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## FOREST FLORA OF THE NORTH CAPE REGION

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### SUMMARY

Approximately 263 species of native vascular plants are listed for four forest remnants in northern-most New Zealand (c. latitude 34°30'S). The lack of tropical and endemic species in this flora may be the result of extinction in cooler Pleistocene times.

### INTRODUCTION

Inland from the coast, the North Cape Region (i.e. the New Zealand mainland north of Ninety Mile Beach c. 34°25' to 34°30'S) consists of low dissected table-lands and subdued volcanic forms. Dieffenbach, the earliest naturalist to travel across these hills, described them as a desolate expanse of manuka (*Leptospermum scoparium*) and bracken (*Pteridium aquilinum*), only occasionally varied by taller vegetation in the gullies. It was obviously a landscape that had been created by fire: "... in not very remote times the kauri pine ..... must have covered all these hills, as is proved by the burnt remains of large trees of this species." (Dieffenbach 1843 vol. 1: 201).

Cheeseman (1897) noted the varying composition of some of the remnant pieces of forest but most of his botanising was done near the coast and he missed seeing the best of the kauri-podocarp stands. Although he made no mention of fires it is certain that continual burning was being done to clear the land for gum-digging and to provide rough danthonia (*Rytidosperma* spp.) pasture (Anon. 1902: 607-9).

For most of the first half of this century burning of the plant cover was customary and frequent; cattle, horses and sheep used to roam across the unfenced hills and wild pigs were numerous (R.H. Michie, pers. comm.). Very little forest has remained sufficiently free of fire and animal damage to be able to indicate the nature of the primitive (pre-human) forest cover. We present in this paper the native vascular flora of what are probably the four best-developed forest remnants in the region.

### FOREST REMNANTS

The approximate location of the four remnants we investigated is

shown in Fig. 1. These remnants are drawn on the topographical sheet NZMS 1 Sheet N1 and N2 North Cape, 3rd Edition 1977, but their extent is overestimated, forest not always being distinguished from tall kanuka (*Leptospermum ericoides*) scrub. For this reason, only approximate locations (four-figure grid references) are given below. None of the remnants exceeds c. 50 ha.

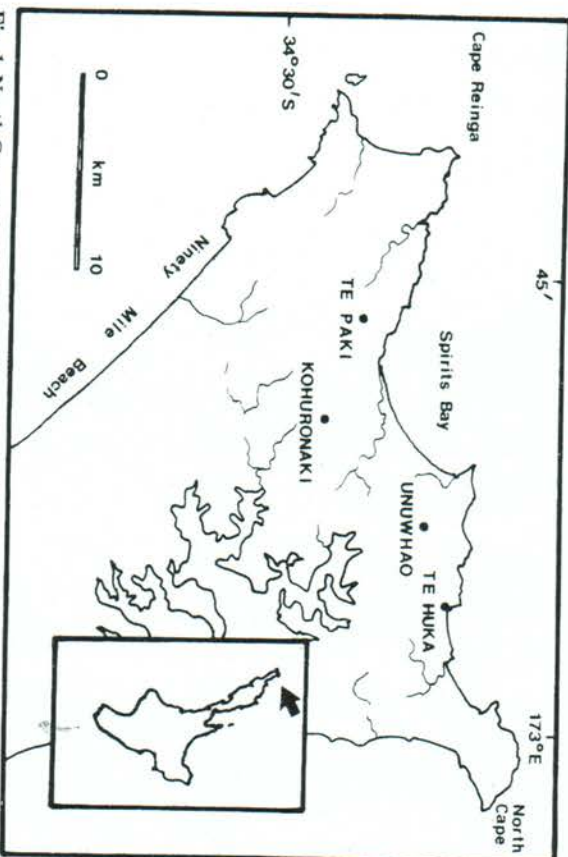


Fig. 1. North Cape region, showing the location of the four forest remnants studied.

**'Radar Bush' grid ref. 25-26/45-46, alt. 80-310 m**

Lies in the head of an unusually cool and sheltered valley south of Te Paki trig. Broadleaved species and occasional podocarps dominate close to the small streams, with kauri (*Agathis australis*), monoa (*Dacrydium kirki*) and kawaka (*Libocedrus plumosa*) upslope. Larger animals are absent (note that goats and opossums have not yet reached the North Cape region) and regeneration is plentiful. Contains c. 211 spp.

