KNOWING KANUKA AS *KUNZEA*

Warwick Harris

Changes to the Latin binomial name of a well known plant species usually brings an annoyed reaction from those who have regularly used and become familiar with that name over a long time. For example, in regularly communicating with botanists it is clear that many have been reluctant to adopt the new nomenclature applying to species of the New Zealand conifers. Not unreasonably, a clear explanation is required to convince those who use binomial plant names in their work that a different name is necessary.

Quite coincidentially I have been caught up in one of the most significant of all recent name changes applying to common New Zealand species. In 1983 I began a study towards improving the understanding of the genetic variation in species of the New Zealand tea trees. When this work started my knowledge of the taxonomy of plants known as tea tree was based on the descriptions in Allan 1961. He recognised three species in New Zealand, *Leptospermum scoparium* commonly known as manuka or kahikatoa, *L.ericoides* commonly known by more discriminating botanists as kanuka but often lumped together with manuka, and *L. sinclairii* which is restricted in its distribution to Great Barrier Island and possibly Three Kings. Understandably it was with some surprise that I learnt that these species, which have usually been happily and collectively referred to as tea trees, were separated into the genera *Leptospermum* and *Kunzea* by the Australian taxonomist Ms Joy Thompson who is located at the National Herbarium of New South Wales, Royal Botanic Gardens, Sydney.

Confirmation of the taxonomic revision which led to the decision to transfer kanuka from *Leptospermum* to *Kunzea*, to give the combination *Kunzea ericoides* (A.Rich.) J. Thompson, was made at a DSIR-CSIRO colloquium on plant taxonomy in Canberra in October 1983 (Edgar et al. 1983). A colloquially stated theme for this colloquium was to make progress toward sorting out plants which occur both in Australia and New Zealand which are either different species known by the same name in the two countries or the same species known by different names. The New Zealand tea trees provide a good example of this problem.

Allan (1961) in Volume 1 of the Flora of New Zealand in dealing with *Leptospermum* states there are some 35 species, mostly Australian, with a few in New Zealand, New Caledonia, and Malaya. 'The New Zealand species appear to be all endemic.' It is curious that Allan should regard all species of *Leptospermum* in New Zealand as endemic, as Bentham (1867) in Flora Australiensis includes *L. scoparium*, listing its distribution in Queensland, New South Wales, Victoria, Tasmania, South Australia, and adding 'The species is

also in New Zealand'. In subsequent regional Australian Floras, *L. scoparium* is usually included as a species. Allan's statement that *Leptospermum* occurs in New Caledonia is also incorrect.

At the Canberra colloquium in a discussion on taxonomic problems of specific groups Dr. Brain P.J. Molloy referred to *Leptospermum*, stating that '*L. scoparium* and *L. ericoides* demonstrate a complex New Zealand relationship with much variation in both species in New Zealand. *L. scoparium* is almost the most widespread of any species of plant in New Zealand. *L. ericoides* is also very widespread but tends to be more restricted to drier soils. Both are important in patterns of succession. The question is whether or not *L. scoparium* is really present in Australia and how similar is *L ericoides* to *L. phylicoides* of Australia? Also, should *L. ericoides* be in *Kunzea* or *Baeckea* ? Thus, there is a real need to know what we have got in both countries'.

Joy Thompson was able to respond specifically to these questions through her involvement in the revision of the genus *Leptospermum* required as part of the Flora of Australia volume dealing with Myrtaceae. Details of her redefinitions and nomenclatural changes within the *Leptospermum* suballiance of Myrtaceae are published (Thompson 1983) and together with an unpublished checklist for seventy nine species of *Leptospermum* this provides the most up to date understanding of the taxonomy and distribution of the New Zealand tea trees. In outlining this current treatment it is useful to consider the historical progress of the naming of the tea tree species.

