

looking plants of a *Hebe* species I wasn't familiar with. They were widespread, low-statured shrubs reaching a height of about 70cm. The leaves were dark green, shiny, fleshy, about 3cm long and elliptic-oblong in shape. Some secondary venation was evident on the leaves which were all twisted at the petiole into one horizontal plane, along the spreading branches. The distinguishing features of the plants were their stoutness, the semi-succulence, shininess and size of the leaves (relatively large for an alpine *Hebe*), and the absence of a sinus in the leaf-bud.

The colony was on a substrate of light, chalky, calcareous siltstone, and the site was quite open and dry. The community in which the *Hebe* plants grew was dominated by *Poa colensoi*. Associated small shrubs and herbs were *Gaultheria* sp. (unnamed), *Coprosma cheesemanii*, *Cassinia leptophylla* var. (*C. vauvillier-sii*), *Celmisia spectabilis* var., *C. monroi* var., and sparse tussocks of *Chionochloa pallens* var.

A cursory scout in the general vicinity of the colony revealed no further plants to add to the three or four seen in this small area.

CONCLUSION

As far as we know, the original plants of *Hebe matthewsii* are no longer in cultivation in New Zealand. Mr L J Metcalfe, Director of Parks and Recreation, Invercargill, does not have any, but it is possible that some are still in cultivation in Dunedin Botanic Gardens. Linda Kristensen who has recently been in New Zealand from Denmark made enquiries for us as to whether the species was still cultivated in Europe and apparently it isn't. However, the British author, Douglas Chalk, in his book "Hebes and Parahebes", published in New Zealand by the Caxton Press in 1988, lists *H. matthewsii* as "mostly a border filling shrub", thereby implying that it is still in cultivation, at least in Britain.

The rediscovery of *Hebe matthewsii* in North-west Nelson, 370km north-east of the Humboldt Mountains, after a lapse of more than 83 years, leads us to expect that the species will eventually turn up somewhere in between. At present, though, we know of only some four or five adult plants in the wild, no seedlings, and two (perhaps four) rooted cuttings in cultivation. A search in the Humboldt Mountains could show whether the species still survives there.

Rangi's Bush, Pukerua Bay

Maggy Wassilieff¹

INTRODUCTION

Rangi's Bush is a small (4.17ha) remnant of low kohekohe forest located just north of the Whenua Tapu cemetery (NZMS1, Sheet N160/414505; NZMS 260, Sheet R26/674157). The stand of forest occurs on a gentle slope of colluvium at the foot of hills that border the Pukerua Fault. The land is flat in the eastern sector, slopes gently down to a small stream that bisects the stand and rises gently to a smaller area west of the stream. The soils of the area are loessial loams and land surrounding the forest has been successfully converted to pasture. The altitude is 60m.

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Members of the Wellington Botanical Society visited Rangi's Bush in July 1983 and carried out a vegetation sampling exercise to gather information on the structure and composition of the forest.

HISTORY

The following information about Rangi's Bush was provided by Christina Carrad. The forest is part of Wairaka Farm which is jointly owned by K F Gray and J Carrad. Ken Gray reports that the area around Rangi's bush was once farmed by a hermit named Rangi Wall. The remains of a house including bricks and rubble are still evident on the eastern side of Rangi's Bush near the railway line.

Sheep and cattle grazed the forest until it was fenced in 1983.

METHODS

Seventy point intercepts were taken at four parallel transects at 10m intervals. The transects ran through the stand in a north-south direction, parallel to the nearby Main Trunk Railway. The intercept data were used to provide information on species contribution to canopy, understorey and ground cover. Species frequencies and their contribution to the stand's basal area were gained by measuring all stems greater than 30mm circumference at breast height in seventeen quadrats of 5×10 m located through the stand.

All seedlings and saplings up to 2m in height were counted in 50 circular plots of 1m radius. In addition, circumference at breast height measures were made on 893 plants located in the eastern sector. These measures have been analysed for species frequencies only.

