

The Vegetation of Mt. Kaiparoro

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For many years Kaiparoro was only a name to me, encountered on reading Zotov, Elder and Beddie's account of the vegetation of the Tararua Mountains (*Trans. Roy. Soc. N.Z.* 68: 259). Not until D. R. McQueen told me he had seen—I forget from where—what he thought might be red tussock on the summit did I become interested in the mountain and find out just where it was. Red tussock (*Danthonia rigida*) was then unknown† from the Tararuas, and we promptly decided we would have to visit Kaiparoro. It was several years, however, before we found the time and means to get there. (†Shortly afterwards R. M. Greenwood reported it from near Taramea Pk. in the N. Tararuas—see Bull. No. 26.)

Kaiparoro is 2660 feet high, and is situated between the Ruamahanga and Mangatainoka rivers about four miles east of the main Tararua range. To reach the foot of the mountain, Ross McQueen, Pamela McQueen and I travelled (on Feb. 20, 1954) from Ekatahuna up the Mangatainoka Valley to the road end beyond Putara. On being questioned the farmer there soon told us that red tussock did grow on the "Kaiparaws", as he called them. Leaving the road about half a mile from its end we climbed a steep spur through poor brown-top and danthonia pasture to a level ridge which led to the bush edge at 1800 feet. *Paesia scaberula* formed large patches in the pasture, but bracken, manuka and tauhinu were uncommon. The pasture, on land that had once supported podocarp-broadleaved forest, was remarkable for the large number of small indigenous species present, a list of which follows:

<i>Abrotanella caespitosa</i>	<i>Epilobium alsinoides</i>	<i>Lycopodium fastigiatum</i>
<i>Acaena sanguisorbae</i>	<i>Gentiana</i> sp.	<i>L. scariosum</i>
<i>Carex dissita</i>	<i>Geranium microphyllum</i>	<i>Nertera granadensis</i>
<i>C.</i> sp. (sect. <i>Acutae</i>)	<i>Haloragis depressa</i>	<i>N. setulosa</i>
<i>Carpha alpina</i>	<i>H. micrantha</i>	<i>Oreobolus pectinatus</i>
<i>Centella uniflora</i>	<i>Helichrysum bellidoides</i>	<i>O. strictus</i>
<i>Craspedia minor</i>	<i>H. filicaule</i>	<i>Oreomyrrhis colensoi</i>
<i>Danthonia gracilis</i>	<i>Hydrocotyle microphylla</i>	<i>Polystichum vestitum</i>
<i>D. nervosa</i>	<i>Juncus antarcticus</i>	<i>Pratia angulata</i>
<i>Dichondra repens</i>	<i>J. pallidus</i>	<i>Raoulia glabra</i>
<i>Eleocharis acuta</i>	<i>J. polyanthemus</i>	<i>Schoenus maschalimus</i>
<i>E. gracilis</i>	<i>Lagenophora pumila</i>	<i>Uncinia nervosa</i>

After leaving the pasture we followed a track that led up through the bush, which appeared to be partly second-growth. It was a mixed forest with the following trees present: kamahi, toro, red beech, celery pine, thin barked totara, miro, rimu (stunted). The slope became less and less steep as we climbed and after only an hour's walking we saw the first plants of leatherwood and dracophyllum. A few minutes later we emerged from the forest and were standing in tall dripping-

wet tussock at about 2400 feet. Gently rolling slopes densely clothed with tussock, interspersed with mountain flax, manuka, dracophyllum and coprosma, receded into a thick mist.

We camped just inside the bush edge for the night. Next morning Ross and I went out into the tussock which, being dense and waist high, soon wet us through. We noted nearly seventy species of plants growing in the tussock, but saw nothing of our surroundings. My next visit to Kaiparoro was with Ron Close and H. S. Gibbs for a few hours in the afternoon of January 31, 1956. This time we were able to see the whole of the tussock top and take a few photographs. Then on March 9-11, 1956, the Society held a weekend trip to Kaiparoro, and fine weather on the Saturday enabled us to make a more detailed study of the flora and vegetation than had been possible on previous visits.