As would be expected from their present distribution both manuka and kanuka were collected in the course of Cook's first voyage to New Zealand in 1769 and are described in Solander's unpublished manuscript Primitiae Florae Novae Zelandiae. Solander describes the taxon *Philadelphus parviflorus* containing the subtaxa *rigidus* and *aromaticus* which he indicated were known to the Maoris as 'Manuca' and 'Heigato' respectively. The description of *rigidus* and the name manuka indicate this to be *Leptospermum scoparium* and var *aromaticus* is clearly what is now known as *Kunzea ericoides.* Solander's recording of the Maori name as 'Heigato' may well be equated with the name kahikatoa which Allan (1961) lists as applied to *Leptospermum scoparium.*

The original description of *L. scoparium* was published by J.R. and G. Forster (1776) and the type specimen at Kew was most probably collected by the Forsters in Dusky Sound on Cook's second voyage. The generic description of *Leptospermum* provided by the Forsters included taxa which have now been classified in the genera *Callistemon, Metrosideros, Leucodendron, Melaleuca, and Baeckea.* One feature, basic to Thompson's (1983) transfer of *L. ericoides* to *Kunzea*, was already noted by the Forsters who indicated two groups in *Leptospermum* , i.e. those species with stamens many times longer than the corolla (Callistemones) and those with stamens shorter than the corolla. The latter group included *L. scoparium* characterised by sparse, ovate-lanceolate leaves which differentiated it from *L. virgatum* with opposite linear-

lanceolate leaves. *L. virgatum* was regarded as a species of *Baeckea* by later authors including Bentham (1867). Curiously, later Forster (1786 a,b) transferred *L. scoparium* to *Melaleuca* as *M. scoparia* .

Richards (1832) described *L. ericoides* A. Rich. from material collected on the voyages by Duperrey in 1824 and D'Urville in 1827, the type specimen at Paris being collected from Astrolabe Harbour (Allan 1961) which is presumably in the vicinity of Astrolabe Roadstead, the channel between Abel Tasman National Park and Adele Island. Richard gave the common Maori name for *L. scoparium* as 'Kai-katoa' and *L. ericoides* as 'Manouea'.

Hooker (1853) in Flora Novae-Zelandiae, preceded his descriptions for *L. scoparium* and *L. ericoides* with the comment 'species very variable and difficult of discrimination; even the two New Zealand ones, though distinct from one another, run into varieties which are often taken for new species'. Hooker describes four varieties within *L. scoparium* , var. *scoparium* erect, leaves lanceolate; var. linifolium erect, leaves narrowly linear-lanceolate; var. *myrtifolium* erect, leaves ovate, patulate or recurved; and var. *prostratum* stems prostrate, branches ascending, leaves broadly ovate-circular, squarrose-recurved. Apart from var. *prostratum*, these varietal descriptions follow those in Solander's manuscript for varieties of *Philadelphus rigidus*, but under *Leptospermum ericoides* Hooker does not refer to the varieties *grandiflorus* and *parviflorus* described by Solander. Like Allan (1961), Hooker ascribes the native names kahikatoa and manuka to *L. scoparium* and for *L. ericoides* the name 'Rawiri', following Cunningham, is listed for the plants of the 'Northern Island' and 'Manouea' for plants of Middle Island following D'Urville in Richard (1832)

Cheeseman (1906) in manual of the New Zealand Flora repeats the varietal descriptions given by Hooker but includes as additions from Kirk's Forest Flora (1889) the variety *lineatum* of *L. ericoides* (in Kirk as var. *linearis*) and from Kirk's Student Flora (1899) a third species *L. sinclairii* Kirk and the variety *parvum* of *L. scoparium*.. Cheeseman applies the native names manuka to *L. scoparium* and kanuka and maru to *L.ericoides*. Both Hooker and Cheeseman note *L. scoparium* as common to Australia and Tasmania, but regard *L. ericoides* as restricted to New Zealand.

Allan's (1961) recognition of varieties differs from that of Hooker and Cheeseman, the varieties they give for *L. scoparium* being noted by Allan but not accepted as taxa. Allan accepts *L. scoparium* var. *incanum* described by Cockayne (1917) to include the populations with pink-red coloured flowers which occur in North Auckland. For *L. ericoides* as well as var. *linare* (which both Cockayne (1911) as *L. lineatum* and Kirk (1899) suggested should have species status), Allan adds var. *microflorum* described by Simpson (1945) in recognition of the depressed , straggling habit of shrubs occurring on heated soils in the volcanic area of central North Island. A recent study of the variation of *L. scoparium* in New Zealand (Yin Ronghua *et*

al . 1984) clearly indicates ecotypic differentiation of the species in New Zea.and, but no attempt is made in that study to relate the observed genotypic variation, particularly of leaf form, to earlier taxonomic descriptions.

