The Lucy Cranwell Lecture of 1998

The Flora and Landscape of the Otago and northern Southland Mountains

Neill C. Simpson

The mountains of Otago and northern Southland (Fig. 1) are fascinating both for their landform and their flora. These two together help give this region its uniqueness. One of these features is the block mountain system of Central Otago. A series of parallel, north-east, southwest trending ranges with broad, planated summit plateaux, steep fault-aligned east faces falling to wide valleys. The ranges become gradually higher the further they are from the coast. They appear to be still rising – a bit like a concertina effect as the Pacific plate of which they are a part, pushes into the Indian-Australian Plate. Large blocky tors rise from the summits of these ranges looking like monuments to some long lost civilisation. They are especially well developed on the Old Man Range. On the lower slopes and on the rolling downland of the Maniatoto, the tors are more craggy and weathered. They are also more numerous and less impressive in size. This basin and range landscape has been described as a vast peneplain exhumed from beneath its former cover of marine sediments (Wood 1967, Fahey 1981, Stevens 1988). The tors are thought to be relict features of an ancient peneplain surface, deep differential weathering during the Tertiary has removed the softer rock.

Another feature of these mountains is the immense feeling of space. This is heightened by the rolling, tussock-covered hill country, the broad summit areas and the absence of trees. The vast, often cloudless sky adds to the effect of spaciousness.

The climate is one of extremes with Central Otago having the greatest temperature range in the country. Rainfall varies significantly from the wet mountains of the Southern Alps (more than 600 cm) to the extremely dry, arid central areas with a mean annual rainfall of less than 50 cm at Alexandra and about 160 cm at 1550 m on the Old Man Range (see . 1). Mean annual temperatures at 1550 m are near freezing point and the range in mean monthly values is only about 12 ° C (February mean, 5° to 6°; July -7 to -8° C) (Mark & Bliss 1970). Temperatures are low during the growing season. Mean daily ground temperatures are below freezing for half of the year and there are freeze-thaw cycles on about 40% of days in the mountain environment.

The Remarkables Range separates the flat-topped central mountains from the more rugged, glaciated mountains further west. The affects of glaciation are evident here with features such as roche moutonées, smoothed and truncated spurs, glacial striations and the many small cirque basins containing alpine lakes such as Lake Alta in the Remarkables. Glaciers did not reach the central, block mountains but small cirque lakes are found on several of the ranges and especially in the Garvie mountains. All except one lie on the upper, eastern slopes. Although not glaciated, the extreme climate during the Pleistocene glaciation has left its mark on these central mountains. Periglacial features abound with patterned ground, soil mounds, solifluction terraces and lobes, soil stripes and hummocks and rock drains. Many of these are considered to be relict features although there is evidence that solifluction activity is still occurring. This landscape has been described as tundra-like. Cushion plants are another feature of these mountains with many genera represented. They include *Dracophyllum muscoides, Raoulia hectorii, Kellaria childii, Abrotenella inconspicua, Hectorella caespitosa, Celmisia sessiliflora, Chionohebe thomsonii, Phyllachne colensoi* and *P. rubra, Anisotome imbricata.* Other small plants found in these cushionfields are *Luzula pumilla, Celmisia laricifolia, Anisotome lanuginosa* and *Leptinella goyenii.* Many of these cushions look nearly identical.

Wet lands and patterned mires with extensive pool systems occupy several areas such as in the Garvie Mountains and Old Man Range. Mosses and sedges are prominent in these areas but in autumn the dainty *Gentiana amabilis* with its spotted leaves and large, white flowers, is prominent.

