Flora and Vegetation of Parts of Tawarau Forest, Western King Country

C.C. Ogle[1] and A.P. Druce[2]

INTRODUCTION

A botanical survey was made of parts of Tawarau State Forest and some adjoining Maori land by 25 members of the Wellington Botanical Society (W.B.S.) on 2-4 January 1984. Tawarau State Forest lies to the west of Waitomo and south of the Waitomo - Marokopa road, and is largely within the catchment of the Tawarau River (Fig 1). Our survey built upon a plant list and some other notes made by one of us (C.C.O.) during the Wildlife Service's fauna survey of the forest in November 1980, notes which had been incorporated into the published report on wildlife values of western King Country state forests by C. O'Donnell (1983).

Even the preliminary survey had shown that this area contained communities which were more typical of cool-climate podocarp forests, such as occur at 600-800m on the Volcanic Plateau, rather than western King Country forests less than 300m a.s.l. In addition, there were some non-forested areas with native vegetation around Appletree Road which seemed to be relicts of long-standing open sites, *not* recent clearings.

Following the Wildlife Service's survey of 1980, C.C.O. drew the attention of Mr J.L. Nicholls, Forest Research Institute, Rotorua, to the presence of matai-dominated forest in the upper Tawarau Gorge below Alpiger Hut. Mr Nicholls visited the area and confirmed (pers. comm., September 1981) the special features of the matai forest but reported that it was largely in Maori ownership rather than part of Tawarau State Forest. He did not examine the non-forested native plant communities.

About the same time, Mr E.K. Cameron of Auckland University obtained botanical information from C.C.O., particularly on the non-forested sites, to incorporate in his submission on the New Zealand Forest Service's King Country Management Plan. He, P.J. Bellingham, and Dr R.O. Gardner of Auckland subsequently visited Tawarau and supplied some additional plant records to the species list.

THE STUDY AREA

The W.B.S. 1984 survey concentrated in three areas:

1. the upper Tawarau Gorge, from immediately below Alpiger Hut to the main waterfall downstream;
2. the flat of *Olearia virgata* crossed by Appletree Road, on the Alpiger Hut side of the locked gate;
3. the Taumatatawhero Ecological Area (E.A.), from the end of Marae Road to the Tawarau River. (Actually W.B.S. did not reach the banks of the river, having spent longer than anticipated in a particularly fine rimu stand on a slump surface below limestone cliffs on the eastern side of the river.)

1. N.Z. Wildlife Service, Department of Internal Affairs, Private Bag, Wellington.
2. 123 Pinehaven Rd., Pinehaven, Upper Hutt.

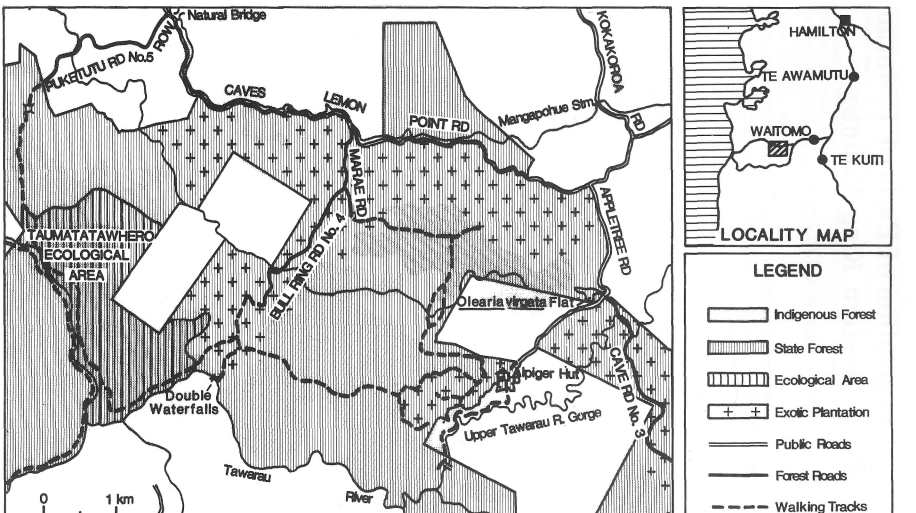


Fig. 1 Some geographic features and the location of Tawarau State Forest and surrounding land.

