitted to the Executive every month of the work to be undertaken during the succeeding month. Before the advertisement appeared the position of Head Gardener was offered to Mr Armstrong, jun., and Mr Armstrong, sen., was to be pensioned, have the cottage to live in, and would only be required to look after the parks. Mr Armstrong, jun., declined to continue under the new regulations, as he considered them impracticable, and Mr Armstrong, sen., refused to accept the position offered him under the new management. They stated that according to the Executive's interpretation of the regulations nothing was to be done in the garden without express sanction and approval; no plants were to be planted without orders; in fact, that the Executive was to manage the gardens, and the head gardener was to do exactly and only what he was told to do. The propagation house was to be abandoned, the cultivation of hardy plants was to be discontinued, and instead, bedding plants were to be substituted.

The Domain Board was being responsible to ratepayers. As the Minutes show one of their concerns was "to please the public taste." And it must also be noted that a sub-committee visiting the Gardens after John and Joseph had departed found several aspects to criticise. But, as John had told the Board, the present condition of the Garden is not so creditable as in the old Provincial days, when the Council allowed him a staff which could cope with the work." (13)

When John Armstrong resigned he was almost 69 years of age; and he told the "Lyttelton Times" that "it is fifty-seven years last March since I began my apprenticeship and it's time I had a rest."(2). He and his wife went to live in Springfield Road, presumably with Joseph and his family.

When Joseph Armstrong left the Gardens he was still only 39. In the Electoral Rolls he continued to describe himself as "Gardener" but what work he undertook I do not know. A major puzzle is that after 1884 (when he was only 34 years of age) Joseph Armstrong wrote nothing more to speak of. He hadn't run out of ideas. In his *Veronica* synopsis of 1881 he mentioned "*Coprosma* (of which I am also drawing up a conspectus)" and also "a work which I have in preparation, entitled a 'Manual of New Zealand Botany'." He would have been understandably disappointed when Cheeseman's monograph on *Coprosma* appeared in 1887; and the loss of his job in 1889 must have been hard to bear. The following events, major or minor, help define his remaining 37 years.

In April 1893, the Department of Agriculture offered prizes for a collection of noxious weeds. "All specimens must have been gathered in the colony. Each specimen must be mounted on paper 18 in. × 11 in., and bear, if possible, the popular and scientific name, also the locality where gathered." Next month prizes were offered for "collections of dried specimens of grasses and forage plants, introduced and native, prominence being given to the most useful indigenous species." In May 1894, the judge, Mr. T.F. Cheeseman, Curator of the Auckland Museum, made the following awards:

Weeds—

First prize, £10 : J.B. Armstrong, Springfield Road, Christchurch

Second prize, £5 : W.M. and J.A. Thomson, Newington, Dunedin

Grasses and forage plants—

First prize £25 : Miss L.M. Kirk, Brougham Street, Wellington

Second prize £15 : J.B. Armstrong, Springfield Road, Christchurch

These collections became the property of the government (14).

Joseph's mother died at 16 Springfield Road on 19 October 1899, and his father, John Francis Armstrong, died there on 16 September 1903, aged 82 years (1). Both are buried in the Barbadoes Street Cemetery. Today, the Armstrong home in Springfield Road has been replaced by flats, but Gould's historic home on the corner of Springfield and Bealey Avenue still stands as "Hambledon Bed and Breakfast Inn", beautifully redecorated and refurbished in the style of its grand days. In the garden the concrete foundations of a glasshouse can still be seen.

Another trial for Joseph—but of a different kind—came in 1906, with the publication of Cheeseman's "Manual of the New Zealand Flora". His name is not mentioned in the "History of Botanical Discovery in New Zealand", where his work on *Veronica*, his description of *Corallospartium*, and his "Sketch of the Flora of the Province of Canterbury" are attributed to his father.