Cheeseman (1906) provides a key to separate the three species of *Leptospermum* , and it is interesting to compare the characters used in this key with those used in Allan's (1961) key to the species. Both use the presence or absence of pungent leaves, leaf hairs, position of the capsule relative to the receptacle rim, arrangement of the flowers as solitary or in cymes, and flower size. Cheeseman also includes persistence of the calyx lobes. Neither use the length of the stamens relative to the petals, the key character by which Thompson (1983) separates *Kunzea* from *Leptospermum.*

In classifying kanuka as *Kunzea ericoides* and placing *Leptospermum sinclairii* in synonomy with it along with *Baeckea phylicoides, L. phylicoides, Kunzea peduncularis* and *K. leptospermoides,* Thompson (1983) indicates *K.ericoides* 'has an androecium characteristic of *Kunzea* rather than *Leptospermum.* The filaments are long, usually in two rows, and of a different texture from those of *Leptospermum.* The stamens in the bud are incurved and deflexed so that they are packed into the space above the ovary and below the stigma. This contrasts with the condition in *Leptospermum* where, even in species with relatively long stamens, the filaments curve towards the stigma.' In the key provided by Thompson to separate eight genera in the *Leptospermum* suballiance, the significant characters distinguishing *Kunzea* and *Leptospermum* from the rest are the morphology of the ovule shape. *Kunzea* and *Leptospermum* are similar in having ovules which are anatropous (said of an ovule that is inverted so that its opening, micropyle, is near the point of attachment to the placenta) and oblong in shape. The two genera are keyed out by, for *Kunzea* : ' Stamens considerably longer than the petals, the filaments in the bud inflexed so that the anthers are below the stigmas', and for *Leptospermum* : 'Stamens not or scarcely longer than the petals, the filaments in the bud incurved towards the stigma'. Figures 1 and 2, from plants grown at Botany Division, illustrate the differences in size of stamens relative to petals and in positioning of the stamens relative to the stigmas for *L.scoparium and Kunzea ericoides* , showing that these conform to the generic discrimation given by Thompson, except that for *K. ericoides* there appears to be only one row of filaments.

For the field botanist, the relative size of stamens and petals is a character readily seen with the naked eye which can be used to distinguish manuka and kanuka when they are flowering. Fortunately in New Zealand, in distinguishing between the indigenous members of the *Leptospermum* suballiance, we are not required to resort to microscopic details to make generic identifications. I found difficulty in discerning a further distinguishing feature provided by Thompson which indicates that there is little or no thickening of the back of the cells at the back of the anthers in *Kunzea* , so

that when the pollen is shed the anther is left gaping. *Leptospermum* does not have this character.

The task of revising the genus *Kunzea* for the Flora of Australia rests with Dr H.R. Toelken, Senior Botanist, at the Botanic Gardens of Adelaide and State Herbarium, Adelaide, South Australia. In personal communication, he says that a complete checklist of all the species of *Kunzea* is not yet available since a number of new taxa must still be closely evaluated as to their rank. He indicates that the genus includes about 30 species distributed in moister temperate areas of Australia with a high number of species in New South Wales and south-western Western Australia.

The species indicated as most closely related to *K. ericoides* is *K. ambigua* a specimen of which can be seen in the Australian section of the Christchurch Botanic Gardens from the path which passes between this section and the *Carmellia* section. It was observed flowering in January 1987 and can be readily distinguished from *K. ericoides* by having stamens much longer than the petals, sessile as compared to pedicellate flowers and campanulate (bell-shaped) as compared to a turbinate (top-shaped) receptacle. In general appearance other species of *Kunzea*, of which *K. baxteri, K. ericifolia, K. recurva, K. preissiana,* and *K. parviflora* have been grown in New Zealand as garden subjects, are quite different from *K. ericoides* and *K. ambigua* and Hellmut Toelken suggests the last two might represent one line of development and warrant subgeneric treatment.