Short periods were spent in a tanekaha[1] stand near Alpiger Hut, and on a steep hillside and road-edge bank on Appletree Road about half way between the locked gate and the Marokopa-Waitomo road (Caves Lemon Point Road, Fig. 1).

Apart from the tanekaha stand, all these areas had been visited by C.C.O. in 1980. At that time the Tawarau River was reached on a transect through the Taumatatawhero E.A. and two days were spent further west, in the Puaroa catchment.

The W.B.S. 1984 survey largely involved making species lists of indigenous vascular plants in obviously different types of vegetation and topographic sub-units of Tawarau forest. Some notes were made on vegetation structure and patterns, but there was insufficient time on our visit to allow for quantitative work or mapping of vegetation. Nevertheless, our findings indicate that there are some significant areas in Tawarau forest which may not have been recognised before, and which need to be protected in any management of the forest.

RESULTS

Species List

Appended is a list of all native vascular plants recorded by the W.B.S., with additions from earlier visits by C.C.O., J.L. Nicholls, P.J. Bellingham, E.K. Cameron and R.O. Gardner.

Locations for the species are indicated in columns. Columns 1, 2, and 3 match the three major study areas listed above. Column 4 is for species, mainly of open country, which were not found in areas 1, 2, or 3. Most of these were from parts of Appletree Road between area 2 and the Waitomo-Marokopa road.

Vegetation

1. Forest patterns

Extant podocarp-hardwood forest around the Tawarau River can be divided into two broad types.

(a) Rimu/tawa forest, with associated mild-climate species such as hinau, northern rata, black maire, pukatea, New Zealand passion vine, *Peperomia urvilleana, Nertera dichondrifolia* s.s. and *Collospermum hastatum.*
This forest occurs in and around the wide, lower gorge of the Tawarau River, and includes the Taumatatawhero Ecological Area. It is typical of the lowland forest which covered much of the western King Country until Europeans arrived. Today it is probably the largest continuous tract of native forest remaining on karst (limestone) topography in the North Island. A few species here are at, or close to, their known southern limits, such as the ferns *Lygodium articulatum* and *Asplenium lamprophyllum.*

1. Common names used in this paper have been incorporated into Appendix 1.

(b) Matai/kamahi forest, with at least 17 associated "cool-climate" species (Table 1). In Tawarau Forest this community is confined to the narrowest part of the Tawarau River gorge, i.e. in the upper reaches below Alpiger Hut. Mr J.L. Nicholls has advised (6 October 1981) that the stand is on section 6B2 of the Taumatatotara A5 Maori Trust's lands. All the cool-climate species (Table 1) were absent, or, at most, rare, in the lower Tawarau gorge. *Pseudopanax simplex*, a species which often grows with those listed in Table 1, was not found in the gorge but is known nearby, close to the tanekaha stand described below.

Where the gorge widens a little, just above the waterfall (approx. grid ref. NZMS1 N82 467820), we encountered the only plants (seedlings only) of tawa and hinau in this forest type.

Many other species listed from this upper gorge are tolerant of a wide range of climate conditions. Where they were not found in the lower gorge also, this may be the result of other local factors such as relatively open, well-drained sites on the rim of the gorge which suit species such as tanekaka, the shrub daisy *Olearia townsonii,* the club moss *Lycopodium deuterodensum* and the sedge *Morelotia affinis*. It possibly reflects, too, the relatively small portion of the lower gorge which we were able to examine.

Trees and shrubs	
	Cordyline indivisa
	Melicytus lanceolatus
	Pseudowintera colorata
	Neomyrtus pedunculata
	Coprosma tenuifolia
Dicotyledonous herb	
	Nertera sp. (unnamed; aff. *N. dichondrifolia*)
Monocotyledonous herbs	
	Uncinia distans
	U. gracilenta
	Hierochloe redolens
	Collospermum microspermum
	Libertia pulchella
	Potamogeton suboblongus
Ferns	
	Grammitis pseudociliata
	Hymenophyllum armstrongii
	H. pulcherrimum
	Leptopteris superba
	Polystichum vestitum

Table 1: Cool-climate plant species of upper Tawarau River gorge; in the King Country these species are usually confined to higher-altitude forests.