**'Kohuronaki' grid ref. 31-33/43-45, alt. 30-300 m**

Lies on the slopes around Kohuronaki trig; best-developed on the upper north-eastern side, where puriri (*Vitex lucens*), taraire (*Beilschmiedia tarairi*) and kohekohe (*Dysoxylum spectabile*) dominate. Horses are present. Contains c. 94 spp.

**'Unuwahao' grid ref. 37-39/50-52, alt. 90-310 m**

Lies on ridges and upper slopes around Unuwahao trig. There is magnificent puriri-taraire-kohekohe forest on the irregular "block and

cleft" volcanic breccia topography south-west of the summit. Pigs and cattle frequent the lower slopes but higher up the forest is little-damaged. Contains c. 152 spp.

**'Te Huka' grid ref. 41-42/50-51, alt. 0-120 m**

Lies on a steep east-facing slope at the western end of Te Huka Bay. Tall pohutukawa (*Metrosideros excelsa*) dominate close to the sea, with puriri, kohekohe, taraire, karaka (*Corynocarpus laevigatus*) and kowhai (*Sophora microphylla*) dominant upslope. Cattle and horses are doing considerable damage. Contains c. 90 spp.

**SPECIES LIST**

This list is based on a visit by both authors in December 1979 and on several earlier visits by J.K.B., the first made in 1975 in company with Mr R.H. Michie, of Katiaia. An attempt was made at a complete listing for the forested areas; plants of the adjacent scrub are also listed but probably not fully. Unuwahao records include plants confined to the rocky grass and shrub-covered pinnacles south and west of the forest proper.

Voucher specimens are cited for the more notable records, or where the group concerned is still taxonomically unresolved. A complete set of specimens (J.K.B.) from Radar Bush has been deposited in Botany Division, Department of Scientific and Industrial Research, Christchurch (CHR). Synonyms are given for the lesser-known name changes. Locality abbreviations (R, K, U, T) refer to Radar Bush, Kohuronaki, Unuwahao and Te Huka respectively.

Scientific Name	Common name	Voucher (CHR No.)	Locality
GYMNOSPERMS			
<i>Agathis australis</i> Salisb.	kauri		R K U T
<i>Dacrydium colensoi</i> Hook.	silver pine	314520	R K
<i>D. cupressinum</i> Lamb.	rimu		R K
<i>D. kirki</i> F. Muell. ex Parl.	monoa		R
<i>Libocedrus plumosa</i> (D. Don) Sargent	kawaka		R
<i>Phyllocladus trichomanoides</i> D. Don	tanekaha		R
<i>Podocarpus dactyloides</i> A. Rich.	kahikatea		R K U
<i>P. ferrugineus</i> G. Benn. ex D. Don	niro		R K
<i>P. hallii</i> Kirk	Hall's totara	316510	R
<i>P. spicatus</i> R. Br. ex Mirbel	matai		R
<i>P. totara</i> G. Benn. ex D. Don	totara		R
FERNS AND FERN ALLIES			
<i>Adiantum aethiopicum</i> L.	maidenhair fern		U
<i>A. cunninghamii</i> Hook.			R
<i>A. diaphanum</i> Blume			R
<i>A. fulvum</i> Raoul			U T
<i>A. pubescens</i> Schkuhr ( <i>A. hispidulum</i> Swartz sensu auct. NZ)			R K U T