Forest. The surrounding forest is dominated by red beech; associated trees are kamahi, toro, *Phyllocladus alpinus*, broadleaf, putaputaweta and thin barked totara. Only a few small clumps of silver beech have been seen (one is marked X in the aerial photograph). Some of the forest has been burnt—presumably at the time the land below was first cleared. Kamahi, toro and *Phyllocladus alpinus* are more prominent in the second-growth forest than in the original forest. It can clearly be seen from the aerial photograph that the canopy of the beech forest is severely windshorn and furrowed from the north-west near the summit. We saw trees that had been blown over, and many trees with broken crowns and dead branches.

Marginal Scrub. Between the forest and tussock grassland there is a marginal belt (ecotone) of scrub. Over the greater part of its length this is well defined and narrow, but elsewhere, notably in the western portion, the scrub belt is rather poorly defined, merging gradually into the tussock grassland over a distance varying from a few yards up to several chains. The change from scrub to forest, however, is nearly always abrupt.

In the scrub immediately adjacent to the forest some or all of the following species may be found: *Phyllocladus alpinus*, *Dracophyllum filifolium*, *Olearia colensoi*, manuka (*Leptospermum scoparium*), *Phormium colensoi*, *Astelia cockaynei*, *Coprosma parviflora* (drupes white), *C.p.* var *dumosa* (drupes red), *C. foetidissima*, *C. colensoi*, *Leucopogon fasciculatus*, *Myrtus pedunculata*, *Myrsine divaricata*. The association of manuka with *Olearia colensoi* is most unusual; as far as I know it does not occur elsewhere in the North Island. Where the ecotone is broad, of the above-mentioned species, only *Dracophyllum*, manuka, *Phormium*, *Coprosma parviflora* var. *dumosa*, and *Astelia* are found away from the forest margin. With the exception of *Astelia* these decrease in importance as *Danthonia* tussocks increase.

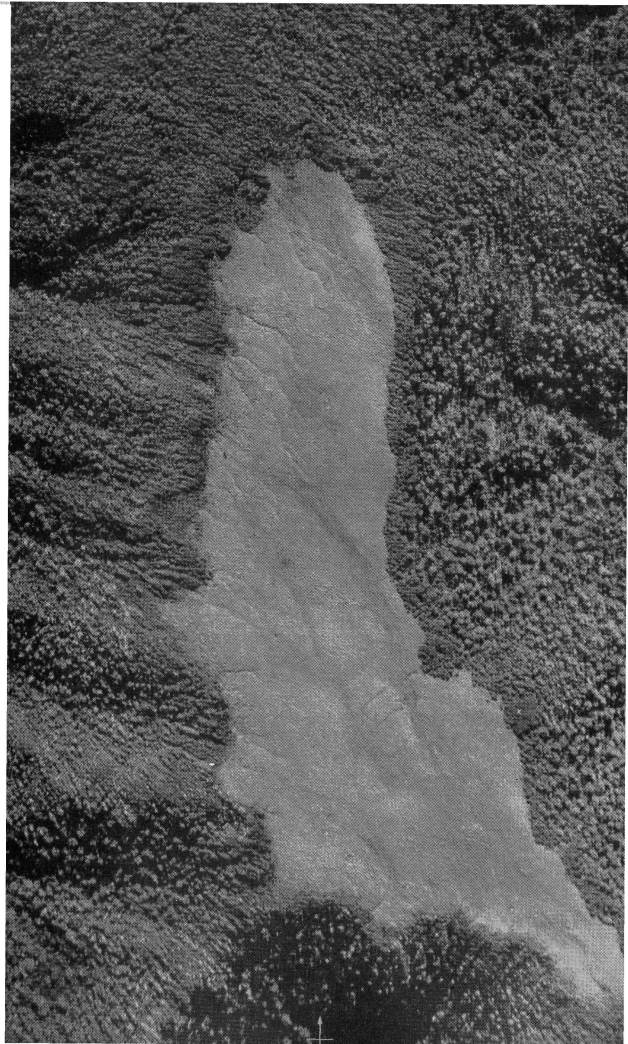
Tussock Grassland. It was soon apparent on our first visit