Forest in the upper Tawarau Gorge showed almost no evidence of recent goat browsing. Palatable species such as *Leptopteris superba* carpeted the forest floor in places, and young plants of tree fuchsia, *Pseudopanax* species (including *P. laetus*), broadleaf and others were common. This has come about, not from the peculiar topography or climate of the site, but from the proximity of Alpiger Hut which is used as a base by goat-cullers. O'Donnell (1983) also drew the attention of the Forest Service to this example of the benefits of intensive goat control.

Although the two forest types described above contain much of the variation seen in and around Tawarau State Forest, in over 4,000 ha of native forest there are inevitably other localised stands which are not covered by these descriptions. The one of greatest note which we visited was an almost pure stand of tanekaha (approx. grid ref. N82 478838). One tree here was notably larger than the others and was probably the seed source for the remaining trees in the stand. At Whirinaki, similar stands have been attributed to clearing by early Maori. The presence of tawari *(Ixerba brexioides)* at what may be its southern limit is of interest here. Only one plant, a juvenile, was seen.

J.L. Nicholls reports that there is a miro-dominant stand, of about 125 trees per hectare, near Mangarere Stream (N82 464800).

2. *Olearia virgata* scrub (Fig. 2)

One of the rarest vegetation types of the entire western King Country is that which occupies part of the almost flat basin crossed by Appletree Road about 1 km before Alpiger Hut. At only 275m a.s.l., the vegetation of this area of several hectares resembles that of "frost flats" on the Volcanic Plateau at altitudes over 600m. It is largely covered in scrub, dominated by the small-leaved, Volcanic Plateau variety of *Olearia virgata* and manuka. The manuka showed considerable die-back in January 1984, almost certainly caused by frost. It is possible that manuka entered the site quite recently, following destruction of the surrounding forest.

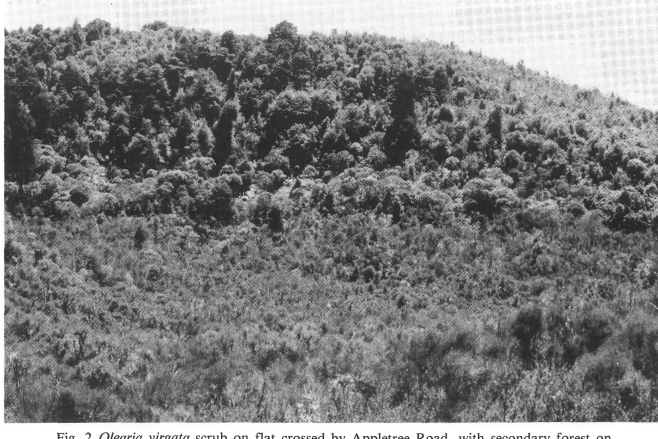


Fig. 2 *Olearia virgata* scrub on flat crossed by Appletree Road, with secondary forest on hillside beyond. Photo: A.P. Druce, January 1984.

Lines cut through scrub and secondary forest surrounding this basin had been recently planted in Tasmanian blackwood (*Acacia melanoxylon*), right to the edge of the basin.

The botanical significance of the basin lies in its history. We believe that it is *not* an induced scrub area following fires or abortive farming attempts, but is a remnant of pre-European non-forested vegetation. The evidence for this belief lies in the wealth of native species of open sites which remain here. These are species with limited powers of dispersal and for which, in most cases, the next nearest location would be in the eastern King Country (Pureora or similar sites). Prime examples are *Clematis quadribracteolata* and the tussockland hooked sedge, *Uncinia rubra*. Others include *Celmisia gracilenta, Botrychium australe, Ophioglossum coriaceum, Leucopogon fraseri, Geranium potentilloides, Pimelea prostrata, Deyeuxia avenoides, Prasophyllum colensoi, Lycopodium fastigiatum* and the small-leaved variety of *Olearia virgata*. Some species which are a little more widely distributed in the region occur here as a result of other factors such as swampy conditions e.g. *Coprosma tenuicaulis, Carex sinclairii, Drosera binata, Epilobium insulare,* and *Astelia grandis.*

Though fernbirds (*Bowdleria punctata vealeae*) were not found in this site, it is probable that those heard in young pines and bracken near Alpiger Hut and Marae Road originally occupied sites such as this, there being no other natural fernbird habitat in the Tawarau Forest area.

Mr R. Guest (New Zealand Forest Service, Te Kuiti) advises that much of this flat lies in Maori Land BB2 and is administered, like the matai stand, under the Taumatatotara A5 trust.

