Mistletoes in Wellington Conservancy

Current status and management requirements

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Department of Conservation
Te Papa Atawhai

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Current status and future management

by John Sawyer and Aalbert Rebergen

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I te timatanga ko te kore
Engari te wehenga Matua herenga tangata
me nga mea katoa.
Ka hanga a Ihoa i nga tamariki a Tane, a Tangaroa, me ngai tatou te tangata
Ka hoatu nga tamariki a Tane, tona reo
Ka hoatu nga tamariki a Tangaroa, tona reo
Ka hoatu ngai tatou te tangata, to tatou reo
No reira i roto i tenei Ao, ka rongo atu
Te reo o nga tamariki katoa o Tane
Te reo o nga tamariki katoa o Tangaroa
Te reo o tena Iwi o tena Iwi o te tuawhenua
Tihei Mauri-ora.

In the beginning there was nothing
But on the separation of the parents, mankind and everything else came into being
God created the children of Tane (God of the forests), Tangaroa (God of the seas)
and he created us, mankind.
He gave the children of Tane their language
He gave the children of Tangaroa their language
He gave us, mankind, our language.
Therefore, if you listen to the environment you will hear
The language of Tane's children
The language of Tangaroa's children
and you will hear the language spoken by the different peoples of the world
Tihei Mauri-ora!!

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Abstract

The goal of mistletoe conservation in Wellington Conservancy is to ensure that all indigenous species of mistletoe continue to survive in the wild throughout their known range and that populations become or remain self-sustaining. Eight indigenous species of mistletoe have been recorded in Wellington Conservancy although one (Alepis flavida) is now believed to be extinct in the region.

The objectives of mistletoe conservation in Wellington Conservancy are presented in this report. Information about each mistletoe species is also presented, including maps of their distribution, notes on their distinguishing features, habitat preferences, and flowering and fruiting times. Threats to mistletoes and their national and regional conservation status are described and an illustration and photographs of each species are provided.

Recommendations are made about protection and management of sites supporting mistletoes. The report describes ways in which people can assist by gathering information about mistletoe distribution and ecology for inclusion on the Department's plant database. A database of mistletoe occurrence records for Wellington Conservancy is provided.

None of the species described in this report should be collected from the wild. Information about the distribution, ecology or threats to mistletoe species may be sent to the Department of Conservation for inclusion on the plant database.