*A. viridescens* Col. R K U T  
*Anarthropteris lanceolata* (J. Smith) L.B. Moore R U U T  
*Asplenium bulbiferum* Forst. f. subsp. *bulbiferum* hen-and-chickens fern R U U  
*A. bulbiferum* Forst. f. subsp. *bulbiferum* x *A. lamprophyllum* Carase U  
*A. bulbiferum* Forst. f. subsp. *gracillimum* K  
*Brownsey* R K U T  
*A. flaccidum* Forst. f. subsp. *flaccidum* spleenwort R K U T  
*A. flaccidum* Forst. f. subsp. *flaccidum* x *A. oblongifolium* Col. R K U U  
*A. lamprophyllum* Carase U  
*A. oblongifolium* Col. (A. *lucidum* Forst. f.) shining spleenwort R K U T  
*A. polyodon* Forst. f. R K U U  
*Blechnum chambersii* Tindale [B. *lanceolatum* (R. Br.) Sturm sensu auct. NZ] U  
*B. chambersii* Tindale x *B. membranaceum* (Col.) Mett. U  
*B. discolor* (Forst. f.) Keys. R  
*B. fraseri* A. Cunn. R R U U  
*B. membranaceum* (Col.) Mett. R K U U  
*B. sp. 1* [B. *capense* (L.) Schlect. sensu Allan (1961)] kiokio R U  
*B. sp. 2* [B. *minus* (R. Br.) Allan sensu Allan (1961)] R R U U  
*Cheilanthes distans* (R. Br.) Mett. R R U U  
*C. seiberi* Kunze U U U T  
*Cyathia dealbata* (Forst. f.) Swartz R K U T  
*C. medullaris* (Forst. f.) Swartz R K U T  
*Dicksonia lanata* Col. R K U T  
*D. squarrosa* (Forst. f.) Swartz 356977  
*Doodia media* R. Br. K U T  
*Gleichenia circhinata* Swartz umbrellia fern R R R  
*G. fabelata* R. Br. umbrellia fern R R R  
*G. microphylla* R. Br. water-fern R R R  
*Histiopteris incisae* (Thunb.) J. Smith filmy fern R K U  
*Hymenophyllum demissum* (Forst. f.) Swartz filmy fern R K U  
*H. dilatatum* (Forst. f.) Swartz filmy fern R R R  
*H. fabelatum* Labill. filmy fern R K U  
*H. flexuosum* A. Cunn. filmy fern R R R  
*H. rufum* R. Br. filmy fern R R R  
*H. revolutum* Col. filmy fern R K U  
*H. sanguinolentum* (Forst. f.) Swartz T  
*Hypolepis tenuifolia* (Forst. f.) Bernh. U  
*Lastreopsis decomposita* (R. Br.) Tindale U  
*L. glabella* (A. Cunn.) Tindale R K U  
*L. hispidula* (Swartz) Tindale R K U  
*Leptopteris hymenophylloides* (A. Rich.) Presl heruheru R R R  
*Lindsaea linearis* Swartz R R R  
*Lindsaea trichomanoides* Dryand. R K U  
*Lycopodium billardieri* Spring R K U  
*L. deuterodensum* Herter R K U  
*L. volubile* Forst. f. R K U

*Paesia scaberula* (A. Rich.) Kuhn R K U T  
*Pellaea rotundifolia* (Forst. f.) Hook. R U U T  
*Phylloglossum drummondii* Kunze R K U T  
*Phymatodes diversifolium* (Willd.) Pic. Ser. hound's-tooth fern R K U T  
*P. scandens* (Forst. f.) Presl R K U T  
*Polystichum richardii* (Hook.) J. Smith R K U T  
*Pteridium aquilinum* (L.) Kuhn U  
*Pteris comans* Forst. f. R K U T  
*P. macientia* A. Rich. R R R  
*P. tremula* R. Br. R R R  
*Pyrrhosia serpens* (Forst. f.) Ching R R R  
*Rumohra adiantiformis* (Forst. f.) Ching R R R  
*Schizaea bifida* Willd. R R R  
*S. fistulosa* Labill. K U T  
*Thelypteris pennigera* (Forst. f.) Allan R K U U  
*T. elongata* Dang. R K U U  
*T. lanceolata* Dang. R R R  
*T. tannensis* (Spreng.) Bernh. R R R  
*Todea barbara* (L.) Moore U  
*Trichomanes endlicherianum* Presl U  
*T. elongatum* A. Cunn. R R R  
*T. reniforme* Forst. f. kidney fern R R R  
*T. venosum* R. Br. R R R  
 DICOT TREES & SHRUBS  
*Ackarna rosaeifolia* A. Cunn. titoki R R U T  
*Alectryon excelsus* Gaertn. R R U U  
*Aseuosmia x quercifolia* A. Cunn. R R U U  
*Aristolelia serrata* (J.R. & G. Forst.) W.R.B. Oliver wineberry R R  
*Ascarina lucida* J.R. & G. Forst. hutu R R  
*Beilschmiedia tarairi* (A. Cunn.) Benth. & Hook. f. ex Kirk tarairie R K U T  
*B. taua* (A. Cunn.) Benth. & Hook. f. ex Kirk taua R K U T  
*Brachyglottis repanda* J.R. & G. Forst. rangiora R R U T  
*Carmichaelia* sp. or spp. (C. *aligera* Simpson?, *C. cunninghamii* Raoul?) R R U T  
*Carpodetus serratus* J.R. & G. Forst. putaputaweta R R U U  
*Cassinia retorta* A. Cunn. ex DC. maningi R K U U  
*Coprosma arborea* Kirk (C. *grandifolia* Hook. f.) R K U U  
*C. areolata* Cheesem. R R U U  
*C. australis* sensu auct. NZ R K U U  
*C. lucida* J.R. & G. Forst. R K U U  
*C. macrocarpa* Cheesem. R K U U  
*C. parviflora* Hook. f. R K U U  
*C. rhamnoides* A. Cunn. R K U U  
*C. robusta* Raoul R K U U  
*C. spatulata* A. Cunn. R R R  
*Cortaria arborea* Lindsey R R R  
*Corkia buddleioides* A. Cunn. R R R  
*C. buddleioides* A. Cunn. x *C. cotoneaster* Raoul R R R  
*C. cotoneaster* Raoul R R R  
*Corynocarpus laevigatus* J.R. & G. Forst. karaka R R U U  
*Cyathodes fasciculata* (Forst. f.) Allan mungingingi R K U U