3. Other Open Sites

Not all the species of open country in the Tawarau forest area were found in the Appletree Road *Olearia virgata* scrub. Some were along sides of Appletree Road towards the Marokopa - Waitomo road and among recent plantings of pines and Tasmanian blackwood nearby (Column 4 of species list). Notable species here included *Schizaea bifida, S. fistulosa, Drosera spathulata, Baumea teretifolia, Coprosma* sp. (unnamed, aff. *C.parviflora), Deyeuxia* sp. (*D. quadriseta* agg.), *Lycopodium cernuum, L.laterale,* and many more plants of *Pomaderris ericifolia* and *Olearia townsonii* than were seen elsewhere.

DISCUSSION

Land in and around Tawarau State Forest contains some forest and shrub communities which are characteristic of a colder climate than that which now prevails in the lowlands of the Western King Country. It appears that local topographic features at Tawarau, namely a narrow limestone gorge and a flat-bottomed basin surrounded by rolling hills, create their own microclimates which appear to be unfavourable to the establishment of many native lowland plant species. In one of these sites, the Appletree Road flat, in January 1984 manuka showed obvious die-back almost certainly resulting from frost, which possibly occurred in late spring in 1983.

It is suggested here that these sites contain remnants of cool-climate vegetation which would have been widespread up to the end of the last Pleistocene ice-age, some 15,000 years ago. In this respect, such vegetation has its origins in the period which produced subalpine herbfields on the crest of the Herangi Range, and montane forest with species such as kaikawaka on Mt Pirongia and the Herangi Range. Support for this view has come from pollen analysis of thin peat layers in sediments of the middle Waikato Basin, where McGlone, Nelson, and Hume (1978) showed that the dominant vegetation 20000-18000 years ago was scrub, grassland, and swamp. Forest probably existed then in small areas only, and the climate was cool, possibly dry and/or drought-pronee, but was characterised by high intensity rainstorms (McGlone et al. 1978).

Just as local factors such as higher altitude, poor drainage and wind exposure have retained subalpine and montane remnants in other parts of the western King Country, so have topography and frost permitted prehistoric, cool-climate vegetation to persist in the Tawarau area.

It is suggested that there may be some further, as yet unknown, open sites with some of the above combinations of species in or near Tawarau State Forest. Certainly some have been destroyed within the last few years for planting exotic trees. There is an urgent need to identify all such sites and to protect them from development.

RECOMMENDATIONS

Following its trip to Tawarau Forest, the Wellington Botanical Society study group recommended to the New Zealand Forest Service that:

1. all the matai-dominated forest of the upper Tawarau Gorge be preserved through consultation with the present owners;
2. the *Olearia virgata* scrub on Appletree Road be reserved in State Forest with a suitable buffer zone to protect it from development, and that Tasmanian blackwoods planted on or close to the site be removed;
3. Tawarau Forest and its surrounds be surveyed urgently for other long-established, non-forested sites with native vegetation, and that these be set aside from development, and be protected and reserved;
4. the level of goat control which prevails currently in the upper Tawarau Gorge be continued, and be regarded as the norm for all parts of Tawarau forest.

SUMMARY

Tawarau State Forest and its adjoining lands contain a greater diversity of native plant communities, both forested and non-forested, than appears to have been recognised to date. Some of these are characteristic of colder climates than that prevailing in the western King Country. It is suggested that these represent relicts from earlier times of cool climate, remaining at Tawarau through pecularities of topography and drainage.

ACKNOWLEDGEMENTS

We thank staff of the New Zealand Forest Service's District Office at Te Kuiti for maps and permission to survey Tawarau Forest, MrJ.L.Nicholls for his comments on the area of matai forest, members of the Wellington Botanical Society who contributed to the 1984 survey, Dr R.O. Gardner and Messrs P.J. Bellingham and E.K. Cameron for their additional records, and Mr K.T. Moynihan for drawing Figure 1.