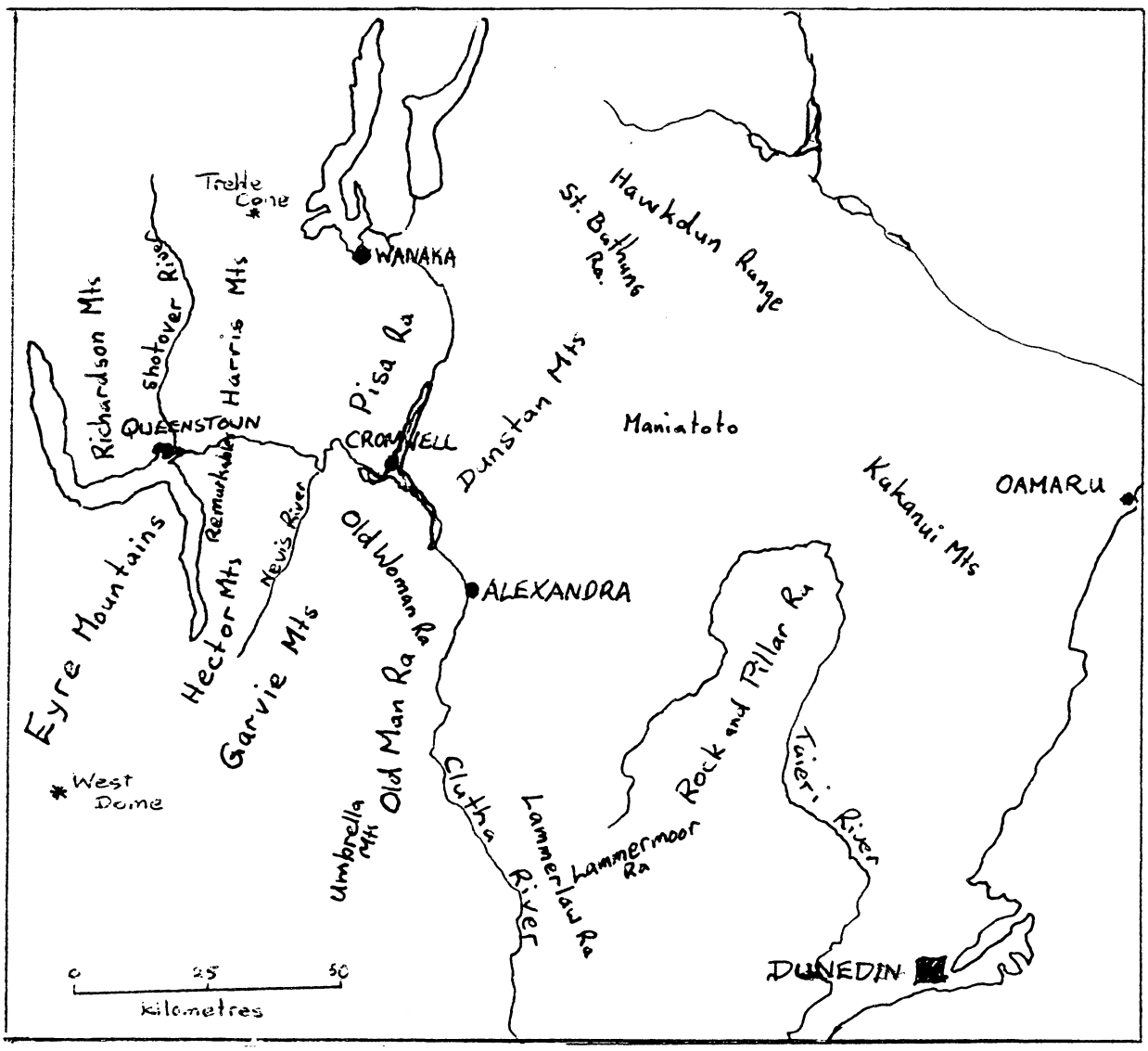
Various grades of chlorite schist form the rock which underlies most of Otago. In places this is very friable, eroding easily and leading to very dissected mountains as seen in the Richardson and Harris Mountains which run north-westwards from Lake Wakatipu. The Shotover River drains a large part of this region and brings down enormous amounts of silt and gravel. The very conservative grazing with no burning, in the upper Shotover, has allowed great recovery of the shrublands and mountain beech patches. To the South of Lake Wakatipu lie the Eyre Mountains. The southern half of this large mountain block is composed of greywacke rock with a belt of ultramafic rock along the southern edge at West Dome.

