GRASSES ON BANKS PENINSULA AND KAITORETE

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Introduction

Stripped of most of its ancient forests, Banks Peninsula is now a largely grassy landscape. Pasture for sheep, cattle and deer feeds much of the rural economy and reveals the passage of the seasons; bright green in spring and early summer, with the grasslands turning straw-coloured as summer advances, and green again in autumn, but paling, as old shoots die in winter.

As a local botanist, however, I am asked far fewer questions about grasses than about trees, ferns and showy flowers. Apart from farmers, whose livelihood depends on a few grass species, many people seem to think that one grass looks much the same as any other, and that they are not very interesting. Actually there are many different sorts of grasses on Banks Peninsula, and a lot of fascinating questions can be asked about them.

Worldwide, botanists recognised at least 9000 grass species. They all belong to one large botanical family, Gramineae (Poaceae is a permitted alternative name, more consistent with the naming of most other botanical families). All grasses have numerous features in common – the structure of the tiny, petal-less, wind-pollinated flowers, for example, and the cylindrical, usually hollow, flower stalks. The ability of most grasses to be eaten to ground level and still sprout readily again explains a lot about their ecological success; their evolution has been closely tied in with the evolution of grazing mammals.

The grass family includes some species not always recognised as grasses by non-botanical people. For example, bamboos, sugar cane, sweet corn and cereals are all grasses. Despite the features they have in common, grasses are very diverse in other ways. One South American bamboo has leaf blades up to 5 metres long! The biggest bamboos can grow 40

metres tall. In contrast some of our own native grasses project at most only a few millimetres above the ground. On the other hand, some plants look like grasses, but are not. Rushes (Juncaceae) and sedges (Cyperaceae), for example, are represented by numerous species on Banks Peninsula.

Development of the Banks Peninsula Grass Flora

During my botanical survey of the Peninsula and Kaitorete through the 1980s I recorded 130 wild grass species, 83 introduced, 47 native (Table 1). Many of the introduced species are useful pasture grasses, but some, such as nasella tussock, are troublesome weeds. I was unable to find five native species that had been reliably recorded by other botanists earlier this century (*Deschampsia caespitosa, Poa anceps, Spinifex sericeus, Stenostachys gracilis* and *S. laevis*). Perhaps they are now locally extinct, or perhaps I need to look harder!

The 47 native species are wonderfully diverse, ranging in size from tussocks several metres tall (toetoe) down to pygmy twitch (*Zoysia minima*) at most several millimetres tall. One native grass, a distinctive, fine-leaved, blue-green tussock, common on cliffs, banks and rock outcrops, has only recently been formally recognised as a species unique to Banks Peninsula. Colloquially called "Banks Peninsula blue tussock" it now has a botanical name, *Festuca actae* (Connor 1998) (Fig. 1).

A good question is "If Banks Peninsula was completely forested before people came, where did all these native grasses grow then?" Some are forest species, such as bush rice grass (*Microlaena avenacea*) and bush poa (*Poa matthewsii*). These two, and about nine other species, are more or less confined now to old-growth, and regenerating forest patches. Many others inhabited restricted open sites such as coastal cliffs and banks (e.g., *Poa cita, P. astonii*), rock outcrops (e.g., *Rytidosperma corinum*), slips (e.g., *Rytidosperma gracile, Poa cita*), sand dunes (e.g., *Austrofestuca littoralis*), saltmarshes (e.g., *Puccinellia stricta, P. walkeri, Lachnagrostis littoralis*), areas temporarily bared by forest fires (e.g., *Hierochloe redolens* (Fig. 2), *Poa cita*), or stony riverbeds on the nearby plains (e.g., *Poa cita, P. lindsayi, Rytidosperma* spp.).