Joseph's name appeared briefly in print on 9 June 1911, when the Domain Board decided to move the Native Section in the Public Gardens. The "Lyttelton Times" stated (15): "In an interview with one of our reporters yesterday, Mr. J.B. Armstrong, to whose extensive knowledge and practical generosity the Gardens owe a great deal, strongly supported the views expressed by Mr Ell (on the educational value of the native section) and emphasized the fact that for many years the native section provided a very valuable field for research.". This led to an important article by Cockayne on the following Monday, describing the origins and value of the native section (10).

After his father died in 1903, Joseph continued to live in Springfield Road until *c.* 1909 when he moved to Barbadoes Street (first 75, then 569) and then *c.* 1919 he moved to 16 Burlington Street, Sydenham (8). He died in the Christchurch Hospital on 26 January 1926, aged 63 years, predeceased by his wife, and is buried in the Linwood Cemetery (3).

In his will Joseph bequeathed three items to the Christchurch Domains Board (16): a portrait of his father (which now hangs in the Visitors Centre at the Botanic Garden); his library of some 100 volumes (now in the Botanic Garden Library); and his herbarium. For want of suitable accommodation at the time the herbarium was housed in the Canterbury Museum (17) and here the 2607 sheets were curated and studied by Professor Arnold Wall. In May 1975 the entire herbarium of the Museum (Canty) was transferred to the Botany Division, DSIR at Lincoln (CHR). Wall's main paper on the herbarium (11) is more concerned with technicalities, and should be read in conjunction with two very important but more popular articles in "The Press" in March 1934 (11, 18). I can best quote from them.

> "J.B.A. visited Dunedin in 1869, Wellington and Nelson more than once, and Auckland in 1868–69, and in all these places he did some collecting. He also travelled to Greymouth, Hokitika, and Westport, collecting everywhere. The collection was enriched by the gifts of many correspondents, the most important being Messrs T. Kirk, T.F. Cheeseman, F. Reader, Canon Stack, who sent many of the plants of Stewart Island, Mr F.A.D. Cox, who supplied Chatham Island material, and Mr H.H. Travers, who also presented Chatham Island plants. Of late years Mr

James Mitchell worked with Mr Armstrong in the neighbourhood of Christchurch and at Arthur's Pass. The collection is thus more or less representative of the New Zealand flora as a whole."

Wall also quotes from R.M Laing's 1919 paper on the vegetation of Banks Peninsula: "Though the identifications of Mr J.F. Armstrong's list may not always be correct, still some plant can generally be found which the name represents; but in J.B. Armstrong's list there are names of many species which obviously do not occur on Banks Peninsula.". But Wall demonstrates that herbarium specimens confirm many of the debated records. However, he concludes: "While I trust that I have done justice to the memory of the Armstrongs in respect of the records here mentioned, I must add that Cheeseman, Laing, Dr. Cockayne, and myself have been quite justified in accepting them with great caution, for there are a number of occurrences recorded in J.B. Armstrong's paper which remain unsupported by any evidence in the Herbarium, such as, e.g., the Filmy Ferns, *Hymenophyllum scabrum, H. pulcherrimum*, and *H. subtilissimum*. And after all, Mr Armstrong has only himself to thank if we have had our doubts, for he could easily, at any time, have sent his specimens to T.F. Cheeseman, or submitted them to other workers in Christchurch, and then the doubts would never have arisen."

And Wall's more general conclusion was this: "Let us be grateful to the Messrs Armstrong, and particularly to Mr J.B. Armstrong, not so much for collecting the plants of old Christchurch, as for the gift of his collections to a public body. We all make mistakes, and the New Zealand flora is so very difficult that the best of us are bound to err sometimes in our determinations of specific identities. All identifications which are unsupported by specimens are open to doubt, and in the case of these two botanists, Mr T.F. Cheeseman and others have maintained a rather critical attitude. Now that the Herbarium is, in a sense, open to all, such doubts can be set at rest very quickly. It is no discredit to the Armstrongs that some of their decisions and records have been questioned; the motto of the Royal Society itself is "Nullius in verba," "relying upon the mere word of no man," and every sensible botanist is only too grateful when his error is pointed out to him.".