REFERENCES

Allan, H.H. 1960. *Flora of New Zealand. Vol. 1.* Government Printer, Wellington.
Crookes, M.; Dobbie, H.B. 1963. *New Zealand ferns.* Whitcombe and Tombs.
McGlone, M.S.; Nelson, C.S.; Hume, T.M. 1978. Palynology, age and environmental significance of some peat beds in the Upper Pleistocene Hinuera Formation, South Auckland, New Zealand. *Journal of the Royal Society of New Zealand 8(4)*: 385-93.
New Zealand Forest Service 1980. Draft King Country Regional Management Plan; 1980 to 1990. N.Z. Forest Service, Wellington.
O'Donnell, C.F.J. 1983. Wildlife values of state forests within the western King Country. *Fauna Survey Unit Report No. 35.* N.Z. Wildlife Service, Wellington.
Pritchard, G.G. 1957. Experimental taxonomic studies on species of *Cardamine* Linn. in New Zealand. *Transactions of the Royal Society of New Zealand 85*: 75-89.

APPENDIX:

Indigenous Vascular Plants of Tawarau S.F., and of Adjacent Lands around Gorge of Upper Tawarau R. (327 species).

1. Species seen in forest of gorge of the Upper Tawarau R.
2. Species seen on flat of *Olearia virgata* crossed by Appletree Rd.
3. Species seen in forest of Taumatatawhero Ecological Area.
4. Additional species seen elsewhere. Species not seen by C.C.O. or A.P.D. are indicated by placing the recorder's name in brackets, e.g. *Syzygium maire* (J.L. Nicholls).

Specimens collected by C.C.O. and A.P.D. for the herbarium of Botany Division, DSIR, are indicated by CHR numbers. Others collected by P.J. Bellingham and E.K. Cameron for the herbarium of University of Auckland are indicated by AKU numbers.

(j) only juvenile plant(s) seen.

	1	2	3	4
GYMNOSPERMS				
Dacrycarpus dacrydioides	x	(j)	x	
Dacrydium cupressinum (rimu)	x		x	
Phyllocladus trichomanoides var. *trichomanoides* (tanekaha)	x	(j)		
Podocarpus cunninghamii	x	(j)		
Prumnopitys ferruginea (miro)	x		x	
P. taxifolia (matai)	x	(j)	x	
DICOT TREES AND SHRUBS				
Alseuosmia macrophylla	x		x	
Aristotelia serrata	x		x	
Beilschmiedia tawa (tawa)	(j)		x	
Brachyglottis repanda s.s.	x		x	
Carpodetus serratus	x		x	
Coprosma grandifolia	x		x	
C. lucida s.s. (syn. *C. australis*)	x	x	x	
C. propinqua ssp. *propinqua*	x	x		
C. rhamnoides ssp. *rhamnoides*	x	x	x	
C. robusta	x	x	x	
C. rotundifolia	x			
C. tenuicaulis (CHR 371314)	x	x		
C. tenuifolia	x	x		
C. sp. (unnamed; included in *C. parviflora* by Allan 1960).				x
C. propinqua x *C. robusta*	x	x	x	
Coriaria arborea	x			
Dracophyllum strictum	x			
Elaeocarpus dentatus (hinau)	(j)		x	
E. hookerianus	x		x	
Fuchsia excorticata (tree fuchsia)	x	x		
F. excorticata x *F. perscandens*		x		