When Maori settlers began burning forest on Banks Peninsula hundreds of years ago, either by accident or design, or both, native grasses rapidly took advantage of the newly

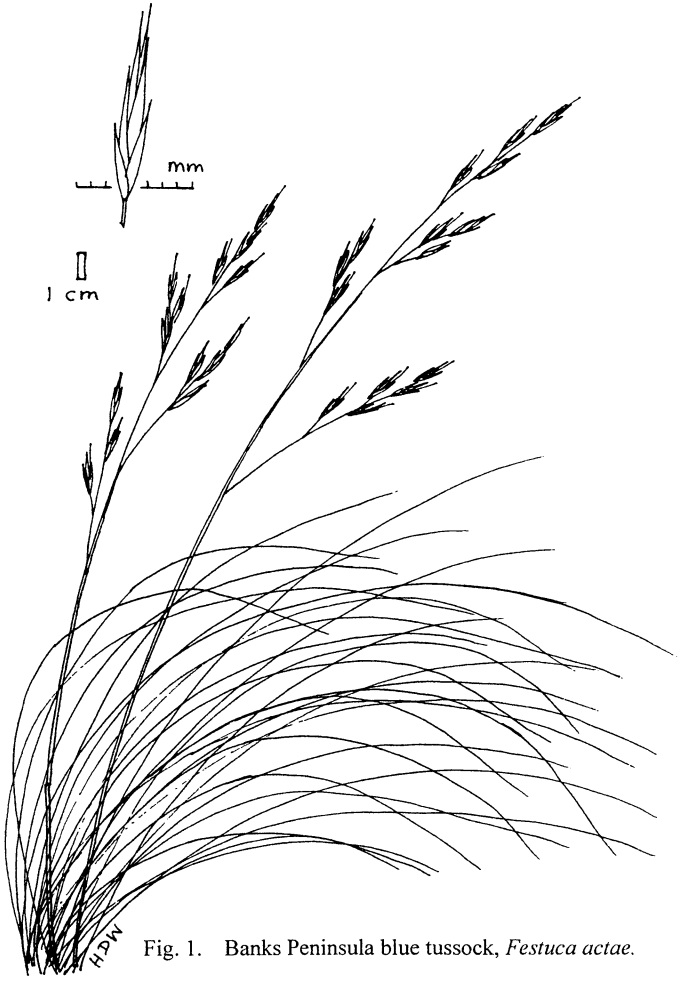

Fig. 1. Banks Peninsula blue tussock, *Festuca actae.*

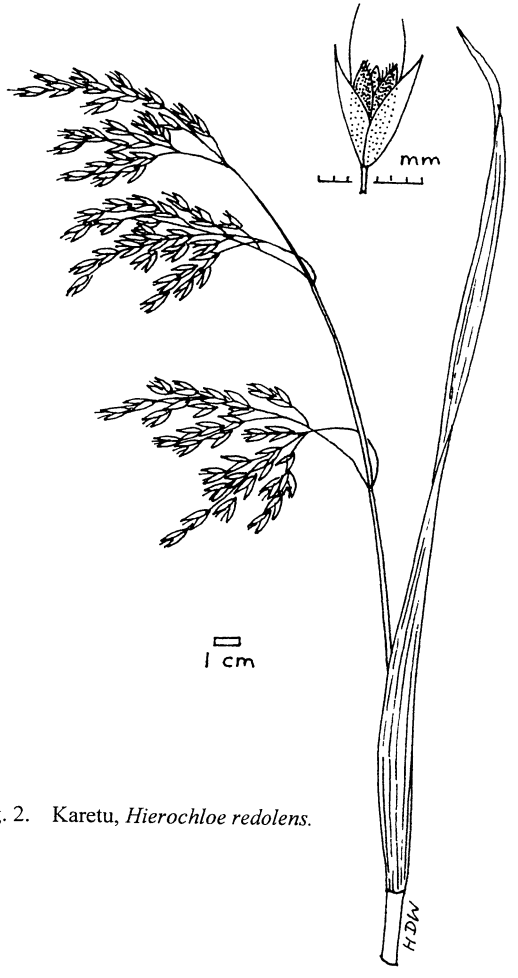

Fig. 2. Karetu, *Hierochloe redolens.*

open ground; tussocks for example spread on to hundreds of hectares of previously forested ground, especially along ridges and headlands.