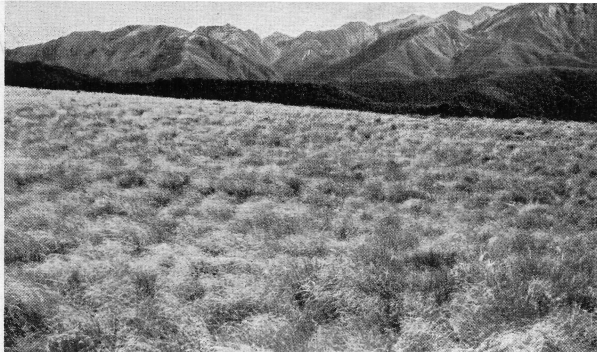
to Kaiparoro that here was a tussock grassland different from anything we had seen before. It appeared to us then that the tussock in the wettest parts was red tussock, but that everywhere else the tussocks were hybrids of various sorts between red tussock and some other tussock, presumably the broad-leaved snow tussock common elsewhere in the Tararuas. We did not do much about it then, but on the trip of March, 1956, I collected pieces of 68 tussocks. I deliberately tried to collect the extremes, red tussock and broad-leaved snow tussock, and as many different intermediates as possible. Back in Wellington I analysed each tussock for ten characters: the result surprised me, for I found I had collected not a single pure red tussock nor a single pure broad-leaved snow tussock; and nearly every one of the 68 intermediate tussocks were different, ranging all the way from nearly pure red tussock to nearly pure snow tussock.

Before considering the significance of the above in relation to the vegetation, it will first be necessary to see why tussock grassland is present on Kaiparoro at all. Tussock grassland only occupies the gently sloping summit area (a little over 100 acres) and the obvious explanation is that poor drainage prevents the forest from invading that area. Very few young beech trees have been seen in the scrub belt adjacent to the forest, i.e., the forest is not advancing at the present time. The vegetation is thus more or less in equilibrium with the environment. As a result of the cool, wet climate the summit is one large seepage area, with the height of the water table and rate of water movement varying from place to place.

The most interesting feature about Kaiparoro appears to be that not only does the tussock grassland vegetation vary continuously in relation to the above-mentioned habitat factors but the population of tussocks does likewise. Over most of the area a very variable intermediate population is present; where the water table approaches the surface the population approaches red tussock; and where the slope is steeper than usual, allowing a more rapid movement of water, the population approaches snow tussock.

To get some idea of the variation in the tussock grassland vegetation over the summit, I studied eleven sites in detail, each of which carried a different vegetation, but within each of which the vegetation appeared by eye to be relatively uniform. Of the 73 species found altogether in the tussock grassland and scrub, 56 were encountered in these eleven sites. The only species covering more than about 10 per cent. of any site, apart from the *Danthonia* complex, were *Carpha alpina*, *Schoenus pauciflorus*, *Oreobolus pectinatus*, *Sphagnum* sp. and *Gleichenia circinata*. Other species of some physiognomic importance were *Cassinia vauvilliersii*, *Dracophyllum filifolium*, *Astelia cockaynei*, *Phormium colensoi*, *Carex* sp., *Juncus polyanthemus*, *Hierochloe redolens*, *Gaultheria depressa*, and *Cyathodes empetrifolia*. Only one species, *Gentiana* sp., was present on every site, apart from the tussock.