	1	2	3	4
Gaultheria antipoda	x	x	x	
G. paniculata			x	
G. antipoda x *G. paniculata*			x	
Geniostoma rupestre var.			x	
Griselinia littoralis (broadleaf)	x	(j)	x	
G. lucida			x	
Hebe stricta var. *stricta*	x	x		
Hedycarya arborea			x	
Hoheria populnea var. *lanceolata*	x		x	
Ixerba brexioides (CHR 394323)				(j)
Knightia excelsa	x		x	
Kunzea ericoides	x		x	
Laurelia novae-zelandiae (pukatea)			x	
Leptospermum scoparium (manuka)	x	x	x	
Leucopogon fasciculatus	x		x	
L. fraseri s.s.		x		
Litsea calicaris			x	
Lophomyrtus bullata	x		x	
Melicope simplex	x			
Melicytus lanceolatus	x			
M. ramiflorus			x	
Metrosideros robusta (northern rata)			x	
Myrsine australis	x		x	
M. salicina	x		x	
Neomyrtus pedunculata	x		x	
Nestegis cunninghamii (black maire)			x	
N. lanceolata	x		x	
N. montana	x		x	
Olearia rani	x		x	
O. townsonii (incl. *O. furfuracea* var. *rubicunda* and *O. thomsonii*) (AKU 17923)	x			
O. virgata var. (leaves smaller than in var. *virgata*) (AKU 17949)	x	x		
Paratrophis microphylla			x	
Pennantia corymbosa	x		x	
Peraxilla tetrapetala				x
Pimelea prostrata s.s.		x		
Pittosporum cornifolium			x	
P. tenuifolium (incl. *P. colensoi*)	x	(j)		
Plagianthus regius var. *regius* (P.J. Bellingham and E.K. Cameron)	x			
Pomaderris ericifolia		x		
Pseudopanax anomalus	x	x	x	
P. arboreus var. *arboreus*	x		x	
P. crassifolius	x	(j)	x	
P. edgerleyi			x	
P. laetus	x		x	
P. simplex (incl. *P.s.* var. *sinclairii*) (P.J. Bellingham and E.K. Cameron) (AKU 17945)				x
Pseudowintera axillaris			x	
P. colorata	x		x	
Quintinia serrata (incl. *Q. acutifolia* and *Q. elliptica*)	x		x	
Rhabdothamnus solandri (AKU 17937)	x		x	
Schefflera digitata	x		x	
Solanum aviculare var. *aviculare*				x
Syzygium maire (J.L. Nicholls, at N82 398803)				x
Weinmannia racemosa ssp. *racemosa* (kamahi)	x		x	
DICOT LIANES				
Clematis foetida	x		x	
C. forsteri (AKU 17956)	x	x		
C. paniculata	x	x	x	

	1	2	3	4
C. quadribracteolata (CHR 394329)		x		
Metrosideros colensoi (AKU 17938)	x		x	
M. diffusa			x	
M. fulgens			x	
M. perforata	x		x	
Muehlenbeckia australis	x		x	
Parsonsia capsularis	x			
Passiflora tetrandra (NZ passion vine)			x	
Rubus australis	x		x	
R. cissoides	x		x	
DICOT HERBS				
Acaena anserinifolia	x	x	x	
Callitriche muelleri			x	
Cardamine sp. (a) (*C. debilis* agg: Long Style of Pritchard 1957)	x		x	
C. sp.(b) (*C. debilis* agg: Glossy Leaf of Prichard 1957)	x			
Celmisia gracilenta var. (AKU 17922, CHR 394327)		x		
Centella uniflora		x		
Craspedia minor var. minor (incl. *C. major*) (CHR 371329)	x			
Drosera binata		x		
D. peltata ssp. *auriculata*		x		
D. spathulata (AKU 17947)				x
Elatostema rugosum	x		x	
Epilobium insulare		x		
E. nerteroides	x			
E. nummulariifolium			x	
E. pedunculare (AKU 17940)	x	x	x	
E. pubens (AKU 17843)	x			
E. rotundifolium	x	x	x	
Galium propinquum		x		
G. trilobum				x
Geranium microphyllum		x		
G. potentilloides var. *potentilloides* (CHR 394330)		x		
Gnaphalium gymnocephalum (CHR 371311)	x		x	
G. keriense	x			
G. limosum (AKU 17931)	x	x		
G. sphaericum				x
Gonocarpus aggregatus		x		
G. incanus (incl. *G. montanus*)		x	x	
G. micranthus ssp. *micranthus*		x		
Gunnera monoica	x		x	
Haloragis erecta ssp. *erecta*	x			
Helichrysum filicaule		x		
Hydrocotyle dissecta	x			
H. elongata	x		x	
H. heteromeria	x		x	
H. microphylla (AKU 18305)	x			
H. moschata	x	x	x	
Hypericum japonicum				x
Lagenifera pumila	x	x	x	
Myosotis forsteri (AKU 17930)	x	x		
Nertera depressa (incl. *N. cunninghamii*)	x			
N. dichondrifolia s.s. (CHR 371315, 394322)			x	
N. sp (unnamed; aff. *N. dichondrifolia*) (CHR 394326)	x	x		
Oxalis exilis	x			
O. magellanica	x			
Parahebe catarractae ssp. *diffusa* (AKU 17936)	x		x	
Peperomia urvilleana			x	
Plantago raoulii var.	x			
Pratia angulata	x		x	