Europeans arrived here to settle about 150 years ago. They found the Peninsula still largely forested, but substantial areas (especially about Lyttelton Harbour and the Port Hills) had been under tussock for a long time; even botanists thought (wrongly) that this was completely natural vegetation in balance with the local climate. Kaitorete was open ground, the seaward side almost desert-like in appearance, but centuries ago forest would have occupied the older soils, with kahikatea, cabbage trees and flax prominent along the lake margins, and akeake, ngaio and kowhai contributing to scrubby, wind-shorn forest nearer the sea. However, much of Kaitorete has young, sharply-drained soils on gravel and sand, and even in pre-human times, before the first moa-hunter fires, extensive open ground would have provided plenty of space for native grasses such as silver tussock, danthonia (*Rytidosperma*) and pygmy twitch (Fig. 3).

European settlers almost totally deforested Banks Peninsula, but the tussocks and other native grasses missed out on the chance to spread much further into this newly cleared ground because the settlers immediately sowed European pasture grasses such as browntop, fog, cocksfoot, sweet vernal, dogstail, ryegrass, and non-grass pasture species such as clover.

One of these exotic grasses formed the basis of an important local industry which dominated the Banks Peninsula economy for several decades. William ("Cabbage") Wilson, Christchurch's first nurseryman and mayor, imported 50 kilograms of cocksfoot seed (*Dactylis glomerata*) in 1852 (Ogilvie, 1990). Cocksfoot flourished on Banks Peninsula. Good seed was in high demand, not only in other parts of New Zealand where farmers were establishing pasture on newly cleared bushland, but also in Australia, southern Africa and South America. "Akaroa cocksfoot" became world-famous. Between 1880 and the 1930s its production was highly profitable, supporting many farming families and enabling closer settlement on Banks Peninsula. Production reached its peak in 1904-5 when Banks Peninsula was the source of 83% of all the cocksfoot seed produced in New Zealand. At least 10 000 hectares were being harvested annually by a thousand casual labourers. Even as late as 1924, Banks Peninsula was growing 82% of all Canterbury's cocksfoot seed. After this date, demand lessened. Most of the available forest country in

New Zealand and elsewhere was by now already converted into pasture. Other factors such as a shortage of labour, high costs, the introduction of machine-harvesting on the Plains, and a shift to other grasses such as ryegrass (*Lolium*) cultivars, all contributed to a decline in the industry on Banks Peninsula (Ogilvie, 1990).

Native grasses still dominate quite extensive areas of the Peninsula. A moderate level of grazing by sheep actually favours the persistence of native tussocks, because it keeps down exotic grasses such as cocksfoot and fog which would otherwise grow tall and shade the tussocks out. Colonising woody species such as native kanuka and *Coprosma*, or exotic gorse and broom, can also smother the tussocks. Silver tussock (*Poa cita*) forms much of the tussock grassland below 500 m. Above 500 m, fescue tussock (*Festuca novae-zelandiae*) and narrow-leaved snow tussock (*Chionochloa rigida*) form considerable tussocklands (Fig. 3). However, native tussockland occupies less than 10 per cent of the Peninsula's total area of some 100 000 hectares, compared to about 50 per cent under exotic pasture.

Some farmers call the rough browntop pasture on their less fertile uplands "native", but the dominant grass species, browntop (*Agrostis capillaris*) is actually an introduced species. A native relative, *A. personata*, is local and uncommon. Interestingly enough, a lot of the pasture on the drought-prone headlands comprises native meadow rice grass (*Microlaena stipoides*) and both native and Australian danthonias (*Rytodisperma* spp.). Without these drought-tolerant but quite nutritious grasses the drier spurs and headlands would be less pastorally productive.

Some of the native grasses make superb garden ornamentals (my house at Hinewai is surrounded by them) – especially toetoe (*Cortaderia richardii*), hunangamoho (*Chionochloa conspicua*) and wind tussock (*Anemanthele lessoniana*).

A wide-bladed, pleasantly scented native grass called karetu (*Hierochloe redolens* (Fig. 2)) was once very important to Maori for medicine and ritual as well as for scented floor coverings, weaving, bodily anointment and steam baths. Although readily eaten by cattle, sheep and goats, karetu is still plentiful in places inaccessible to stock, including many roadsides, rock outcrops, banks and reserves. Recently a friend interested in Maori botany was helping me remove broom from along Hinewai's Brocheries Road boundary.