<i>Parsonsia capsularis</i> (Forst. f.) R. Br.		R	K	U	T
<i>P. heterophylla</i> A. Cunn.		R	K	U	T
<i>Passiflora tetrandra</i> Sol. ex DC.				U	
<i>Ripogonum scandens</i> J.R. & G. Forst.		R	K	U	T
<i>Rubus australis</i> Forst. f.		R	K	U	T
<i>R. australis</i> Forst. f. x <i>R. cissoides</i> A. Cunn		R	K	U	T
<i>R. cissoides</i> A. Cunn.		R	K	U	T
MONOCOT TREES, SHRUBS & HERBS					
<i>Arthropodium citratum</i> (Forst. f.) R. Br.		R	K	U	T
<i>Astelia banksii</i> A. Cunn.		R		U	T
<i>A. solandri</i> A. Cunn.		R		U	T
<i>A. trinervis</i> Kirk		R	K	U	T
<i>Collosperrum hastatum</i> (Col.) Skottsb.		R	K	U	T
<i>Cordyline australis</i> (Forst. f.) Endl.		R	K	U	T
<i>C. banksii</i> Hook. f.		R	K	U	T
<i>C. banksii</i> Hook. f. x <i>C. puniitio</i> Hook. f.		R	K	U	T
<i>C. puniitio</i> Hook. f.		R	K	U	T
<i>Dianella nigra</i> Col.		R	K	U	T
<i>Juncus australis</i> Hook. f.		R	K	U	T
<i>J. pauciflorus</i> Hook. f.				T	
<i>Libertia</i> sp. or spp. ( <i>L. grandiflora</i> (R. Br.) Sweet, <i>L. ictoides</i> (Forst. f.) Spreng.)		R	K	U	T
<i>Phoridium tenax</i> J.R. & G. Forst.		R	K	U	T
<i>Rhopodostylis sapida</i> Wendl. & Drude		R	K	U	T
SEDGES					
<i>Carex breviculmis</i> R. Br.		R	K	U	T
<i>C. dissita</i> Boott in Hook. f.		R	K	U	T
<i>C. flagellifera</i> Col.		R		U	
<i>C. inuversa</i> R. Br.		R		T	
<i>C. lanbertiana</i> Boott in Hook. f.		R		T	
<i>C. spinirostris</i> Col.		R		T	
<i>C. virgata</i> Boott in Hook. f.		R		T	
<i>Cyperus ustulatus</i> A. Rich.		R		T	
<i>Gahnia lacera</i> (A. Rich.) Steud.		R	K	U	T
<i>G. pauciflora</i> Kirk		R	K	U	T
<i>G. setifolia</i> (A. Rich.) Hook. f.		R		U	
<i>G. xanthocarpa</i> (Hook. f.) Hook. f.		R		U	
<i>Lepidosperma australe</i> (A. Rich.) Hook. f.		R		U	
<i>L. filiforme</i> Labill.		R		U	
<i>L. laterale</i> R. Br.		R		U	
<i>Morelotia affinis</i> (Brong.) Blake		R		U	
<i>Schoenus apogon</i> Roem. & Schult.		R	K		T
<i>S. breuifolius</i> R. Br.		R		T	
<i>S. maschalatus</i> Roem. & Schult.		R		U	T
<i>S. tendo</i> (Hook. f.) Hook. f.		R		U	T
<i>Scirpus nodosus</i> Rottb.		R		U	T
<i>Tetraria capillaris</i> (F. Muell.) J.M. Black		R		U	T
<i>Urcinia banksii</i> Boott in Hook. f.		R		U	T
<i>U. uncinata</i> (Linn. f.) Kuk.		R	K	U	T
ORCHIDS					
<i>Bulbophyllum pygmaeum</i> (Smith) Lindl.		R	K		T
<i>Corybas oblongus</i> (Hook. f.) Reichb. f.		R			T
<i>C. rivularis</i> (A. Cunn.) Reichb. f.		R			T
<i>Dendrobium cunninghamii</i> Lindl.		R			T
<i>Drymonanthus adversus</i> (Hook. f.) Dockrill		R		U	T