From a cursory look at Australian regional floras the placement of Australian plants which most resemble kanuka of New Zealand suggests that the complex now best classified as *Kunzea ericoides* might in future be accorded separate generic status. Recent regional Australian floras have most often used the name *Leptospermum phylicoides* for the close Australian relative of kanuka, while '*ambigua*' is consistently coupled with *Kunzea* (Burbidge and Grey 1970, Willis 1972, Rotheram *et al.* 1975, Lebler 1979, Beadle *et al.* 1982). Galbraith (1967) applied the name *L. ericoides* to a 'very common shrub or small tree in the south and east of Victoria'. Examination of the keys and descriptions in the regional floras does not provide a simple explanation for the frequent allocation by Australian flora writers of plants resembling 'kanuka' to *Leptospermum.* Perhaps use of the diagnosis 'flowers solitary or arranged in axillary clusters' and 'flowers...usually arranged in short, leaf spikes or terminal heads' (Beadle *et al.* 1982) for *Leptospermum* and *Kunzea* respectively, features which can be readily observed from a superficial observation of the species involved, is a possible explanation for the placement of Australian 'kanuka' in *Leptospermum.* A detailed analysis of the evolution of inflorescence structure in Myrtaceae was made by Briggs and Johnson (1979). By their definition, and as indicated in Figures1 and 2, the inflorescences of both *L. scoparium* and *K. ericoides* are monadic (consisting of a solitary flower) and blastotelic (ending in a vegetative bud or sprout), but show flexibility in being auxtolic (continuing vegetative growth beyond the

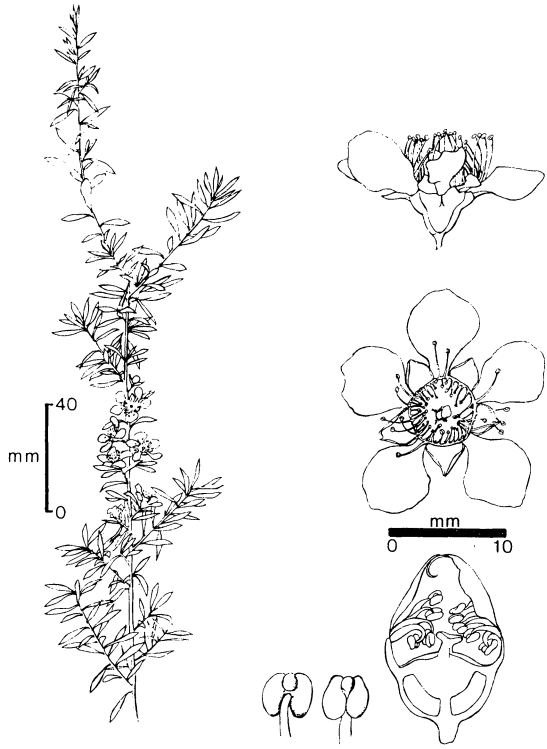


Figure 1. *Leptospermum scoparium* showing a flowering shoot with solitary axillary flowers, transverse and longitudinal views of the flower, longitudinal section of the bud to show the position of the stamens relative to the stigma, and views of the anther above and below the point of attachment of the filament.