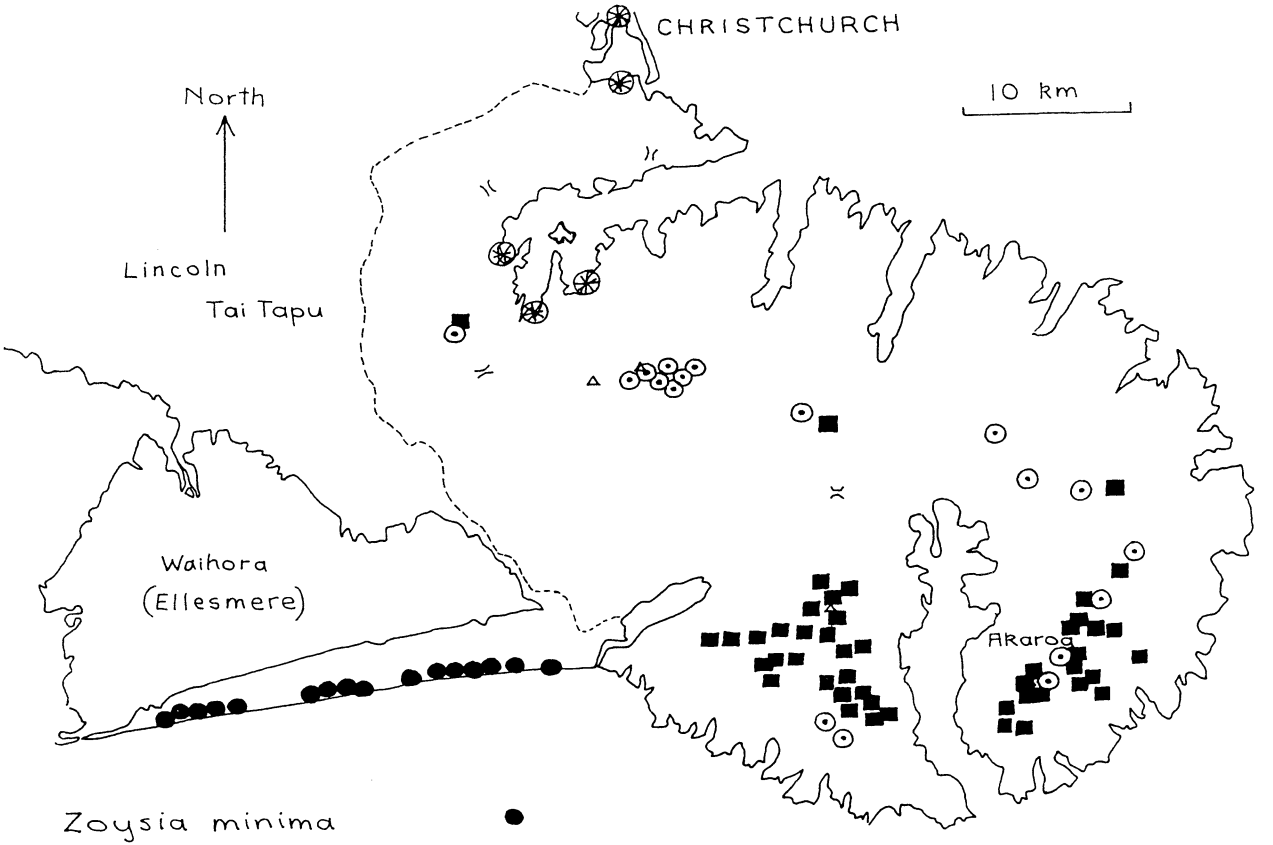

Fig. 3. Distribution of four grass species across Kaitorete and Banks Peninsula, three native species (*Zoysia minima* or pygmy twitch, *Chionochloa conspicua* or hunangamoho, *C. rigida* or narrow-leaved snow tussock) and one naturalised species (*Spartina anglica* or cord grass).

We stopped for lunch and sat down among tall grass on the road bank. "Do you know of a grass called karetu?" she asked. "What does it look like?" This was one of the easiest botanical questions I have ever had to answer. I replied "You are sitting on it.".

Table 1: Checklist of Wild Grasses on Banks Peninsula and Kaitorete

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Symbols

Footnotes.

[3 (superscript numeral)] = note follows at end of table.