The Flora

The Otago mountains that we will look at tonight (refer map) have a diverse flora with much of it unique. More than 1000 species have been recorded (not including 115 hybrids) and about 90 of these appear to be

unnamed species only some of which are presently being studied. They include several plants in the *Brachyscome* genus, this tiny *Galium* and a *Leptinella* from the Clutha valley (Pisa flats). Seventy-five species appear on the NZ Threatened Plants list. *Ischnocarpus novae-zelandiae*, a small cress which is typically found on dry rock ledges under bluffs is one of these. It is not uncommon around the Wakatipu but has disappeared from much of its previous habitat. More than 25 species are endemic to Otago and northern Southland with the Eyre Mountains particularly rich. *Myosotis albo-sericea* is confined to one tiny area on the southern end of the Dunstan mountains. Many of the plants of this region have small flowers so are not as spectacular as the macro-herbs of the wetter mountains to the west, but they are none-the-less fascinating. I believe that Otago is a botanist's paradise.

Fig. 1. The mountains of Otago and northern Southland



Most of the Otago high country is in Pastoral Lease, but the Tenure Review process which allows freeholding of farmable land is also having great gains for conservation. In Otago 34 properties have gone through this process with about 70,000 ha of mainly mountain land with high conservation values added to public lands administered by the Department of Conservation. A further 50 properties are presently being processed with an average of 40% of the land likely to become public land.

Salt Pans are a small but important feature of the arid climate of Central Otago. These saline soils contain a number of specialist plants such as the tiny cress *Lepidium kirkii* and larger species *L. sysimbrioides* var. *matau*. Other plants here are *Atriplex buchananii* and three *Pucinellia* species (grasses). Not confined to the salt pans but often found nearby are the tiny spring annuals, *Ceratocephalus pungens* and *Myosurus minimus* subsp. *novae-zelandiae.* Both are members of the Ranunculaceae family. The higher central basins contain large areas of red tussock (*Chionochloa rubra* var. *cuprea*) above about 600 m. At least two unnamed species of *Brachyscome* (a small daisy), are found here. In some deep, rocky gullies some of the

original shrubland still survives. The pre-Polynesian vegetation was thought to be a mosaic of dry forest, shrubland and tussockland. Hall's totara, kanuka, mountain toa toa and mountain pine (*Halocarpus bidwillii*) were important low forest species. Kanuka forest with kowhai is still found in the upper Clutha valley, with small patches of mountain toa toa and mountain (or bog) pine. Some of this is now Conservation land. Curiously, no kanuka gets up the Kawarau gorge into the Wakatipu basin.

The Pisa flats in the Clutha valley is another special area. A small undeveloped, stony terrace contains an unnamed *Leptinella, Galium, Craspedia* and other plants rare in Otago such as *Raoulia monroi, Lepidium sisymbrioides* var. *sisymbrioides* and *Myosotis uniflora*.

Next a brief look at the mountain ranges starting with the Rock and Pillars. *Brachyscome linearis* and *Celmisia haastii* var. *tomentosa* are two species endemic to these mountains. *Celmisia argentia* is common here but not elsewhere in Otago. It is easily confused with *C. sessiliflora* which is relatively common. The tiny *Aciphylla hectorii* is found throughout the Otago mountains but is not common. South to the wet, rolling tussockland of the Lammermoor and Lammerlaws, *Donatia novae-zelandiae* is found, a plant of wetter mountains.

The Dunstan Mountains contain the endemic plants *Myosotis albo-sericea, M. oreophila* and *Gentiana liliputiana*, a very tiny gentian of bogs. A feature of the southern end, on south-facing slopes, is the prostrate *Dracophyllum pronum.* Further west and parallel lies the Pisa Range with its patterned summit plateau and many cushion plants. *Aciphylla simplex* forms rounded, orange mounds. *Chionohebe myosotoides* and *C. glabra* are endemic cushion plants. Other plants of note are *Poa pygmaea, Celmisia brevifolia* and the shrub-like *Celmisia ramulosa.* Patches of slim-leaved snow tussock (*Chionochloa macra*) are all that remain of what was probably once extensive tussockland with cushionfields rather than the reverse as now. As with many of these mountain tops much of this land is now part of the public estate with grazing largely removed and burning no longer likely.