RESULTS

Vertical Structure of Stand (Table 1)

The stand has a closed canopy around 8m in height dominated by kohekohe but with lesser contributions from mahoe and tawa. The upper understorey (defined as vegetation below the canopy but above 2m) is mainly kohekohe. A lower understorey tier (defined as vegetation between 0.3 and 2m) is absent. The ground cover (any intercept below 0.3m) is mainly leaf litter. Ferns occur sporadically. The absence of an understorey tier and the paucity of the ground flora are a legacy of the browsing and grazing activities of stock that had access to the stand until early 1983.

QUADRAT ANALYSIS

The stand has an average density of 4900 stems/ha and a basal area of 63.8m²/ha. Kohekohe stems make the greatest contributions to these measures (Table 2). Although 81% of the stems are kohekohe their contribution to the stand's basal area is only 68%. This is a reflection of the numerous small-sized stems of kohekohe. There are fewer stems of mahoe but because many of them are in the larger size classes they make a significant contribution to the total basal area measure. The canopy cover contribution of other species bears more relation to their basal area measure than to stem frequency. This is because the few species, other than kohekohe and mahoe, that appear in the canopy are large trees in the main.

Results from the seedling and small sapling maple reveal a very poor tree seedling flora and the absence of any sapling in the 50 circular plots (Table 3). It would appear, therefore, that stock not only eliminated the understorey, but

TABLE 1:
Cover contribution of species to canopy, upper and lower understoreys, and ground layer of Rangi's Bush.

Species Name	Cover % (+/- Standard Error)			
	Canopy	Upper understorey	Lower understorey	Ground
<i>Dysoxylum spectabile</i>	40+/-6	71+/-5		1+/-1
<i>Melicytus ramiflorus</i>	27+/-6	1+/-1		
<i>Beilschmiedia tawa</i>	13+/-4	1+/-1		
<i>Elaeocarpus dentatus</i>	4+/-2			
<i>Melicope ternata</i>	3+/-2			
<i>Macropiper excelsum</i>		1+/-1		1+/-1
<i>Pennantia corymbosa</i>			1+/-1	
<i>Coprosma rhamnoides</i>			1+/-1	
<i>Metrosideros diffusa</i>				1+/-1
<i>M. fulgens</i>	1+/-1			
<i>M. perforata</i>	3+/-2	3+/-2		1+/-1
<i>Muehlenbeckia australis</i>	1+/-1			3+/-2
<i>Ripogonum scandens</i>			1+/-1	
<i>Rubus cissoides</i>			1+/-1	1+/-1
<i>Carex virgata</i>				1+/-1
<i>Uncinia uncinata</i>				1+/-1
<i>Hydrocotyle heteromeria</i>				2+/-2
<i>Stellaria decipiens</i>				1+/-1
<i>Blechnum filiforme</i>				4+/-2
Other ferns				5+/-3
Fungus				1+/-1
Adventive grasses				6+/-3
Other species	2+/-2			4+/-2
Litter				60+/-6
Soil				5+/-2
Gap	6+/-3	22+/-5	96+/-2	

TABLE 2
Stem Frequency and % Contribution to Basal Area

Species Name	Frequency (%) (N=418)	% Contribution to basal area
<i>Dysoxylum spectabile</i> (live)	81	62
<i>Dysoxylum spectabile</i> (dead)	4	2
<i>Melicytus ramiflorus</i>	4	10.7
<i>Macropiper excelsum</i>	3	1.5
Other	8	22.3

TABLE 3
Seedling density (plants <300m tall)

Species name	Number/100m ²
<i>Dysoxylum spectabile</i>	160
<i>Macropiper excelsum</i>	49
<i>Melicytus ramiflorus</i>	26
<i>Pennantia corymbosa</i>	13
<i>Hedycarya arborea</i>	9
<i>Beilschmiedia tawa</i>	6
Others	10

No saplings (0.3m – 2m height) were recorded.