Status

* not native to Banks Peninsula

o native to Banks Peninsula

⊙ endemic to Banks Peninsula

Hy hybrid

TL type locality on Banks Peninsula

Abundance

1 widespread and common

2 widespread, often common but more or less patchily distributed

3 local, common only in one or a few localities, or else quite widespread but nowhere common

4 local and uncommon

5 local and rare

6 not certainly wild; e.g. plant may have been planted or result only from dumped garden discards without further reproduction

E although reliably reported in the past, not noted in recent years and possibly now extinct on Banks Peninsula

Main habitats

Wh widespread in a range of habitats

G grassland, open ground

D disturbed and waste ground (including gardens and roadsides)

F forest or scrub

Co coastal sands and/or saltmarsh or banks

Cl cliffs and banks

	Footnote	Status	Abundance	Main Habitat
x *Agropogon littoralis* (= *Agrostis stolonifera* x *Polypogon monspeliensis*) perennial beard-grass		* Hy	5	Co
Agrostis capillaris browntop		*	1	Wh
A. gigantea redtop		*	4	G
A. personata		o	4	G
A. stolonifera creeping bent		*	1	G
Aira caryophyllea silvery hair grass		*	1	G
A. praecox early hair grass		*	4	G
Alopecurus geniculatus marsh foxtail		*	2	We
A. pratensis meadow foxtail		*	3	G
Ammophila arenaria marram grass		*	3	Co
Anemanthele lessoniana wind tussock		o	5	F
Anthoxanthum odoratum sweet vernal		*	1	G
Arrhenatherum elatius tall oat grass		*	1	G
Austrofestuca littoralis sand tussock	1	o	5	Co
Avena fatua wild oat		*	3	D
Briza maxima quaking grass		*	4	D
B. minor shivery grass		*	2	G
Bromus diandrus ripgut brome		*	1	G
B. hordeaceus soft brome		*	1	G
B. lithobius furry brome		*	1	G
B. stamineus spiky brome		*	1	G
B. sterilis barren brome		*	1	G
B. willdenowii prairie grass		*	1	G
Catapodium rigidum hard meadow grass		*	5	Cl
Chionochloa conspicua hunangamoho		o	2	G
C. conspicua x *rigida*		o Hy	5	G
C. rigida narrow-leaved snow tussock; wi kura		o TL	2	G

	Footnote	Status	Abundance	Main Habitat
Cortaderia jubata purple pampas grass	2	*	6	D
C. richardii toetoe		o	2	We
C. selloana pampas grass	3	*	6	D
Cynodon dactylon Bermuda grass		*	5	D
Cynosurus cristatus crested dogstail		*	1	G
C. echinatus rough dogstail		*	1	G
Dactylis glomerata cocksfoot		*	1	G
Deschampsia caespitosa tufted hair grass	4	o	E	
D. novae-zelandiae hair grass		o	4	F
D. tenella hair grass		o	4	F
Deyeuxia avenoides		o	2	G
D. youngii		o	5	G
Dichelachne crinita plume grass		o	1	G
Digitaria sanguinalis summer grass		*	3	D
Echinochloa crus-galli barnyard grass		*	4	D
Echinopogon ovatus hedgehog grass		o	2	F
Ehrharta erecta veld grass		*	5	D
Elymus multiflorus wheat grass		o	5	Co
E. rectisetus slender wheat grass		*	1	G
E. solandri blue grass		o	2	G
Elytrigia repens, couch, twitch		*	1	G
Festuca actae Banks Peninsula blue tussock		⊙ TL	2	Cl
F. arundinacea tall fescue		*	1	G
F. novae-zelandiae fescue tussock		o TL	2	G
F. rubra subsp. *commutata* Chewing's fescue		*	1	G
F. rubra subsp. *rubra* red fescue		*	4	G