The Old Man Range, Old Woman Range, Umbrella and the Garvie Mountains form a large complex extending into Southland. It is a fantastic landscape. Small cirque lakes are found along the southern Garvies and lake-less cirques on the Old Man Range. All face roughly east. Cushion plants and large tors are a feature of the summit plateaux. *Celmisia viscosa* is another important plant covering large areas adjacent to the cushion fields. Like several of our alpine plants it flowers only intermittently, but is a spectacular site when in full flower. Several Otago endemic plants are found on this complex and include, *Luzula crenulata, Parahebe trifida, Acaena tesca, Hebe dilatata* and *Geum pusillum* a tiny plant of snow banks. Several unnamed species are also found here. Evidence of the search for gold is found in the old water races, tailings and remains of old stone buildings scattered in the upper valleys. One of these, at Potters, has been restored by DoC.

Gold was also found in the cold Nevis Valley which follows a fault line and separates the Garvies from the Hector Mountains. These latter run south from The Remarkables, along the shore of Lake Wakatipu. Water filled holes, tailings and remnant buildings are all that remain of the past but modern mining is still taking place here. It is on old tailings and bare gravel terrace edges that the tiny, cryptic *Myosotis glauca* is found. It can be associated with *M. drucei* here, another tiny forget-me-not. Other rare or threatened plants found in this valley include *Deschampsia caespitosa* and *Ranunculus ternatifolius*, both plants of wet areas, the latter associated with red tussock.

On the other side of Lake Wakatipu lies the Eyre Mountains, an extensive, dissected block of country extending southwards into Southland. Jane Peak at 2035 m is the highest point. South of Eyre Creek the parent rock changes from schist to greywacke while West Dome on the south end, is ultramafic. The Eyre Mountains have several wonderful endemic plants. *Celmisia philocremna* is found on vertical rock faces and ledges in just a few small areas but is abundant on these sites. *Celmisia thomsonii* favours damp, shaded rock faces, shunning the sun. It is more widespread but never abundant. A plant of stable bare clay slopes, or occasionally scree, is *Ranunculus scrithalis,* a tiny, very cryptic buttercup with the flower borne right down in the base of the plant. It also occurs further west, in the Thompson Mountains. *Pimelea poppellwellii*, a small shrub of tussock grassland is also found on the Garvie Mountains. It is a scented native daphne. In places debris slopes and coarse scree contain numerous *Ranunculus haastii* var. *pilifera*, a handsome plant with thick, leathery, glaucous leaves and masses of large yellow flowers, while the clumped, bluish mounds of *Aciphylla spedenii* are found on rock faces and debris slopes. Both are endemic to the Eyre region. Other plants of interest here are *Cheesemania wallii* in shaded rock crevices, *Stellaria roughii* (screes), *Ourisia remotifolia, O. confertifolia,* and *O. spathulata, Ranunculus crithmifolius, Kirkienella novae-zelandiae* (a small dandelion), and a rhizomatous speargrass of seepages, *Aciphylla pinnatifida* with attractive orange/gold flower heads. West Dome has its special plants also. They include *Celmisia spedenii,* an unnamed, tiny *Brachyscome* and *Myosotis* species.

The Richardson Mountains are very rugged while the Harris Mountains to the north are generally less so. They are separated by the Shotover River and tributaries, renown for its gold, historic sites and the amount of eroded material it carries when in flood. It is also renowned more widely for its jetboat and rafting industry. Goats were once a problem in this country but are now in very low numbers. Beautiful, remote Lake Lochnagar has been created by a huge landslide. Large, slow-moving landslides are found through much of the schist country, often giving a ripple effect to hillsides. Shrublands are important in this lightly grazed country with *Olearia odorata,* matagouri (*Discaria toumatou), Hebe anomala, Dracophyllum uniflorum, D. longifolium, Hoheria lyallii* and *Phyllocladus alpinus* all being important species. The largest population remaining in the country of the threatened shrub *Hebe cupressoides*, is found in the Shotover valley. More than 1000 plants but virtually no regeneration. Although common in gardens it appears to have gradually disappeared from many parts of the eastern South Island where it was once common. The skifield road gives easy access to Treble Cone in the northern Harris Mountains. In the narrow-leaved tussockland (*Chionochloa rigida*) here can be found two striking speargrasses, *Aciphylla kirkii* and *A. montana.* The latter is found to the north but disappears southwards to be replaced by the Otago endemic *Aciphylla lecomtei* a very similar plant. Both are also closely allied to *A. similis*, a plant of wetter mountains. A small creeping plant of damp scree is *Parahebe planopetiolata*, not uncommon on these mountains. Southwards, below Mt. Cardrona, in the middle of the skifield, a tiny *Plantago obconica* has been found. It is found in wet places, and its 1 cm grass-like leaves make it easily overlooked amongst the sedges with which it is associated.