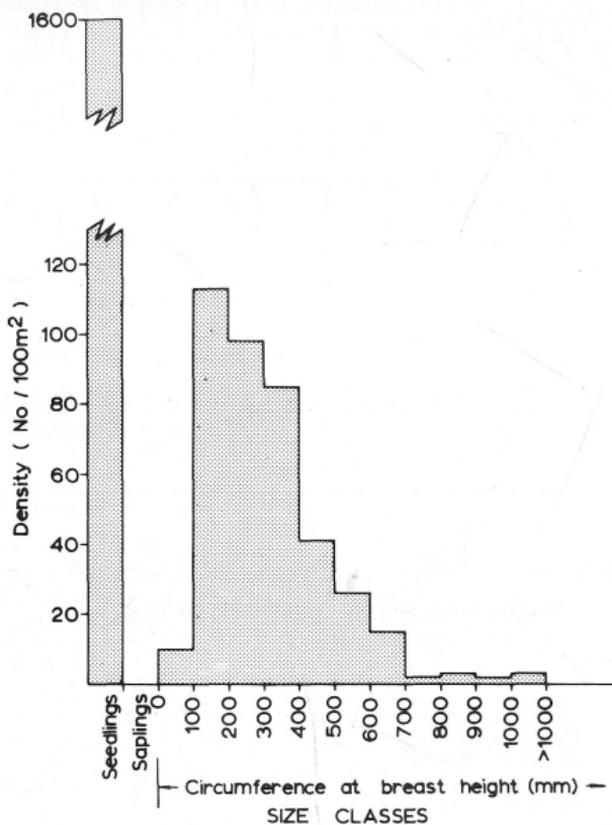


Fig. 1. Size-class distribution of kohekohe.

effectively prevented any regeneration for some considerable period prior to the study visit.

A size-distribution analysis of kohekohe shows that most stems occur between 110 and 400mm circumference at breast height. There are very few stems represented in the larger size classes (Figure 1).

Some distributional differences occur within the stand. A detailed sample from the eastern sector showed that here there was a greater concentration of mahoe and woody lianes, principally *Metrosideros perforata*, than elsewhere in the stand (Table 4).

TABLE 4
Stem Frequency in Eastern Sector

Species Name	Frequency % (N=893)
Dysoxylum spectabile	68
Melicytus ramiflorus	12
Macropiper excelsum	2
Lianes	8.4
Dead	3.6
Others	6

SPECIES LIST

The indigenous vascular flora consists of 62 species and 2 hybrids. Tree, shrub and herb species are poorly represented and a number of species present in a grazed-out coastal forest remnant 1.5km south-southwest are absent from Rangi's Bush. Colin Ogle has compiled a species list from this nearby remnant and it is interesting to note that it contains five podocarps (rimu, kahikatea, totara, miro, and matai) along with kanuka, *Leucopogon fasciculatus*, ramarama, mapau, *Olearia solandri*, heketara, kohuhu, cabbage tree and nikau palm. The herb layer is richer too, with 11 additional species.

The liane flora is fairly typical of disturbed kohekohe forest, but only mature specimens with woody stems hanging from the canopy are present. Such plants must have established at times when stock grazing was negligible or at a light level.

DISCUSSION

The stand appears to represent second-growth kohekohe of quite recent origin. The size distribution of kohekohe contrasts with the size class structure of the secondary kohekohe stand at Waikanae Scenic Reserve (Wassilieff 1985). At Waikanae most kohekohe stems were concentrated in diameter at breast height size classes of 110 - 300mm that correspond to circumferences between 346 - 942mm. No kohekohe with diameters greater than 1m were located at Rangi's Bush, although a few such trees are present at Waikanae Scenic Reserve. There are two large pukatea growing in Rangi's Bush with circumferences of 3.76m and 2.84m. They are most probably survivors from the original forest cover.