	1	2	3	4
Pseudognaphalium sp. (*P. luteoalbum* agg.)				x
Ranunculus sp. (unnamed; *R. hirtus* auct.)	x	x	x	
Schizeilema trifoliolatum	x			
Senecio minimus	x	x	x	
S. rufiglandulosus var. *rufiglandulosus* (AKU 17935)	x	x		
Stellaria decipiens (incl. *S. minuta* and *S. parviflora*)	x		x	
Urtica incisa	x		x	
Viola filicaulis	x	x		
SEDGES				
Baumea rubiginosa		x		
B. tenax		x		
B. teretifolia				x
Carex breviculmis				x
C. dissita	x	x	x	
C. forsteri	x		x	
C. geminata s.s.	x	x		
C. lessoniana	x			
C. maorica (AKU 17953)		x		
C. secta s.s. (AKU 17934)	x	x		
C. solandri	x			
C. sinclairii (CHR 394324, AKU 17950)	x			
C. testacea s.s.		x		
C. virgata	*x*	*x*		
Eleocharis acuta		x		
Gahnia pauciflora	x		x	
G. setifolia	x			
G. xanthocarpa				x
Isolepis pottsii	x	x		
I. reticularis	x		x	
Lepidosperma australe		x		
Machaerina sinclairii				x
Morelotia affinis	x			
Schoenus maschalinus	x			
Uncinia banksii	x			
U. distans (AKU 17925)	x			
U. ferruginea (AKU 17929)	x		x	
U. gracilenta	x			
U. laxiflora (CHR 394320)		x		
U. rubra (CHR 394321)		x		
U. uncinata	x		x	
U. zotovii	x		x	
U. sp. (unnamed; *U. affinis* auct.)		x		
RUSHES				
J. gregiflorus	x			
J. pallidus				x
J. planifolius				x
J. sarophorus	x			x
Luzula picta s.s. (AKU 17941)	*x*	*x*		
L. subclavata (CHR 391312, AKU 17927)	x	x	x	
L. picta x *L. subclavata*	x	x		
GRASSES				
Cortaderia fulvida	x	x		
Deyeuxia avenoides (incl. *D.a.* var. *brachyantha*)		x		
D. sp. (*D. quadriseta* agg.)				x
Elymus narduroides	x			
Hierochloe redolens (AKU 17951)	x	x		

	1	2	3	4
Microlaena avenacea	x	x	x	
M. stipoides	x	x		
Poa anceps var. *anceps* (CHR 394331, AKU 17932, 17948, 17952)	x	x		
P. pusilla (CHR 394332)		x		
Rytidosperma gracile	x	x		
ORCHIDS				
Acianthus sinclairii			x	
Bulbophyllum pygmaeum			x	
Caladenia carnea var. *minor*	x	x	x	
Chiloglottis cornuta	x	x		
Corybas acuminatus			x	
C. macranthus (P.J. Bellingham and E.K. Cameron) (AKU 17946)		x		
C. oblongus		x		
C. rivularis (AKU 17928)	x	x		
C. trilobus s.s.	x		x	
Dendrobium cunninghamii			x	
Drymoanthus adversus			x	
Earina autumnalis	x		x	
E. mucronata	x		x	
Gastrodia cunninghamii	x			
Microtis unifolia		x		
Orthoceras strictum	x			
Prasophyllum colensoi (CHR 394328)		x		
Pterostylis alobula				x
P. banksii var. *banksii* (AKU 17955)	x		x	
P. banksii (var. *patens*?)		x		
P. graminea	x	x		
P. trullifolia (E.K. Cameron at N82 465813)				x
Thelymitra longifolia	x	x		
T. sp. (cf. *T. pauciflora*)		x		
OTHER MONOCOTS (OTHER THAN SEDGES, RUSHES, GRASSES, ORCHIDS)				
Arthropodium candidum (AKU 17926)	x			
Astelia fragrans	x		x	
A. grandis	x	x		
A. solandri			x	
Collospermum hastatum			x	
C. microspermum	x		x	
Cordyline australis		(j)		
C. banksii	x		x	
C. indivisa	x			
Dianella nigra	x	x	x	
Freycinetia baueriana ssp. *banksii*			x	
Lemna sp. (*L. minor* auct.)				x
Libertia grandiflora (P.J. Bellingham and E.K. Cameron)	x			
L. pulchella	x			
Phormium sp.				x
Potamogeton suboblongus	x			
Rhopalostylis sapida		x		
Ripogonum scandens		x		
Typha orientalis (P.J. Bellingham and E.K. Cameron)		x		
LYCOPODS				
Lycopodium australianum (CHR 394325)		x		
L. cernuum				x