My own conclusion is what I wrote in 1969 (9). J.B. Armstrong's wide botanical knowledge, his philosophical turn of mind, his acute powers of observation, his energy, and the felicity and quiet authority with which he writes of the plants he loved, place him amongst our foremost botanists of the nineteenth century.

Publications (J.F. Armstrong)

1870 On the vegetation of the neighbourhood of Christchurch, including Riccarton, Dry Bush etc. *TNZI 2:* 118–128.

1872 On the naturalised plants of the Province of Canterbury. *TNZI 4:* 284–290.

1872 On some new species of New Zealand plants. *TNZI 4:* 290–291.

1872 (with J.B. Armstrong) Notes on grasses indigenous to the Province of Canterbury. *TNZI 4:* 301–304.

1872 In Anon. Appendix D. *TNZI 4:* 309–310.

Publications (J.B. Armstrong)

1879 Descriptions of some new native plants. *NZ Ctry J. 3:* 56–59.

1879 The native grasses. *NZ Ctry. J. 3:*201–204.

1879 New kinds of grasses. *NZ Ctry. J. 3:*293.

1880 A short sketch of the flora of the Province of Canterbury, with catalogue of species. *TNZI 12:* 325–353.

1880 Planting in towns. *NZ Ctry J. 4:* 49–53.

1880 A short history of the grasses. *NZ Ctry J. 4:* 69–70; 120–125, 170–174, 219–222, 301–304; 340–343.

1881 Ibid. *NZ Ctry J. 5:* 54–63, 121–126.

1881 On the genus *Corallospartium*. *TNZI 13:* 333–335.

1881 Descriptions of new and rare New Zealand plants. *TNZI 13:* 335–343.
1881 On the occurrence of the Morel (*Morchella esculenta* Pl.) in New Zealand. *TNZI 13:* 343–344.
1881 A synopsis of the New Zealand species of *Veronica*, Linn. with notes on new species. *TNZI 13:* 344–359.
1881 A natural arrangement of the New Zealand ferns founded on the system of Smith's "Historia Filicum", with critical notes on certain species. *TNZI 13:* 359–368.
1882 Description of new plants. *TNZI 14:* 359–362.
1883 The Southern Alps of New Zealand. *Gdnrs. Chron. N.S. 20:* 235–236; 267; 299–300.
1883 Fertilisation of red clover in New Zealand. *NZ J. Sci. 1:* 500–504.
1884 *Acaena huttoni* Brown. *NZ J. Sci 2:* 122–123.
1919 Indigenous Flora of Hagley Park and Domain, Christchurch, in 1864. *In:* E.M. Herriott, *TNZI 51:* 441–442.

Eponymy (J. F. Armstrong)

1879 (Jan) *Veronica* (*Hebe*) *armstrongii* "Upper Rangitata. J.F. Armstrong & W. Grey [sic]." "The following plant was named eight years ago, but has never previously been published" Johnson ex J.B. Armstrong in *N.Z. Ctry. J. 3:* 59.
1879 (May) *Veronica* (*Hebe*) *armstrongii* "Notwithstanding the doubts I entertain of the claims of our plant to specific honours, I have great pleasure in describing it under the name by which it has become known to horticulturists – – but it would have afforded me greater pleasure to have attached the name of its discoverer to some form likely to prove of permanent specific value." T. Kirk *TNZI 11:* 464.

