Dawson, J.W. 1967: A growth habit comparison of *Metrosideros* and *Fiscus*. *Tuatara*15(1):16-24.

Fiscus sometimes known in temperate regions as the fig, comprises about 800 speces which are widely distributed in the warmer parts of the world. *Metrosideros* with its strangling epiphyte species and root climbing lianes as well as ground rooting trees and shrubs, provides a remarkable if less exuberant ecological parallel to *Fiscus*.

Metrosideros is a genus of the Myrtaceae, notable for the brightly coloured flowers of some species, which ranges from New Zealand to Malaya and Hawaii with an isolated species in South Africa. Thus its geographic range is much less than that of *Fiscus*, and it also encompasses fewer species, perhaps 50, although this figure would be increased if the related genus *Mearnsia* were to be united with it. In New Zealand *Metrosideros* is largely restricted to the lowlands, and in the tropics largely to montane rain forests. *Metrosideros* is thus suited to a lower temperature regime than *Ficus*, a point which is emphasised by the presence of protective bud scales in a number of the species.

Key words: Growth habit; Metrosideros; Metrosideros excelsa; Northern Rata; Metrosideros robusta; Pohutukawa; Metrosideros umbellata; Southern Rata; Climbers; Fiscus; Habit; Strangulation.

A growth habit comparison of *Metrosideros* and *Ficus*

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THE GENUS *Ficus*, best known in temperate regions by the species providing the fig, comprises about 800 species which are widely distributed in the warmer parts of the world. The genus is conspicuous in lowland tropical rain forests by virtue of its wide range of growth habit, many species coming into the category known as strangling epiphytes, others being root climbing lianes and others again ground rooting trees or shrubs. The latter produce aerial roots very freely and in this respect the extreme case is the 'banyan', and other species of similar habit, whose branches, supported by aerial roots, may spread out over acres of ground.

From my knowledge of the New Zealand lowland forest and from visits to New Caledonia and Fiji it has occurred to me that *Metrosideros*, with its several strangling epiphyte species and root climbing lianes, as well as ground rooting trees and shrubs, provides a remarkable if less exuberant ecological parallel to *Ficus*.

Metrosideros is a genus of the Myrtaceae, notable for the brightly coloured flowers of some species, which ranges from New Zealand to Malaya and Hawaii with an isolated species in South Africa. Thus its geographic range is much less than that of *Ficus*, and it also encompasses fewer species, perhaps 50, although this figure would be increased if the related genus *Mearnsia* were to be united with it. In New Zealand *Metrosideros* is largely restricted to the lowlands, and in the tropics largely to montane rain forests. *Metrosideros* is thus suited to a lower temperature regime than *Ficus*, a point which is emphasised by the presence of protective bud scales in a number of the species.

Strangling Epiphytes

Of the eleven New Zealand species one — *Metrosideros robusta* — is a strangling epiphyte. This species is common and conspicuous in the rain forests from the far north to the north of the South Island. It establishes on a wide variety of host species, but is most common on the emergent conifers and, by virtue of this, itself becomes a tall emergent. The details of its growth habit and in particular whether or not it kills its host have been the subject of argument. Kirk (1872) claimed that the roots of the *Metrosideros* Zotov (1948) questioned this view and postulated that the adverse effect on the host is due to the overshadowing of its foliage by that of the epiphyte. It has also been suggested that root competition may play a part (Simpson and Thompson, 1942). A quite different suggestion is that the *Metrosideros* has no significant effect on the host. It does not establish until the host is mature, so by the time it has achieved independance the host might well have died of old age (Zotov 1948).

It certainly seems clear that the roots of *Metrosideros robusta* do not completely enclose the host trunk as is the case with many of the 'strangling fig' species. In the latter the young descending roots form a complete network around the host trunk, but in *Metrosideros robusta* the one to several vertically aligned roots are usually disposed to one side of the host trunk, except near the ground where they often enclose it with branch roots. In the simplest case there is a single main root ,which is attached to the host in the early stages by a number of slender, horizontal 'girdling' roots (Fig 1). The main root often branches near the ground to form a tripod arrangement. (Fig. 1; Fig. 2, left). Thus the growth habit of *Metrosideros robusta* is very similar to that of the New Zealand shrub epiphyte *Griselinia lucida* (Dawson 1966), although the latter does not appear to become self supporting.

The habits of *Metrosideros* species outside New Zealand are not so well known, but at least one species in New Caledonia is a strangling epiphyte and has a very similar growth habit to *Metrosideros robusta* (Fig. 3, left). The sole Fijian species — *M. collina* var. *vitiensis* — is also frequently a strangling epiphyte in montane forests (Fig. 3, right). This species is notable in that it also plays a quite different role as a terrestrial shrubby pioneer following fire and in this regard seems to provide a parallel with *Leptospermum* in New Zealand. *Metrosideros robusta* in New Zealand may also occur terrestrially, but not so commonly as the Fijian species. Possibly two species of *Metrosideros* in the New Hebrides are strangling epiphytes and there may be others elsewhere. In general, in Fiji and New Caledonia at least, *Ficus* 'stranglers' give way to *Metrosideros* 'stranglers' at higher elevations, but there is considerable overlap and in both places I have noted instances where *Ficus* and *Metrosideros* shared the same host.