MT. KAIPARORO

Top: Looking W.S.W. across the tussock grassland of the gently sloping summit towards the headwaters of the Ruamahanga R., Mt. Bannister, Mt. Arete and other peaks in the N. Tararua Mountains

—*Photo: A. P. Druce*

Bottom: Looking S.E. along the forest margin at the S.E. end of the summit grassland. Near the margin the red beech trees are stunted and much damaged by wind.

—*Photo: A. P. Druce*

Opposite: Aerial photograph (893/5) taken 25/5/1944. The summit area of tussock grassland is just under one mile long and a little over one quarter mile wide at its broadest.

—*Photo: Crown Copyright, Lands and Survey Dept.*

Nine others were present on most sites. The various types of tussock grassland vegetation appear to be related to the habitat in somewhat the following way. On slopes where the water table is usually some distance below the surface the vegetation is 3 to 4 feet high and consists of closely spaced *Danthonia* tussocks (variable population), scattered plants of *Cassinia*, *Dracophyllum* and *Phormium*, clumps of *Astelia*, and many other plants between the tussocks, notably *Carpha*, *Juncus*, *Carex* and *Hierochloe*. With an increase in the height of the water table *Schoenus* becomes important, the tussocks (approaching red tussock) become less closely spaced, and the clumps of *Astelia* smaller.

With a further increase in the height of the water table *Cassinia*, *Dracophyllum*, *Phormium* and *Astelia* become stunted or altogether wanting, and the rate of water movement becomes critical. In flushed areas on gentle slopes the vegetation may consist of tussocks 2 to 3 feet high, together with *Schoenus*, *Carex*, *Juncus*, *Hierochloe* and *Carpha*; on very gentle slopes *Schoenus* may become co-dominant with tussocks 18 inches to 2 feet high, interspersed with a *Carpha*-dominant sward; and in nearly flat areas or very shallow depressions *Carpha* may dominate, with slender tussocks 12 to 18 inches high occurring in patches. *Oreobolus pectinatus* is usually present in these sites and may become locally dominant.

Where the water table approaches the surface and there is some movement of water, such as occurs on gentle slopes and in broad, shallow drainage channels, *Gleichenia circinata* is likely to be the dominant species. Associated with it there may be *Sphagnum* sp., *Schoenus*, *Carpha*, *Juncus*, *Carex*, *Hierochloe* and slender tussocks 2 to 3 feet high. In nearly flat areas *Carpha* becomes dominant, *Gleichenia*, *Schoenus* and *Sphagnum* are stunted, and the tussocks only reach 12 inches.

With the water table at the surface, in basins, seepage channels and beside streams, *Sphagnum* dominates. Through it grow scattered tussocks, *Carex* sp. and *Juncus polyanthemos*. Both in *Sphagnum* and free-running water *Juncus novae-zelandiae* may be conspicuous.

A feature of Kaiparoro, common to the rest of the Tararuas, is the almost complete absence of bog in spite of the very wet climate. There may be a thin layer of peat under *Carpha*-dominant vegetation, but even under *Sphagnum* on Kaiparoro there is little or no peat—the living moss grows directly on the gley soil.

The tussock grassland on Kaiparoro is in a good state of preservation. Part, at least, has been burnt, but not recently. To judge from sticks—some still standing—there were probably a few scattered clumps of *Olearia colensoi* present originally; and *Dracophyllum filifolium* and *Cassinia vauilliersii* may well have been more plentiful than they are now. Deer and pigs have not greatly disturbed the vegetation, and there is very little bare ground on the summit.

The Flora. I have closely searched the tussock grassland and the scrub on the summit but not the surrounding forest, so the list probably approaches completeness for the former but not the latter. Seventy-three species (marked T) are recorded from the tussock grassland and scrub, and forty-six (marked F) from the forest; nine marked M were only seen near the margin of the forest. A parenthesis round the T, F or M, indicates that the species is uncommon or local. *Gleichenia alpina* (= *G. circinata*) and *Celmisia gracilentata* (= *C. graminifolia*) are the only plants specifically mentioned by Zotov, Elder and Beddie as occurring on Kaiparoro.