Eponymy (J. B. Armstrong)

1868 *Trichomanes* (*Hymenophyllum*) *armstrongii* J.G. Baker Cat. Ferns; "Waterfalls near the sources of the Waimakiriri, altitude 3800 feet, Dr Haast & J.B. Armstrong, 1867." John F. Armstrong *TNZI 4:* 291, 1872.
1882 *Logania* (*Pygmea*) *armstrongii* "Named in honour of J.B. Armstrong who has added much to our knowledge of the Alpine Flora of New Zealand" J. Buchanan *TNZI 14:* 347.
1894 *Celmisia armstrongii* D. Petrie *TNZI 26:* 269. [no citation]

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(1) Death certificate (J.F.A.); (2) Anon. The Domain Gardens. Messrs. Armstrongs' retirement. Work done in the past. *The Lyttelton Times*, 12 October 1889; (3) Death certificate (J.B.A.); (4) *The Lyttelton Times*, 27 September 1862; (5) G.R. Macdonald Dictionary of Canterbury Biographies, Canterbury Museum; (6) Arnold Wall 1935: Notes on the Armstrong herbarium. *Rec. Cant. Mus. 4:* 97–114; (7) Miss E.M. Herriott 1919: A history of Hagley Park, Christchurch, with special reference to its botany. *TNZI 51:* 427–47; (8) Electoral Roll or Wise's Directory; (9) E.J. Godley 1967: A century of botany in Canterbury. *Trans. Roy. Soc. NZ* General 1: 243–66; (10) L.Cockayne 1911: The native section, its value and possibilities. *The Lyttelton Times* 12 June; (11) A. Wall 1934: The Armstrong herbarium. Lost plants of Hagley Park. *The Press* 3 March; (12) Anon. 1883: Additional plants for the Domain. *The Lyttelton Times* 10 May; (13) Anon. 1889: Changes at the Domain. *The Press* 10 October; (14) N.Z. Gazette; (15) Anon 1911: The native section. *The Lyttelton Times* 9 June; (16) Anon. 1926: A botanist's bequest. Books and specimens. Valuable collection for Domains Board. *The Lyttelton Times* 6 February; (17) M.J. Barnett 1963: A Garden Century 1863–1963. Pegasus Press, Christchurch; (18) A. Wall 1934: The Armstrong Herbarium. Finds on peninsula and plain. *The Press* 10 March.

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■ DoC's national weed plan launched

Conservation Minister Nick Smith launched DoC's weed plan from Motutapu Island in Auckland, on 31 January this year. This weed plan comes in three parts, all of which are available to the public at no charge.

- *Strategic Plan for Managing Invasive Weeds*; 86 pp. This is the formal weed plan.
- *Invasive weed threats*. 66 pp. This describes over 300 natural areas at risk from weed impacts, and 18 programmes where the objective is to eradicate or contain a species on a regional scale.
- *Space Invaders*. 28 pp. This summarises the key parts of the weed plan. It is in full colour with 28 photos and maps.

It is clear that invasive weeds are one of the greatest threats to New Zealand's biodiversity. Almost half of all vascular plant species growing wild in New Zealand are introduced. Landcare Research's weed database has records of over 19,000 introduced plant species, of which about 2,068 have so far naturalised. Compare this to New Zealand's *c.* 2,400 native vascular plants, about 80% of which are endemic. To date, DoC has identified over 240 naturalised species as current or potential invasive weeds, but this number is increasing as more information is gathered and new species naturalise. DoC estimates that at least 580,000 hectares of New Zealand's unique natural places will be threatened in the next 10 to 15 years if nothing is done. More specifically, invasive weeds affect the survival of 77 threatened native vascular plants, and native animals on many sites.

What is in the weed plan documents?

The ***Strategic Plan for Managing Invasive Weeds*** (SPMIW) provides a 10-page overview of weed impacts and trends, but otherwise doesn't focus on specific weed species or control methods. Rather it concentrates on identifying the critical strategic objectives and needs for properly managing weed threats to public conservation lands in the long term. It includes general principles, objectives and management approaches, targets for DoC's weed activities to 2002, criteria for evaluating the feasibility of programmes, and detailed ranking systems. The plan also outlines DoC's priorities for activities that support weed management (e.g., research, surveillance, training, and management systems).

A distinction is made between protecting those natural areas we value from weed threats, and managing emerging weed problems. These two approaches split a complicated issue into two clear objectives, respectively implemented by "site-led" and "weed-led" control programmes. A second key element in the plan is that it highlights the scale and complexity of weed threats, and the need for DoC, regional councils, landowners, iwi, researchers, and the general public to work together to protect New Zealand's unique natural heritage.