Production of aerial roots by Terrestrial Species

Three of the terrestrial tree species of *Metrosideros* — *M. excelsa* (pohutukawa), *M. umbellata* (southern rata) and *M. kermadecensis* — resemble many of the terrestrial *Ficus* species in their ability to produce aerial roots. Some individuals of *Metrosideros excelsa* in particular may produce an abundance of pendant roots from their

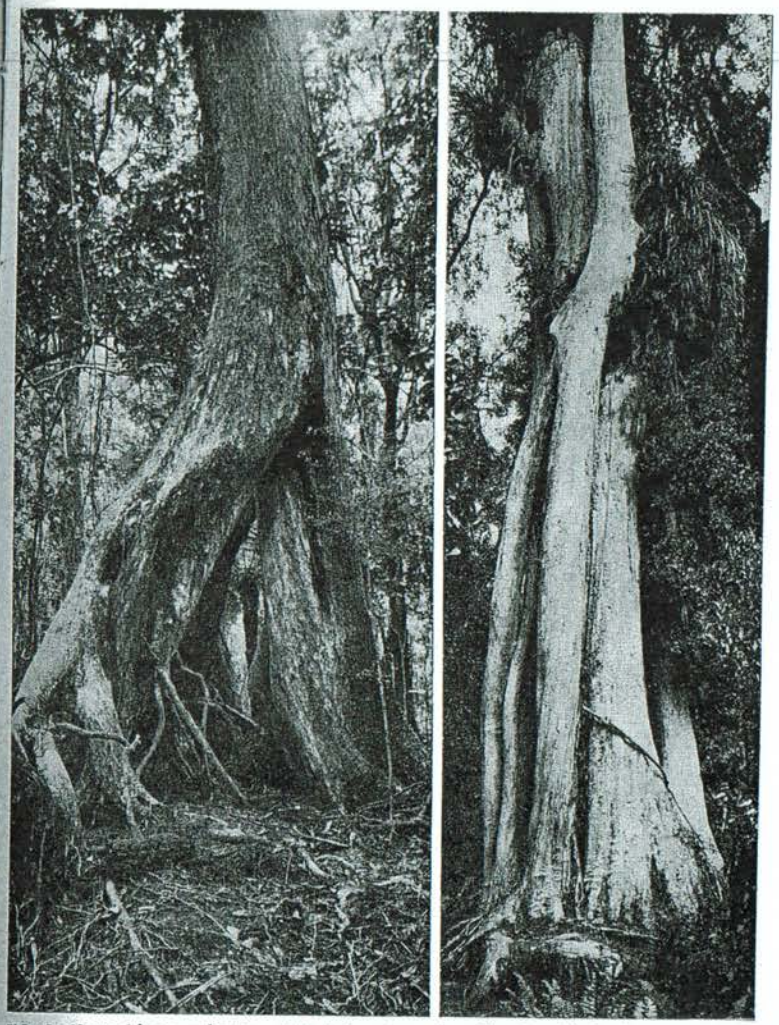

FIG. 2: *Metrosideros robusta*. Left: Later stage than Fig. 1 with the host tree gone and showing 'tripod' arrangement of lower part of root system. Scenic Reserve Paraparaumu. Right: A more complicated example probably involving 2 individuals of the *Metrosideros*. Kaitoke Reserve. Photos: M. D. King.

FIG. 1: (A) Roots of *Metrosideros robusta*. (B) Dead trunk of host tree, probably a rimu *(Dacrydium cupressinum)*. (C) Hinau *(Elaeocarpus dentatus)*. Below letter B 2 dead 'girdling' roots of the *Metrosideros* can be seen. Plateau Reserve, Hutt Valley. Photo: M. D. King.
INSET: Younger stage of *Metrosideros robusta*, on *Beilschmiedia tarairi*, showing