The regeneration capacity of the forest is hard to assess from the present data. Kohekohe is the only tree, shrub or liane which appears to have an adequate supply of seedlings for future replacement. However, the recorded seedling density is at least an order of magnitude less than that recorded in kohekohe

stands on Kapiti Island which are now possum-free (Stephen Fuller, pers. comm.). The hard, trampled forest floor with a very shallow litter layer is a poor substrate for successful kohekohe germination and establishment. Court and Mitchell (1988) reported that optimal conditions for the germination and early establishment of kohekohe seeds occur when the seeds are buried beneath a deep (40mm) litter layer.

With the exclusion of stock there will be a chance for the ground flora and understorey to develop. Kohekohe, mahoe, kawakawa and hangehange are shade-tolerant species which are likely to become important in the understorey. A number of dead kohekohe saplings and small trees were observed; it is unclear whether they have succumbed to possum browse or have died from other causes. All the larger kohekohe appeared to be in good health and kohekohe should continue to dominate the canopy for the foreseeable future.

There are enough local examples of grazed coastal forests standing in a sea of pasture for us to be confident that, without fencing, Rangi's Bush would have continued to deteriorate in structure and composition. It is to be hoped that stock exclusion will permit the recovery of the forest interior. The stand will be worthy of a resampling visit within the next 10-15 years.

ACKNOWLEDGEMENTS

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- Court, A J Mitchell, N D 1988: The germination ecology of *Dysoxylum spectabile* (Melicaceae). *New Zealand Journal of Botany* 26: 1-6.
Wassilieff, Maggy 1985: Vegetation of the Waikanae Scenic Reserve. *Wellington Botanical Society Bulletin* 42: 36-40.

APPENDIX 1 - LIST OF INDIGENOUS VASCULAR PLANTS OF RANGI'S BUSH, WHENUATAPU, PUKERUA BAY

Colin Ogle

(unc = uncommon - one or several plants only)

Dicot Trees and Shrubs

Alectryon excelsus

Beilschmiedia tawa

Brachyglottis repanda (unc)

Coprosma propinqua

C. rhamnoides

Dysoxylum spectabile

Elaeocarpus dentatus

Fuchsia excorticata (unc)

Geniostoma rupestre

Griselinia lucida

Hedycarya arborea (unc)

Laurelia novae-zelandiae

Leptospermum scoparium (unc)

Macropiper excelsum

Melicope ternata

Melicytus ramiflorus

Myoporum laetum
Pennantia corymbosa
Pseudopanax arboreus (unc)
P. crassifolius (unc)
Streblus banksii (unc)
Urtica ferox

Dicot Lianes
Clematis paniculata (unc)
Metrosideros diffusa
M. fulgens (unc)
M. perforata
Muehlenbeckia australis
Parsonsia heterophylla
Rubus cissoides (unc)

Dicot Herbs
Centella uniflora
Epilobium nummulariifolium
Gnaphalium gymnocephalum (unc)
Hydrocotyle heteromeria
Oxalis exilis
Parietaria debilis
Ranunculus reflexus (unc)
Stellaria decipiens

Monocot Liane
Ripogonum scandens

Grasses
Cortaderia toetoe (unc)
Microlaena stipoides

Sedges
Carex dissita (unc)
C. flagellifera
C. virgata
Cyperus ustulatus
Scirpus prolifer
Uncinia uncinata

Rushes
Juncus australis
J. gregiflorus

Ferns
Asplenium hookerianum
A. oblongifolium (unc)
A. flaccidum × *A. sp.* (*A. bulbiferum* or *A. gracillimum*) (unc)
A. hookerianum × *A. sp.* (*A. bulbiferum* or *A. gracillimum*) (unc)
Blechnum chambersii (unc)
B. filiforme
Cyathea dealbata (unc)
C. medullaris (unc)
Hypolepis ambigua
H. lactea (unc)
Lastreopsis glabella (unc)
Pellaea rotundifolia s.s.
Phymatosorus diversifolius (unc)
P. scandens
Pneumatopteris pennigera (unc)
Pyrrrosia eleagnifolia

(62 spp. and 2 hybrids)