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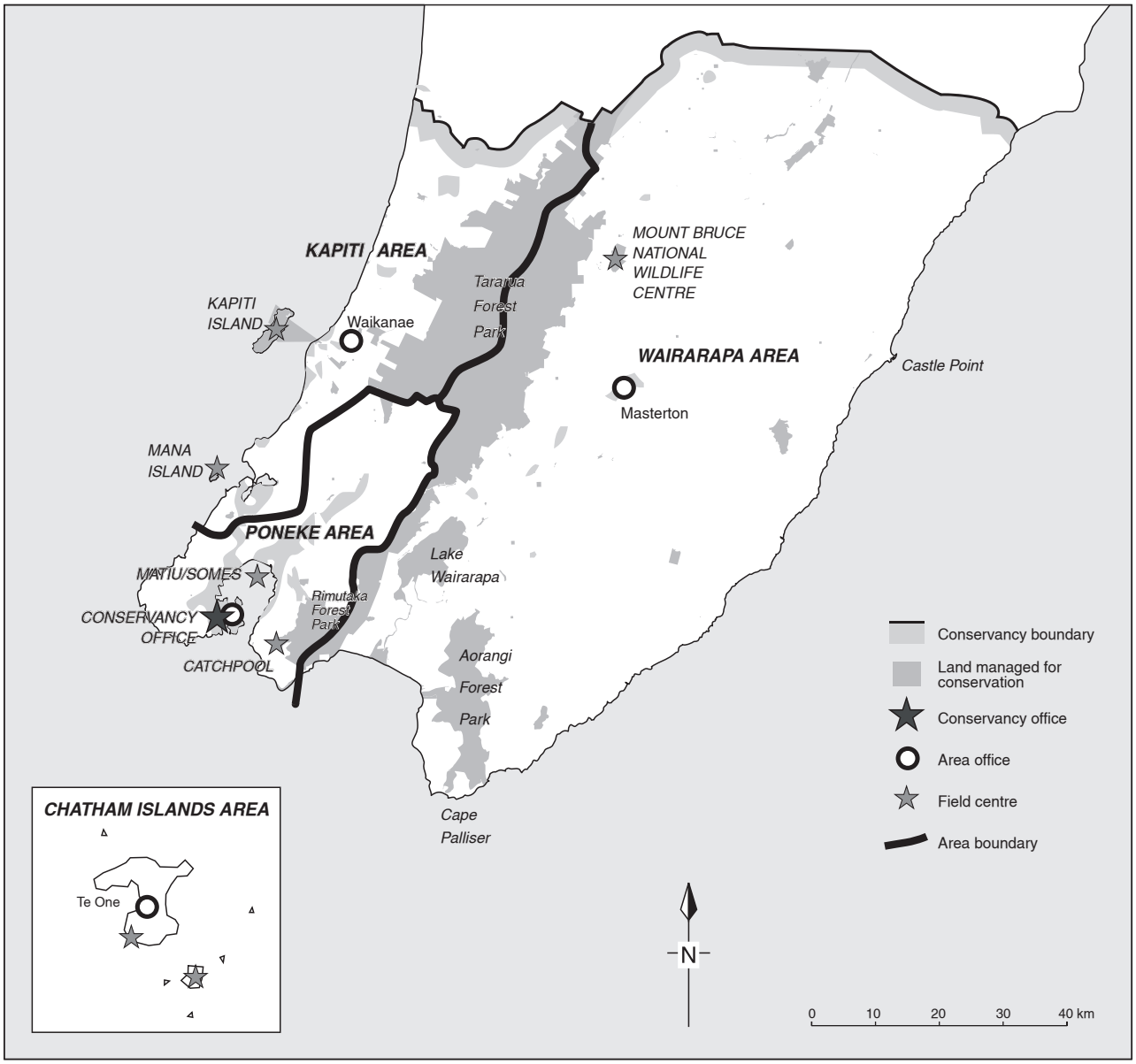
1. Introduction

Eight indigenous mistletoe species have been recorded in Wellington Conservancy[1] (Table 1). This report presents biogeographical and ecological information about each of those species.

Wellington Conservancy (Figure 1) is one of the thirteen administrative regions of the Department of Conservation. Wellington Conservancy also encompasses the Chatham Islands but no mistletoes have been found there.

Figure 1: Location and extent of Wellington Conservancy



For each species, distribution maps, photographs and illustrations are presented. The information contained in this report has been obtained from Wellington Conservancy's native plant database held in Wellington. Information about indigenous vascular plant species has been compiled onto that database that was established in 1993. Mistletoe records on the database date from 1875 (when Buchanan first recorded mistletoes from Wellington Botanic Garden.

[1] One exotic mistletoe species (Viscum album, a native of Europe) was once recorded from the Wairarapa but is now believed to be extinct in the conservancy.

The purpose of this report is to provide information about the status of mistletoe species in the wild in Wellington, and their immediate management needs so that they may be protected more effectively. This report aims to raise awareness of the indigenous mistletoes of the region and to focus attention on sites that support them. It describes some of the key actions required to protect mistletoes in the wild, and explains how people can assist with gathering information about mistletoe distribution for inclusion on the Department's plant database. The information provided will be used to monitor the changing status of mistletoes. It will also be used as the basis for research to determine better ways to protect and manage mistletoes both in the wild and in cultivation.

A national recovery plan has been prepared for native loranthaceous mistletoes (Dopson, in press). The information contained in this report will support effective implementation of actions identified in that plan.

2. Goal and objectives of mistletoe management

The goal of mistletoe conservation in Wellington Conservancy is "to ensure that all indigenous species of mistletoe continue to survive in the wild throughout their known range and that all viable populations become or remain self-sustaining". This goal is in accord with the Department's Plant Conservation Strategy for Wellington Conservancy (Empson & Sawyer 1996) and the National Species Recovery Plan for the Loranthaceous mistletoes (Dopson, in press).