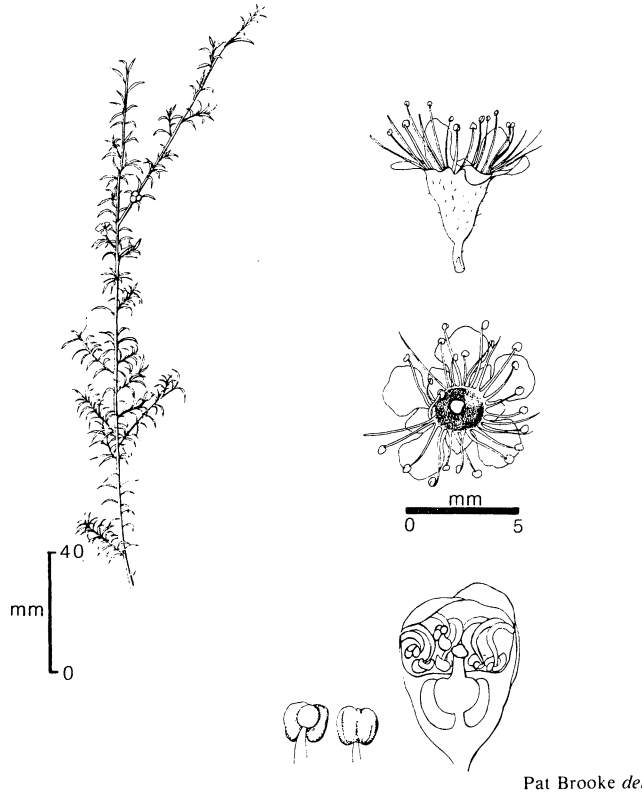


Figure 2. *Kunzea ericoides*. Details as for Figure 1. In this sparsely flowering specimen, flowers were soliatary. In more profusely flowering specimens, although single flowers are borne on each node, the grouping together of flowers on successive nodes, and in some cases the absence of subtending leaves on the node, results in the formation of a compound inflorescence.

flowering region) or anauxotelic (terminating in an abortive vegetative apex) the latter being more characteristic for lateral shoots and more frequent in K. ericoides than L. scoparium . Most species of Kunzea characteristically have terminal inflorescences.

What should be clear from this account is the confusion associated with the classification of manuka and kanuka. It is only through greater understanding of the relationship of the New Zealand species to their relatives in Australia that we can come closer to their correct taxonomic classification. At this stage it may be concluded, that the species which in the past has been called L. phylicoides in Australia is closely related to that called L. ericoides in New Zealand, that these taxa can be readily distinguished from other species of *Leptospermum* , and that they show close relationship to *Kunzea* in primary floral characteristics. Further study is required to determine whether representatives of *K. ericoides* as they occur in Australia and New Zealand respectively deserve separate taxonomic status and whether further subtaxa occur within either country. While Thompson (1983) treats *Leptospermum sinclairii* as a synonym of *Kunzea ericoides* , plants raised at Lincoln from seeds collected from *Leptospermum sinclairii* on Great Barrier Island have morphological characteristics which clearly distinguish them from all plants of *Kunzea ericoides* in New Zealand. Both Dr B.P.J. Molloy and W.R. Sykes of Botany Division visited Great Barrier Island in 1986 and in observing *'sinclairii'* in the wild in close proximity to both manuka and kanuka express the opinion that it warrants taxonomic recognition. There is, however, likely to be as much or greater difference between the various populations in Australia included by Thompson (1983) in *Kunzea ericoides* as what there is between *K. sinclairii* and the more widely distributed forms of *K ericoides* in New Zealand. Support for this conclusion is indicated in the Flora of the A.C.T. (Burbidge and Gray 1970) where three points in the range of variability of *Leptospermum phylicoides* are described which indicate variability different from that shown by *Kunzea ericoides* in New Zealand. It would indeed be surprising if there were not some evolutionary differentiation of New Zealand and Australian representatives of *K. ericoides* after some fifty to eighty million years of geographic isolation.

For the field ecologist in New Zealand who is often required to distinguish between manuka and kanuka without the assistance of flowers and fruit, as a 'rule of thumb' for identification purposes it is useful to refer back to Daniel Solander and his method of distinguishing these species on the first occasion they were encountered by a plant taxonomist. For the tea tree whose identify is in doubt, take a shoot and rub it between the thumb and forefinger. If the tissue is soft and the smell strongly aromatic then the specimen can be known as kanuka or *Kunzea ericoides*. If the tissue is harsh to the feel and is without scent or only mildly aromatic the specimen is manuka and can be left in *Leptospermum*.

Acknowledgements
To Pat Brooke for the illustrations, Elizabeth Edgar for improvements to the text and translation of Solander's manuscript, and Diane Percy and Andrew Purdie for assisting my studies of tea trees.

References

Allan, H.H. 1961 *Flora of New Zealand, Volume I.Indigenous Tracheophyta.* Government Printer, Wellington, 1085 pp.

Beadle, N.C.W., Evans, O.D., Carolin, R.C. & Tindale, M.D. 1982 *Flora of the Sydney Region..* Third Edition. Reed, Singapore, 720 pp.

Bentham, G. 1867 *Flora Australiensis: A Description of the Plants of the Australian Territory. Volume III. Myrtaceae to Compositae.* Lovell Reeve, London. 704 pp.