The ***Invasive Weed Threats*** document provides the details of 306 site-led and 18 weed-led programmes identified as at June 1998. There are probably another few hundred site-led programmes still to be included, but it nevertheless starts to give a real picture of the nature and scale of the weed problem. The site-led programmes are listed by conservancy, and each one has information on the programme's location, general community type, important natural values, the weeds present, their threats and the hectares potentially affected, and whether DoC is currently running a control programme there.

Space Invaders provides an brief overview of what is in the *SPMIW* and *Invasive Weed Threats*. It does not include the detailed ranking and decision-making systems that are in the main plan. *Space Invaders* is therefore probably far more digestible for most people. For those who would like more detailed information on weed impacts than *Space Invaders* provides, the chapter on weed impacts and trends in the SPMIW is available as a separate reprint.

How to order

To order the *SPMIW, Space Invaders, Invasive Weed Threats*, and the reprint on weed impacts and trends, contact:

DoC Science Publications, Dept of Conservation, P.O. Box 10-420, Wellington
Phone: (04) 471 0726; Fax: (04) 471 3279; e-mail: svaughan@doc.govt.nz

Other recent DOC publications on invasive weeds

Other recently published items on invasive weeds are also available—the details and costs are given below. Contact the address above to order.

Allen, R.B. 1993. **Gorse and wilding pine management: proposed additions, Maungatua Scientific Reserve**. *Conservation Advisory Science Notes 8*. 24 p. $2.25 incl. GST.

Atkinson, I.A.E. 1997. **Problem weeds on New Zealand islands**. *Science for Conservation 45*. 58 p. $18.00 incl. GST.

Craw, J. 1994. ***Ageratina* at Waipoua and Taranga/Marotene Islands**. *Conservation Advisory Science Notes 86*. 2 p. $2.25 incl. GST.

Department of Conservation 1998. **Space Invaders. A summary of the Department of Conservation Strategic Plan for Managing Invasive Weeds**. 28 p. (no charge).

Johnson, P.N. 1993. **Heath rush: an unwanted weed in Fiordland**. *Conservation Advisory Science Notes 24*. 5 p. $2.25 incl. GST.

McCluggage, T. 1998. **Herbicide trials on *Tradescantia fluminensis***. *Conservation Advisory Science Notes* 180. $10.00 incl. GST.

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Turner, S.J. and Hewitt, J.E. 1997. **Effects of Gallant for *Spartina* control**. *Conservation Advisory Science Notes 158*. 16 p. $2.25 incl. GST.

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FORTHCOMING CONFERENCES/MEETINGS

New Zealand Botany at the end of the Millennium

A celebration of
Eric Godley's Contribution

A conference to be held at
Lincoln, Canterbury
16-18 June 1999

Organised by:
New Zealand Botanical Society
and Landcare Research

The New Zealand Botanical Society and Landcare Research are organising a two-day conference to mark Eric Godley's eightieth birthday in 1999. The intention is to have the same sort of botanical meeting as that marking Eric's retirement from Botany Division, DSIR, in 1984, at which the New Zealand Botanical Society itself was conceived.

The conference will be a chance to consider where New Zealand botany has got to at the end of the millennium, and to look forward to the next millennium.

Keynote speakers

Mary Kalin Arroyo	"Biogeographical patterns & conservation of the mediterranean-type climate flora of central Chile"
Bruce Clarkson	"Conservation at the end of the century: challenges, crises and contradictions"
Colin Webb	"Progress toward understanding the reproductive biology of the New Zealand Flora"
Phil Garnock-Jones	"Systematics: opinions, ideas and tests"
Peter Johnson	"Botany from Boffins: Plants to the People"
Kevin Gould	"Moas to fairies: probing the design of New Zealand's more eccentric plants"

Registration cost
Early registration expired on 26 February 1999. Registration fees are now $110 per person and $60 per student (with student I.D.).

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