<i>Earina autumnalis</i> (Forst. f.) Hook. f.		R	K		
<i>E. mucronata</i> Lindl.		R			
<i>Orthoceras strictum</i> R. Br.		R			
<i>Prasophyllum pumilum</i> Hook. f.		R			
<i>Pterostylis banksii</i> A. Cunn. in Hook.		R	K		
<i>P. trullifolia</i> Hook. f.		R			
GRASSES					
<i>Agropyron kirkii</i> Zotov				U	
<i>Dichelachne crinita</i> (Linn. f.) Hook. f.		R		U	T
<i>D. micrantha</i> (Cav.) Domin		R	K		
<i>D. rara</i> (R. Br.) Vickerly		R			
<i>Echinochloa ovatus</i> Beauv.		R	K	U	T
<i>Lachnagrostis filiformis</i> (Forst. f.) Trin.		R			
<i>Microlophena auenacea</i> Hook. f.		R	K	U	T
<i>M. stipoides</i> R. Br.		R	K	U	T
<i>Opismenus imbecillis</i> (R. Br.) Roem. & Schult.		R	K	U	T
<i>Rytidosperma</i> spp.		R	K	U	T
		R	K	U	T

## DISCUSSION

Cheeseman (1897) included plants of all habitats in his list of the North Cape flora. He commented that despite the warm climate of this region the flora contains only a few 'tropical' species (i.e. warmth-loving plants of places northwards outside New Zealand). We would add that the deficiency is most marked in the forest flora. The coastal fringes, scrub communities and the swamps have a fair number of Australian and Pacific plants (e.g. *Bidens pilosa*, *Cassya paniculata*, *Hibiscus* spp., *Ipomoea* spp., *Pomaderris* spp., thelypteroid ferns etc.; AK, CHR!) indicating a climate not completely unsuitable for tropical species but of the forest plants only the unnamed *Metrosideros* is perhaps a tropical species. Most North Cape forest plants range throughout northern New Zealand and can grow under quite cool conditions - this is true even of those 15 or 20 species (mostly ferns, also *Dodonaea viscosa*, *Geniostoma rufepes*, *Melicytus ramiflorus*) which do occur northwards outside New Zealand.

Also missing from the forest flora, and in fact missing from the flora at large, are species endemic to the North Cape region. Several species of the Surville Cliffs might appear to belong to this category but they present a special case; they are adapted to the serpentine soils found only in this area and have probably been unaffected by the biogeographical factors that we suppose - see below - to have acted on the rest of the flora (Druce *et al* 1979).

This lack of both tropical and endemic species contrasts markedly with the composition of the flora of the Three Kings Islands. Only 60 km north-west of Cape Reinga (15° of latitude further north) these islands have a very strong endemic element, some of which is tropical in affinity (*Cordylina kaspar*, *Davallia tasmanii*, *Elingamita johnsonii*, *Pennantia baylisiana*, *Strebilus smithii*, *Tecomanthe speciosa*) with

the rest more closely related to New Zealand species (*Alectryon grandis*, *Brachyglottis arborescens*, *Carex elingamita*, *Hebe insularis*, *Myrsine oliveri*, *Pitiosporum fairchildii*).