INDIGENOUS SPECIES

- Abrotanella caespit.*—T
Acaena sanguisorbæ—M
Agrostis perennans—T
Alseuosmia pusilla—F
Aporostylis bifolia—T
Arundo sp.—T
Asplenium flaccidum—F
Astelia cockaynei—T
A. linearis var. *n.z.*—T
Blechnum discolor—F
B. fluviatile—F
B. penna-marina—T
B. procerum—T
B. minus—T, F
B. vulcanicum—(F)
Carex dissita—(T), F
C. sp. (sect. *Acutæ*)—T
Carpha alpina—T
Carpodetus serratus—F
Cassinia leptoph.—(M)
C. zauvilliersii—T
Celmisia graminifolia—T
Clematis paniculata—(F)
Coprosma banksii—F
C. colensoi—F
C. foetidissima—F
C. parviflora—T, F
C. p. var. *dumosa*—T
Cordylina indivisa—(F)
Ctenopteris graminifolia—F
Cyathea colensoi—F
C. smithii—F
Cyathodes enpetrifol.—T
Dacrydium cupress.—F
Danthonia flavescens X
rigida—T
D. gracilis—T
Deschampsia tenella—T
Doyuxia avenoides var.
brachyantha—T
Dracophyllum filifol.—T
Drosera binata—(T)
D. stenopetala—T
Elacocarpus hooker.—F
Epilobium cockaynei.—T
E. pernitens—T
Euphrasia cuneata—T
Gaultheria depressa—T
G. rupestris var.
subcorymbosa—(T)
Gentiana sp.—T
Geranium microph.—T
Gleichenia circinata—T
Gnaphalium ker.—(T)
G. sp.—T
Griselinia littoralis—F
Haloragis depressa—T
H. micrantha—T
Hebe salicifolia—(M)
H. buxifolia—(T)
Helichrysum filic.—(M)
Hierochloa redolens—T
Histiopteris incisa—(M)
Hydrocotyle mosch.—M
Isolep. sp. (unnamed)—T
Juncus antarcticus—T
J. novæ-zelandiæ—T
J. planifolius—T
J. polyanthemus—T
J. sp. (unnamed)—(T)
Lepidosperma austr.—T
Leptospermum scop.—T
Leucopogon fascic.—F
Lyparophyll. gunn.—(T)
Luzula sp.—T
Lycopod. billard.—(F)
L. fastigiatum—T
L. scariosum—(T)
Mecodium rarum—F
M. sanguinolentum—F
Meliclytus lanceol.—(F)
Merringium multifid.—F
Microlaena avenacea—F
Myrsine divaric.—(T), F
Myrsine salicina—F
Myrtus pedunculata—F
Nertera granadensis—T
Nothofagus fusca—F
N. menziesii—(F)
Nothopanax colensoi—F
N. simplex—F
Olearia arboresc.—(T)
O. colensoi—T
O. ilicifolia—(M)
O. lacunosa—(M)
Oreobolus pectinatus—T
O. strictus—T
Pentachondra pumila—T
Phormium colensoi—T
Phyllocladus alpinus—F
Pimelca gnidia—T
Podocarpus hallii—F
P. ferrugineus—F
Polystichum vestitum—F
Prasophyllum col.—T
Pratia angulata—T
Pteridium escul.—(M)
Ranunculus geran.—(T)
Rubus cissoides—F
Schoenus pauciflorus—T
Senecio elacag.—(T)
Sticherus cunning.—F
Thelymitra venosa—T
Uncinia filiformis—F
U. caesp. var. *minor*—F
U. nervosa—T
U. pedicellata—F
U. sp. (unnamed)—F
Viola filicaulis—T, F
Weymannia racem.—F

EXOTIC SPECIES

- Agrostis tenuis*—T
Carex demissa—(T)
Holcus lanatus—T
Hypochaeris radicata—T
Juncus articulatus—T