	1	2	3	4
L. deuterodensum	x		x	
L. fastigiatum		x		
L. laterale				x
L. scariosum		x		
L. varium (incl. *L. billardierei* and *L. novae-zelandicum*)	x		x	
L. volubile	x	x	x	
PSILOPSIDS				
Tmesipteris elongata (incl. *T.e.* ssp. *robusta)*	x		x	
T. tannensis			x	
FERNS				
Adiantum cunninghamii	x		x	
Anarthropteris lanceolata			x	
Asplenium bulbiferum s.s.	x		x	
A. flaccidum s.s.	x		x	
A. gracillimum	x			
A. hookerianum			x	
A. lamprophyllum			x	
A. oblongifolium			x	
A. polyodon	x		x	
Blechnum chambersii	x		x	
B. colensoi	x		x	
B. discolor	x		x	
B. filiforme			x	
B. fluviatile	x		x	
B. membranaceum	x		x	
B. minus		x		
B. nigrum				x
B. penna-marina	x	x		
B. vulcanicum	x	x	x	
B. sp.(a) (unnamed in *B. capense* agg.: common lowland sp. with proximal pinnae progressively shorter)	x		x	
B. sp.(b) (unnamed in *B. capense* agg.: cliff sp. with proximal pinnae the longest - The Green Bay Species of Crookes and Dobbie, 1963) (CHR 371320)	x		x	
Botrychium australe		x		
B. biforme	x			
Cardiomanes reniforme	x		x	
Ctenopteris heterophylla	x	x	x	
Cyathea cunninghamii (AKU 17944, 17957)			x	
C. dealbata			x	
C. medullaris			x	
C. smithii	x		x	
Dicksonia fibrosa	x		x	
D. squarrosa	x		x	
Diplazium australe	x		x	
Gleichenia dicarpa		x		
G. microphylla				x
Grammitis billardierei	x			
G. pseudociliata (CHR 371335)	x			
Histiopteris incisa	x	x	x	
Hymenophyllum armstrongii (CHR 371331)	x		x	
H. demissum	x		x	
H. dilatatum	x		x	
H. ferrugineum			x	
H. flabellatum	x		x	
H. flexuosum	x		x	

	1	2	3	4
H. multifidum	x	x	x	
H. pulcherrimum	x			
H. rarum	x		x	
H. revolutum	x		x	
H. sanguinolentum	x	x	x	
H. scabrum			x	
Hypolepis ambigua	x		x	
H. distans (E.K. Cameron)				x
H. lactea			x	
H. rufobarbata	x		x	
Lastreopsis glabella			x	
L. hispida			x	
Leptolepia novae-zelandiae			x	
Leptopteris hymenophylloides	x		x	
L. superba	x			
L. hymenophylloides x *L. superba*	x			
Lindsaea trichomanoides			x	
Lygodium articulatum			x	
Paesia scaberula	x		x	
Phymatosorus diversifolius	x		x	
P. scandens			x	
Pneumatopteris pennigera	x		x	
Polystichum richardii	x		x	
P. silvaticum	x			
P. vestitum	x	x		
Pteridium esculentum	x	x	x	
Pteris pendula (P. macilenta auct.)			x	
P. tremula				x
Pyrrosia serpens			x	
Rumohra adiantiformis			x	
Schizaea bifida (CHR 371334)				x
S. fistulosa (CHR 371333)				x
Sticherus cunninghamii	x			
Trichomanes endlicherianum			x	
T. elongatum (CHR 371346)			x	
T. venosum	x		x	

Mistletoes: are urban parks ideal habitats?

Syd Moore[1]

An article "Where have all the mistletoes gone?" by Colin Ogle and Peter Wilson (*Forest & Bird 16(3)*, August 1985) suggested that possum browsing is a significant cause of marked regional declines of mistletoe occurrences.

"Forest & Bird" must be commended for publishing well-illustrated items such as this for the lay person. It so raised my awareness of mistletoes that I recognised there are many of them in Benge Park, next door to my home. The species of mistletoe here is *Ileostylus micranthus* (Colin Macdonald, Colin Ogle, and Tony Druce, pers. comm.).

1. 46 Clouston Park Rd, Upper Hutt