The Remarkables are aptly named. Their dissected west face rising a sheer 2000 m from Lake Wakatipu to the high point of Double Cone at 2319 m. The skifield road gives easy access to the base building at 1500 m in the Rastus Burn. This saddles with the relatively remote Wye Valley which runs south before turning westwards to enter Lake Wakatipu. The Wye separates the Remarkables from the Hector Mountains which appear as a southwards extension. The Wye is a wonderful area to botanise, with a rock bivouac half way down the valley. Here at the foot of a sleeping platform, a large plant of *Myosotis macrantha* with golden, scented flowers, has managed to survive. The lower Wye has magnificent cliffs and is becoming a rock-climbing mecca. *Ischnocarpus novae-zelandiae,* (the small, threatened cress) grows under some of these cliffs and may be benefiting from this activity as now that local climbers are aware of its identity, they empty their water bottles on the plants at the end of the day. The lower mountain beech forest gives way to extensive sub-alpine shrubland which contains four species of whipchord *Hebe. Hebe hectorii, H. propinqua, H. cupressoides* (a few), and *H. annulata.* Another whipchord, *Hebe lycopodioides* is found on the other side of the lake. Well up valley the snow tussockland gives way to cushionfields and high alpine lakes. Small patches of snow patch tussock (*Chionochloa oreophila*) reach their eastern limit here as does *Parahebe birleyi*, only found on the summit rocks of Double Cone. Another plant reaching its eastern limit here is the large, white flowered *Ranunculus buchananii.* This beautiful plant is increasing dramatically now that sheep and goats have been removed, moving out from the shelter of crevices and high ledges to the debris slopes below the sheltering bluffs.

One of the first flowers to appear in the spring, often flowering while still under the snow edge, is *Psychrophila obtusa (Caltha).* The dainty white flowers give off a wonderful aroma when in full sun. It is a plant of bogs and wet areas. *Celmisia haastii* is another early flower of wet areas and snow banks. The endemic Otago buttercup, *Ranunculus pachyrrhizus* also frequents these places. Two orange fruited *Coprosmas* which look almost identical are *Coprosma niphophila* and *C. perpusilla*, the former with two pyrenes, the latter with 3-4. Stipules also differ. A relatively common plant of the tussockland is a large, unnamed *Aciphylla* tag named "lomond" (by John Dawson). It is a fierce plant. *Chionochloa rigida is found* to about1500 m, and *C. macra* above. Lower down is the glaucous *Aciphylla glaucescens.* Plants of fellfield and bluff include *Haastia fulvida,* many of the cushion plants, *Myosotis pulvinaris, Hebe haastii* var. *humilis, Craspedia lanata, Anisotome pilifera, Anisotome capillifolia, Leucogenes grandiceps* and the spectacular orange mounds of *Aciphylla simplex* found clinging to the nearly vertical faces of the upper rocks. The small rosettes of the cress *Pachycladon novae-zelandiae* grow in rock crevices. South along the Hector Mountains, *Celmisia hectorii* forms very large patches at the foot of bluffs while the most spectacular daisy of the wetter places is *Celmisia verbascifolia.*

I hope that this has given you an insight into the spectacular landforms and special places of Otago and northern Southland. It is a unique region of New Zealand with many wonderful plants, only a small percentage of which we have been able to talk about here. To me it is a truly a botanists paradise.

References

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