Objectives of mistletoe conservation management in Wellington Conservancy are as follows:

- Survey historic mistletoe sites (not visited since 1990) especially for populations of nationally and regionally threatened mistletoe species. Record when found using a species record sheet. Include distribution information on the National Native Plants Database.
- Record mistletoe populations when they are found during fieldwork, using a species record sheet, and include distribution information on the plant database.
- Legally protect populations of each indigenous mistletoe species in the region, throughout their range.
- Protect mistletoe populations from threats (e.g., control possums and band host trees to protect mistletoes from possums) and monitor to ensure protection measures are effective (e.g., regularly check bands to ensure they are not constricting growth of hosts).
- In consultation with land owners, ensure physical protection (e.g., pest-animal control, banding of hosts, fencing of remnants) of mistletoe populations that occur on private land.
- Develop and implement a monitoring programme to regularly inspect (at least bi-annually) a representative sample of mistletoe populations throughout the region in order to determine population trends and dynamics, and to assess the viability of these populations (in line with the national standard procedure).
- Undertake research: to determine how to mitigate threats to mistletoe survival; to determine species limiting factors; and to determine how to cultivate and translocate mistletoe species.
- Raise public awareness of mistletoe species and their conservation needs by regular media releases about discoveries of populations, measures taken to protect mistletoes and by disseminating this report.
- Translocate mistletoe species to reserves (including islands such as Kapiti, Mana and Matiu/Somes Island) to establish self-sustaining populations.
- Work with iwi to determine the importance to Maori of mistletoe and to raise awareness of mistletoe biology, ecology and conservation needs.
- Implement population management plans for nationally-threatened mistletoe species (see Townsend et al. 1998).

3. Methods

The information used to create this report has been taken from the native plant database for Wellington Conservancy of the Department of Conservation. Information has been compiled onto that database since 1993 from various sources including:

- Protected Natural Areas Programme reports compiled for ecological districts in Wellington Conservancy (Ravine 1992, Ravine 1995, Beadel et al. 2000).
- Plant checklists for areas in Wellington Conservancy (Sawyer 1998, Druce 1972).
- New Zealand herbaria (such as Auckland, Christchurch and Wellington).
- Scientific publications (Duguid 1990, Zotov et al. 1938)
- Vegetation survey reports (Wassilieff et. al. 1986, WERI 1990, SSWI)
- Natural history journals (Beddie 1938)
- Mistletoe field guides and books (de Lange & Norton 1997)
- Field reports by botanists (including species record sheets completed by staff of the Department of Conservation and members of Wellington Botanical Society).

Distribution information about each indigenous mistletoe species in Wellington Conservancy was used to produce dot distribution maps. Those maps depict a generalised distribution of each species range. Some species may be more widespread than depicted due to lack of survey in areas where mistletoes may still occur. Also species may not have been recorded at all sites surveyed either because of their cryptic nature or simply because they were overlooked. Other species may be less common than they appear on the maps because some records are old and mistletoe populations may already have disappeared from those sites. Some dots represent individual plants.

4. Mistletoe species in Wellington Conservancy

The eight indigenous species of mistletoe recorded in Wellington Conservancy are shown in Table 1. They are all members of two plant families: Loranthaceae and Viscaceae. They are all "hemi-parasites" which means they attach themselves and derive nourishment from another organism (in this case another plant) but also derive nourishment from their own photosynthetic activity. The loranthaceous mistletoes (also known as the leafy mistletoes) are predominantly arboreal xylem parasites and depend on their host for water, nutrients and carbon (Barlow 1966). The mistletoes of the Viscaceae (also known as dwarf mistletoes) are not leafy but have flattened photosynthesising stems.

There are only two other mistletoe species native to the New Zealand botanical region, *Trilepedia adamsii* (Adams's mistletoe) and *Muellerina celastroides* (regarded as a vagrant from Australia where it is common). Neither has been recorded in Wellington Conservancy and both are now considered extinct in New Zealand.