Briggs, B.G. & Johnson. L.A.S. 1979 Evolution in the Myrtacea - evidence from inflorescence structure. *Proceedings of the Linnean Society of New South Wales 102,* 157-256

Burbidge, N.J. & Gray, M. 1970 *Flora of the Australian Capital Territory.* Australian National University Press, Canberra. 447 pp

Cheeseman, T.F. 1906 *Manual of the New Zealand Flora.* Government Printer, Wellington. 1198 pp.

Cockayne, L. 1917: Notes on New Zealand floristic Botany including descriptions of new species, & c. (No 2). *Transactions and Proceedings of the New Zealand Institute 49,* 56-65.

Edgar, E., Garnock-Jones, P.J., Given, D.R., Macmillan, B.H., Molloy, B.P.J., Sykes, W.R. & Webb, C.J. 1983 Report of DSIR/CSIRO Colloquium on plant taxonomy, Canberra Australia, 26 September - 2 October 1983. *Botany Division Internal Report.* 75 pp.

Forster, G. 1786a *Florulae Insularum Australium Prodromus* Gottingen. 103 pp.

Forster, G. 1786b *De Plantis Esculentis Insularum Oceani; Australis. Commentatio Botanica.* Berlin. 80 pp.

Forster, J.R. & Forster, G. 1776 *Characteres Generum Plantarum quas in Itinere ad Insulas Maris Australis Collegerunt, Descripserunt, Delinearunt, Annis MDCCLXXII-MDCCLXXV.* London. 150 pp.

Galbraith, J. 1967 *Wildflowers of Victoria.* Third Edition.Longmans, Croydon, Australia. 163 pp.

Hooker, J.D. 1853 *The Botany of the Antarctic Voyage II Flora Novae-Zealandiae. PartI. Flowering Plants.* Lovell Reeve, London. 312 pp.

Kirk, T. 1889 *The Forest Flora of New Zealand.* Government Printer, Wellington. 345 pp.

Kirk, T. 1899 *The Students' Flora of New Zealand and the Outlying Islands*. Government Printer, Wellington. 408 pp.

Lebler, B.A. 1979: *The Leptospermums of South-Eastern Queensland.* Advisory leaflet No. 1473, Division of Plant Industry, Department of Primary Industries, Queensland. 16 pp.

Richard, A 1832 *Voyage de Decouvertes de L'Astrolabe, Botanique. Essai d'une Flore de la Nouvelle-Zelande.* Paris. 376 pp.

Rotheram, E.R., Blaxell, D.F., Briggs, B.G. & Carolin, R.C. 1975 *Australian Flora in Colour. Flowers and Plants of New South Wales and Southern Queensland.* Reed, Sydney. 191 pp.

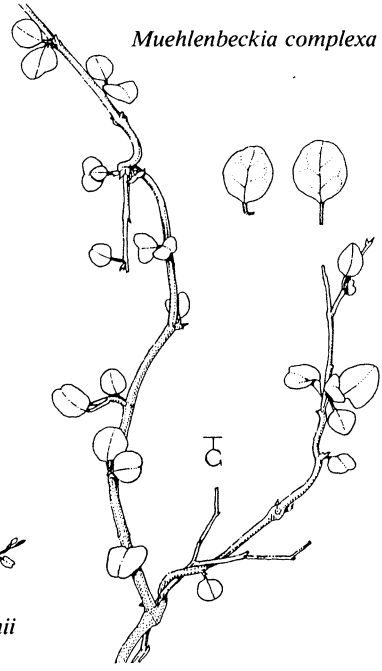
Simpson, G. 1945 Notes on some New Zealand Plants and descriptions of new species (No. 4). *Transactions of the Royal Society of New Zealand 75* , 187-202.

Thompson, J. 1983 Redefinitions and nomenclatural changes within the *Leptospermum* suballiance of Myrtaceae.*Telopea 2* , 379-383.

Willis, J.H. 1972 *A Handbook to Plants in Victoria. Volume II Dicotyledons*. Melbourne University Press, Melbourne. 832 pp.

Yin, R., Mark, A.F. & Wilson, J.B. 1984 Aspects of the ecology of the indigenous shrub *Leptospermum scoparium* (Myrtaceae) in New Zealand. *New Zealand Journal of Botany 22* , 483-507.

Muehlenbeckia astonii



Muehlenbeckia complexa