	Footnote	Status	Abundance	Main Habitat
x *Festulolium holmbergii* (= *Festuca rubra* x *Lolium perenne*) hybrid fescue		* Hy	5	G
Glyceria declinata blue sweet grass		*	1	We
G. plicata floating sweet grass		*	5	We
Hainardia cylindrica barb grass		*	5	Co
Hierochloe redolens karetu, holy grass		o	2	G
Holcus lanatus Yorkshire fog		*	1	G
Hordeum distichon barley		*	4	D
H. hystrix Mediterranean barley grass		*	3	Co
H. marinum sea barley grass		*	3	Co
H. murinum (incl. *H. leporinum*) barley grass		*	1	G
Koeleria novozelandica		o	4	Cl
Lachnagrostis billardierei sand wind grass		o	3	Co
L. filiformis wind grass		o	2	We
L. littoralis subsp. *salaria* saltmarsh wind grass		o TL	3	Co
L. lyallii wind grass		o	4	G
L. pilosa subsp. *pilosa* broad-leaved wind grass		o	2	Cl
L. tenuis wind grass		o	4	Co
Lagurus ovatus hare's-tail		*	3	Co
Leymus arenarius lyme grass		*	4	Co
L. racemosus lyme grass		*	4	Co
Lolium x *hybridum* (= *L. multiflorum* x *perenne*) short rotation ryegrass		*	4	G
L. multiflorum Italian ryegrass		*	2	G

	Footnote	Status	Abundance	Main Habitat
L. perenne perennial ryegrass		*	1	G
L. temulentum darnel	5	*	E	
Microlaena avenacea bush rice grass		o TL	2	F
M. polynoda knotted rice grass		o	4	F
M. stipoides meadow rice grass		o	1	G
Milium effusum millet grass	6	*	E	
Nasella trichotoma nasella tussock		*	4	G
Parapholis incurva sickle grass		*	4	Co
Paspalum dilatatum paspalum		*	3	D
Pennisetum clandestinum Kikuyu grass		*	5	D
P. macrourum African feather grass		*	5	G
Phalaris aquatica phalaris		*	3	G
P. canariensis canary grass		*	5	D
P. minor lesser canary grass		*	4	D
Phleum pratense timothy		*	1	G
Piptatherum miliaceum bamboo grass		*	5	D
Pleioblastus chino bamboo		*	6	
Poa ? *anceps* subsp. *anceps* broad-leaved poa	7	o	E?	Cl
P. annua annual poa		*	1	D
P. astonii blue shore tussock		o	4	Co
P. breviglumis		o	2	F
P. cita silver tussock		o	1	G
P. colensoi blue tussock		o	2	Cl
P. imbecilla weak poa		o	2	F
P. infirma early meadow grass		*	2	D
P. labillardierei rough poa tussock		*	3	G
P. lindsayi Lindsay's poa	8	o	5	G
P. matthewsii bush poa		o	1	F

	Footnote	Status	Abundance	Main Habitat
P. pratensis meadow grass		*	1	G
P. ? pusilla	9	o	5	Cl
P. trivialis rough meadow grass		*	1	G
Polypogon monspeliensis annual beard grass		*	4	We
Pseudosasa japonica bamboo		*	6	
Puccinellia distans reflexed saltmarsh grass		*	3	Co
P. fasciculata Borrer's saltmarsh grass		*	3	Co
P. stricta saltmarsh grass		o	2	Co
P. walkeri subsp. *walkeri* saltmarsh grass		o	4	Co
Rytidosperma buchananii		o	4	G
R. caespitosum danthonia		*	1	G
R. clavatum danthonia		o	1	G
R. corinum bristle tussock		o	3	Cl
R. geniculatum danthonia		*	5	G
R. gracile danthonia		o	1	G
R. maculatum danthonia	10	o	4	G
R. ? merum danthonia	11	o	2	G
R. pilosum danthonia	11	*	3	G
R. racemosum danthonia		*	1	G
R. thomsonii		o	2	G
R. unarede danthonia		o TL	1	Wh
Secale cereale rye	12	*	6	
Setaria verticillata rough bristle grass		*	5	D
Sieglingia decumbens heath grass		*	5	G
Spartina anglica cord grass		*	4	Co
Spinifex sericeus spinifex	13	o	E	
Sporobolus africanus ratstail grass		*	3	G