There are no mistletoe species endemic to Wellington Conservancy. Seven species in the region are considered endemic to the New Zealand Botanic Region. *Ileostylus micranthus* is a near endemic having been recorded from only one other site outside New Zealand, Norfolk Island. No mistletoe species reaches its distribution limits in Wellington Conservancy.

In Wellington Conservancy six mistletoe species are of national conservation concern, either because they are in decline (de Lange et al. 1999) or because so little information is known about them that it is impossible to be certain of their status. The status of each species is described in each of the following sections. More information about some of those threatened species may be found in "Plants of National Conservation Concern in Wellington Conservancy" (Sawyer et al. 1998).

A general discussion follows about each indigenous mistletoe species including information about distinguishing features, habitat preferences, flowering and fruiting times and an illustration of the species. Principal hosts are identified for each species. Those lists are not complete but serve to indicate the range of hosts in the region. For a complete checklist of mistletoe hosts see de Lange et al. (1997). Distributions of the eight indigenous mistletoe species in Wellington Conservancy are shown in Figures 2–9 with photographs of each species. These distribution maps show all records from 1875 (the first record of mistletoe in Wellington) to the present. 'Historic' records are those made prior to 1990. Threats to mistletoes in the wild are described in Section 5.

TABLE 1: MISTLETOE SPECIES IN WELLINGTON CONSERVANCY

LATIN NAME[1]	COMMON NAME	SYNONYMS
1. Loranthaceous		
Alepis flavida	Yellow mistletoe, golden mistletoe, pirita, piriraki	*Elytranthe flavida* (Hook.f.) Engl., *Loranthus flavidus* Hook. f.
Ileostylus micranthus	Green mistletoe, scrub mistletoe, papauma, small-flowered mistletoe, pirirangi, pikirangi, pirinoa	*Loranthus micranthus* Hook. f.
Peraxilla colensoi	Scarlet mistletoe, korukoru, pirinoa, pirita, roeroe, piriraki	*Elytranthe colensoi* (Hook.f.) Engl., *Loranthus colensoi* Hook. f.
Peraxilla tetrapetala	Red mistletoe, pikirangi, pirita, roeroe, pirinoa	*Elytranthe tetrapetala* (Murr) Engl., *Loranthus tetrapetalus* Murr., *Loranthus decussatus* Kirk, *Loranthus punctatus* Col., *Loranthus fieldii* Buchan.
Tupeia antarctica	White mistletoe, tapia, pirita, kohuorangi, tirau-riki, pirinoa	*Viscum antarcticum* Forst. f., *Viscum pubigerum* A. Cunn., *Tupeia cunninghamii* Miq., *Tupeia pubigera* Miq.
2. Viscaceous		
Korthalsella salicornioides	Mistletoe, dwarf mistletoe, leafless mistletoe	*Viscum salicornioides*
Korthalsella clavata	Mistletoe, dwarf mistletoe, leafless mistletoe	*Viscum clavatum*, *Korthalsella lindsayi* var. *clavata*
Korthalsella lindsayi	Mistletoe, dwarf mistletoe, leafless mistletoe	*Viscum lindsayi*, *Heterixia lindsayi*

[1] *The full authority for each taxon is provided in Sections 3.1 to 3.8.*

4.1 *ALEPIS FLAVIDA* (HOOK. F.) TIEGH.

Distinguishing features

This species is a shrub that can grow up to 2 m across. It has leathery leaves that are 2–6 cm long , narrow and dull green with deciduous tip. The leaves sit in pairs on opposite sides of the stem and are thick and fleshy with a matt surface. The margins of the leaves are red and are rough to touch. Veins are visible on the lower surface of the leaves. Its flowers are small, with orange-yellow to yellow tepals that open right back. The fruit are small, shiny, translucent oval berries (approximately 4–5 mm long) and ripen to yellow or gold, although fruit have been recorded as yellow, green and orange on herbarium sheets at Landcare (CHR).