The Three Kings, in geological composition (Kear & Hay 1961) and probably in climate too (unfortunately, no weather records exist for these islands) resemble at least the western coastal parts of the North Cape region, and it seems unlikely that the floristic contrast can simply be due to environmental differences between the two regions. Rather, we prefer the suggestion (Kelly 1967) that the North Cape flora lost its tropical and endemic species in the Pleistocene, through the direct effects of a cooler climate and also because of competition from an invading cool-climate flora. Isolated from the mainland since their formation in pre-Pliocene times (Fleming 1979), and perhaps having a slightly milder climate, the Three Kings have been able to retain a greater proportion of their warmth-loving elements.

The tropical species now present in the North Cape region (*Bridens. Cassytha* etc) can then be supposed to have recolonized in the c. 20 000 years since the last glacial period, probably coming from Australian or Pacific sources. Not all have reached the Three Kings, perhaps because of the small target area these islands present to incoming seed. The Three Kings endemics, and also the near-endemics *Meryta sinclairii* and *Nestegis apetala*, have not yet reached (recolonised?) the North Cape region: the limited number of individuals of these plants and the resulting lack of seed for long-distance dispersal may be responsible for this failure, also, several are dioecious species and likely therefore to be poor colonizers.

We do not know of any direct evidence for the severity of Pleistocene climates in northern-most New Zealand but there is some circumstantial evidence from plant distributions. Firstly, outlying stands of beech (*Nothofagus* spp.) occur today in some cool upland parts of the Waipoua-Pukeki region, 35°30'S (N. *truncata*; CHR1) and Little Barrier Island, 36°10'S (N. *solandri*, N. *truncata*; CHR1). These stands are several degrees of latitude north of the usual lowland occurrence of the genus, and since it is generally accepted that beech is bound to slow migration over continuous land this distribution in the north seems likely to be relictual and evidence for generally cooler temperatures at some time in the recent past. (For tectonically-stable northern New Zealand, migration of beech northwards along post-Tertiary uplands, a process which might not have required cool lowland climates, can be ruled out. Certainly such a process could not account for the beech on Little Barrier because this island is an isolated volcanic cone of only mid-Pleistocene age (Thompson 1960).) Secondly, in the coldest parts of the North Cape region itself (Radar Bush, Unuwhao) there are three cool-climate species, *Dacrydium colensoi*, *Podocarpus hallii* and *Pseudowintera axillaris*, which like the

beech are a long way north of their usual distribution limits and could therefore be relicts of the North Cape Pleistocene flora. It should be admitted, though, that this site may be a uniquely favourable one and that the three species could have reached here by long-distance dispersal from outlier stands in Waipoua-Pukeki (CHR1).

Cheeseman (1897) apparently regarded the absence of tropical and endemic species from the North Cape flora as part of what he called the lack of "luxuriance" in the plant life, i.e. a fairly low total number of species and, in general, an only moderate vigour of growth. He ascribed these features to the "uniformity of physical conditions" in this "arid and sterile" region. Certainly the dryness of the climate has a strong influence on today's forests, e.g. the greater density and vigour of the vegetation around Unuwhao summit was attributed by Kelly (1967) to the additional moisture brought by mists; also, even in the cool and sheltered Radar Bush there is a very high summer mortality among juvenile plants (J.K.B.). But we consider it unlikely that a recent (post-Pleistocene) change of the North Cape climate towards dryness has been responsible for the lack of tropical and endemic species. Such a hypothesis overlooks the occurrence of refugia for damp-loving species (Radar Bush, Unuwhao summit) and is to some degree contradicted by the considerable number of endemic species on the Three Kings. Dryness, however, may be the reason why the North Cape forests now have only three cool-climate species, while the Waipoua-Pukeki-Herakino uplands, just a short way to the south but much wetter, have about a dozen such species, e.g. *Cyathia cunninghamii*, *C. smithii*, *Dacrydium intermedium*, *Dracophyllum pyramidale*, *Ixerba brexioides*, *Quintinia serrata*, *Pseudowintera colorata*; CHR1

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**Note added in press**

Radar Bush has a fourth cool-climate species, *Neomyrtus pedunculata* AK!).

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