	Footnote	Status	Abundance	Main Habitat
Stenostachys gracilis	14	o	E	
S. laevis	15	o	E	
Stenotaphrum secundatum buffalo grass		*	6	
Stipa bigeniculata giant stipa		*	4	G
S. flavescens giant stipa		*	4	G
S. nodosa needle grass		*	2	G
S. scabra needle grass		*	2	G
S. stuposa giant stipa		*	3	G
Themeda triandra kangaroo grass	16	*	6	
Thinopyrum junceiforme sand couch		*	5	Co
Trisetum lepidum		o	4	F
Triticum aestivum wheat	17	*	6	D
Vulpia bromoides squirrel-tail fescue		*	1	G
V. myuros var. *megalura* fox-tail fescue		*	4	G
V. myuros var. *myuros* rat's-tail fescue		*	1	G
Zoysia minima pygmy twitch	18	o	3	Co

Notes:

1 *Austrofestuca littoralis.* Recently found only on Kaitorete. Laing (1919) recorded "Peninsula, near shore. Wall (1953) recorded "coastal, sandhills".

2 *Cortaderia jubata.* Planted on Banks Peninsula. Not yet certainly noted as wild.

3 *Cortaderia selloana.* Widely planted on Banks Peninsula, but as yet barely naturalised.

4 *Deschampsia caespitosa.* Recorded for Banks Peninsula by J.F. Armstrong (1870), J.B. Armstrong (1880), Canterbury Botanical Society (1983). Recorded for Canterbury coast from New Brighton Spit northwards by Wall (1953) and Simpson and Mason (1981). Not currently known from Banks Peninsula.

5 *Lolium temulentum.* Known only from old specimens from Okains Bay and Akaroa. Not seen recently on Banks Peninsula.

6 *Milium effusum*. There is a specimen at CHR collected from Otahuna, Banks Peninsula. Not seen wild by me.

7 *Poa anceps*. Edgar (1986) mapped *Poa anceps* as having an outlying population on Banks Peninsula, but all plants that I have seen which resemble this species appear to be part of variable *Poa cita*; extravaginal tillering seems to occur in forms of *Poa cita* that trail down over steep banks, while leaf width and folding vary a lot. Further plants and character states still need checking, but as yet I am not convinced that *Poa anceps* occurs here.

8 *Poa lindsayi*. I found this species only on Kaitorete, but there is a specimen at CHR collected by Wall in 1921 from Saddle Hill. Armstrong (1880) also recorded *Poa lindsayi* from the Peninsula.

9 *Poa pusilla*. A population near Lake Forsyth appears to be this species, but needs further investigation to be certain. Wall (1953) recorded it for "coastal grassland", and Simpson and Mason (1981) recorded it (as *P. seticulmis*) for the Canterbury coast from New Brighton Spit northwards.

10 *Rytidosperma maculatum*. I saw this species only on Kaitorete.

11. *Rytidosperma merum* and *pilosum*. In the field I found it hard not to believe that plants matching *R. clavatum, R. penicillatum, R. pilosum* and *R. merum* merged into each other and formed one variable population. Another *Rytidosperma* I was unable to place. The plant was slightly glaucous, with awns barely protruding from the spikelet; the lemma had a robust upper row of hairs. Some of the characters suggested *R. tenuis* or *R. biannulare*, and ruled out *caespitosum* or *unarede*. Similar plants occurred in several places on Kaitorete.

12 *Secale cereale*. Not certainly recorded wild.

13 *Spinifex sericeus*. This occurred on New Brighton Spit at least into the 1940s (Wall, 1953), but probably became locally extinct. It is being reintroduced by the Christchurch City Council Coast Care Group.

14 *Stenostachys gracilis*. Collected by Raoul near Akaroa in the 1840s. Wall (1953) comments "long ago collected near Akaroa by Raoul, but only recently observed again here; it is fairly abundant in all the gullies on Mount Herbert from about 1500 ft upwards". Specimen seen at CHR, but I failed to find this species on Banks Peninsula during my survey.

15 *Stenostachys laevis*. Connor (1994) indicates Banks Peninsula as being within the range of this species. Not seen during my survey. Simpson and Mason (1981) recorded it "near Leithfield".

16 *Themeda triandra*. Collected once in Bowens Valley (presumably Bowenvale, Port Hills), in the past. Not seen by me.

17 *Triticum aestivum*. Cultivated locally; plants sometimes found along roadsides, etc., germinated from spilt seeds.

18 *Zoysia minima*. Abundant on Kaitorete. Not seen on Banks Peninsula proper.

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