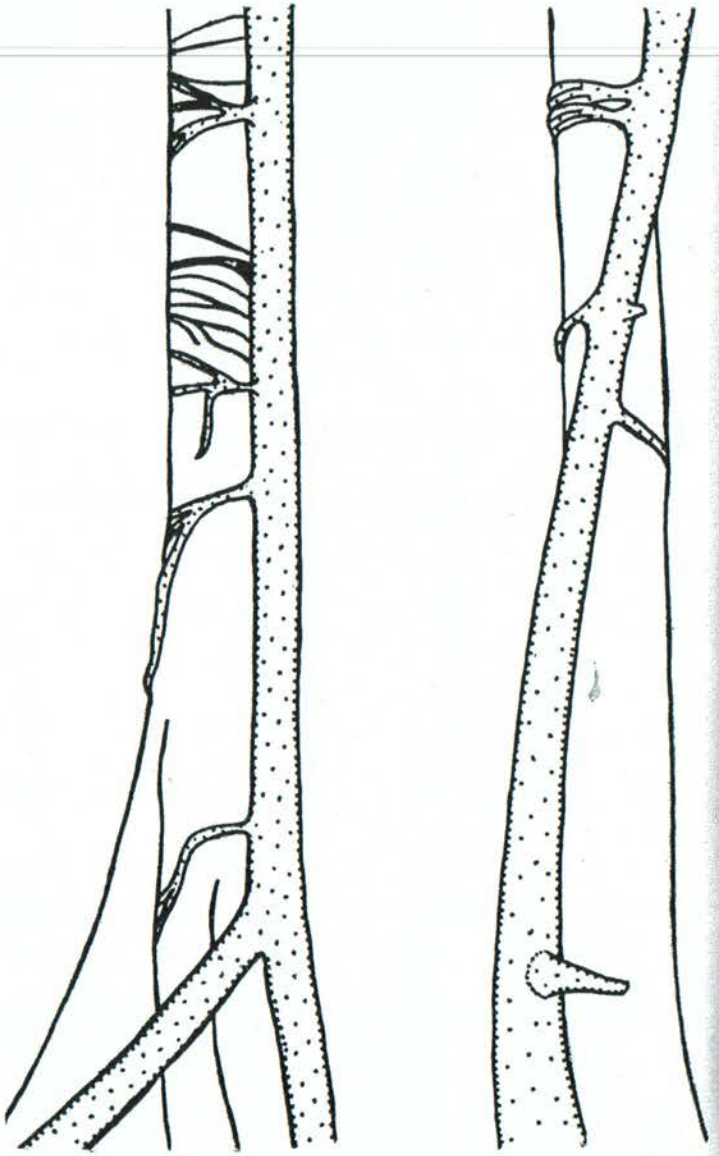

FIG. 3: Left: Young epiphytic *Metrosideros* sp. Monts Koghi, New Caledonia.
Right: Older epiphytic *Metrosideros collina*. Nadarivatu, Fiji.
Drawn from photographs.

FIG. 4: *Metrosideros excelsa* (Pohutukawa) showing aerial roots. New Plymouth.

appear to make contact with the ground except where they are able to grow down one of the usually several trunks of the tree. The extent of aerial root production by these three species is comparable to that of some of the *Ficus* species, but falls far short of the extreme 'banyan' habit exhibited by other members of that genus.

Shrubs

Probably none of the New Zealand species can be regarded as true shrubs. *M. perforata* and to a lesser extent, *M. diffusa* assume a shrubby habit when they establish in open sites, but they are typically forest lianes. It is interesting to note that some tropical lianes also grow and flower as shrubs in similar circumstances (Richards, 1952 p. 105). *M. excelsa, M. kermadecensis, M. umbellata* and *M. parkinsonii* can flower when they are quite small, but they all achieve the dimensions of trees, even though the last is only a small tree and in some localities may persist for a long time at the shrub stage.

In New Caledonia on the other hand there are several species, mostly undescribed, which are true shrubs. These commonly grow along stream margins, or even on rocks in the middle of streams, and have a four ranked leaf arrangement which is very reminiscent of *Hebe* in New Zealand. I am not aware of shrub species of *Metrosideros* anywhere else.

Lianes

Six of the New Zealand species of *Metrosideros* — *M. fulgens, M. perforata, M. diffusa, M. colensoi, M. carminea* and *M. albiflora* — are root-climbing forest lianes very similar in habit to the climbing species of *Ficus*. Seedlings of these *Metrosideros* species establish on the ground and their slender stems attach themselves by adventitious roots to tree trunks. The leaves at this stage are in most of the species flattened against the host trunk to form a mosaic (Fig. 5, inset).

Eventually the ascending stems reach the tree crown seventy or more feet above ground level and in the full light send out many more or less horizontal branches which bear the flowers.

The climbing stems lower down lose their attaching roots and separate from the host trunk. The species vary in the maximum size attained by these stems but those of *Metrosideros fulgens* and *M. perforata* in particular, may become quite massive. The stems of the latter species shown in Fig. 5 are ten inches in diameter.

I am not aware of liane species of *Metrosideros* elsewhere than New Zealand although some species of *Mearnsia* in New Guinea

FIG. 5: *Metrosideros perforata*. 2 large stems supported by a rimu *(Dacrydium cupressinum)*. Kaitoke Reserve. Photo: M. D. King.
INSET: Early stage showing leaf mosaic formed by slender climbing stems. Mangamuka, near Kaitaia. Photo: B. V. Sneddon.

Although a few species of *Ficus* are cultivated quite successfully out-of-doors in the warmer parts of New Zealand there are no native species, nor is there any evidence that the genus occurred in New Zealand in former geological times. Probably in the past as now *Metrosideros* played a role in the New Zealand rain forests parallel to that of *Ficus* in tropical rain forests. Was New Zealand the centre of origin, or at least diversification of *Metrosideros* with later migration into montane tropical areas ? This seems a likely possibility, but the question cannot really be seriously considered until the genus and others related to it have been studied in greater detail, particularly in the tropical areas.

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