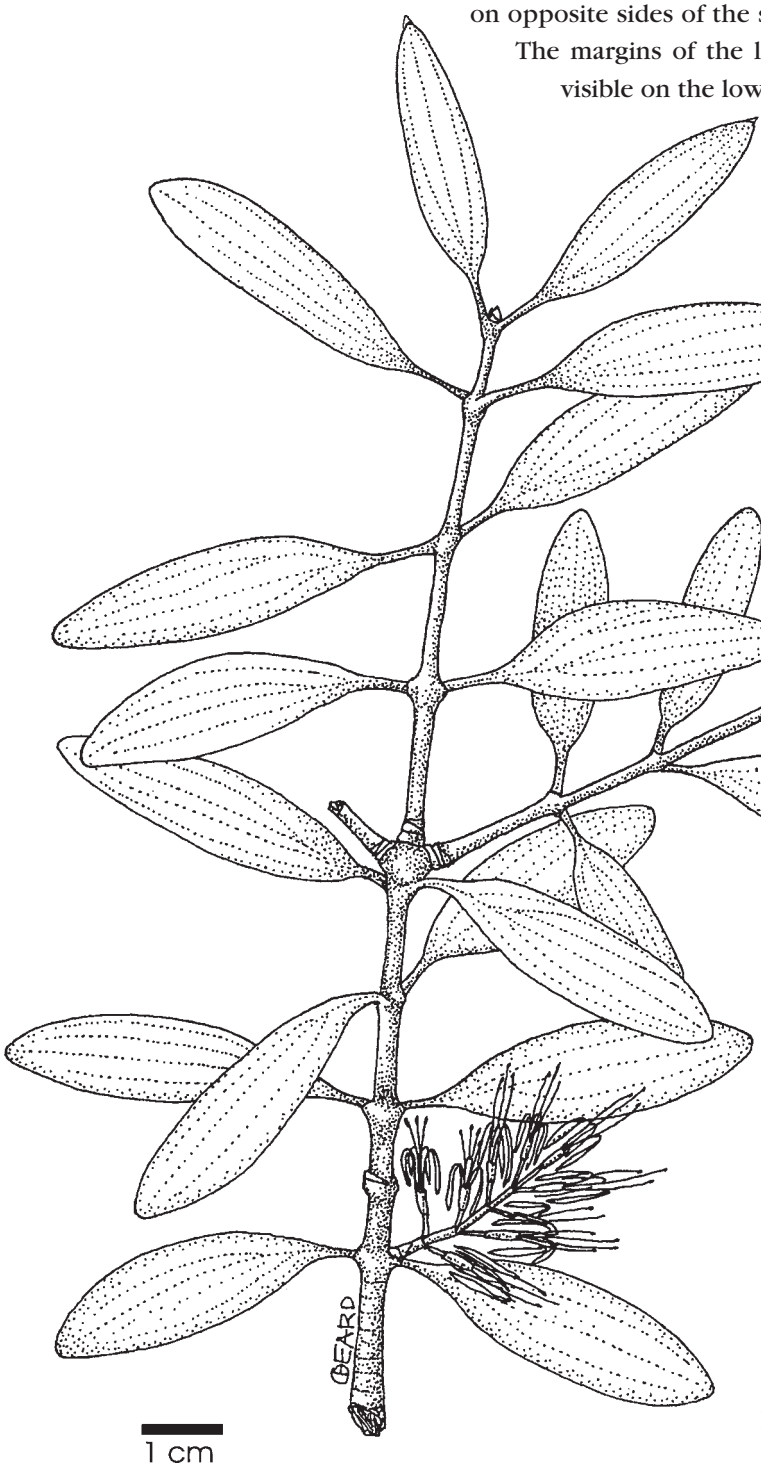


Illustration by Catherine Beard

Habitat requirements

Its host is most commonly mountain or black beech (the only host recorded in Wellington Conservancy) but it has been recorded on 13 species, all indigenous to New Zealand (de Lange et al. 1997). In the North Island the species is dispersed by bellbird (*Anthornis melanura*). It has probably never been common in the North Island and is now believed extinct in Wellington Conservancy.

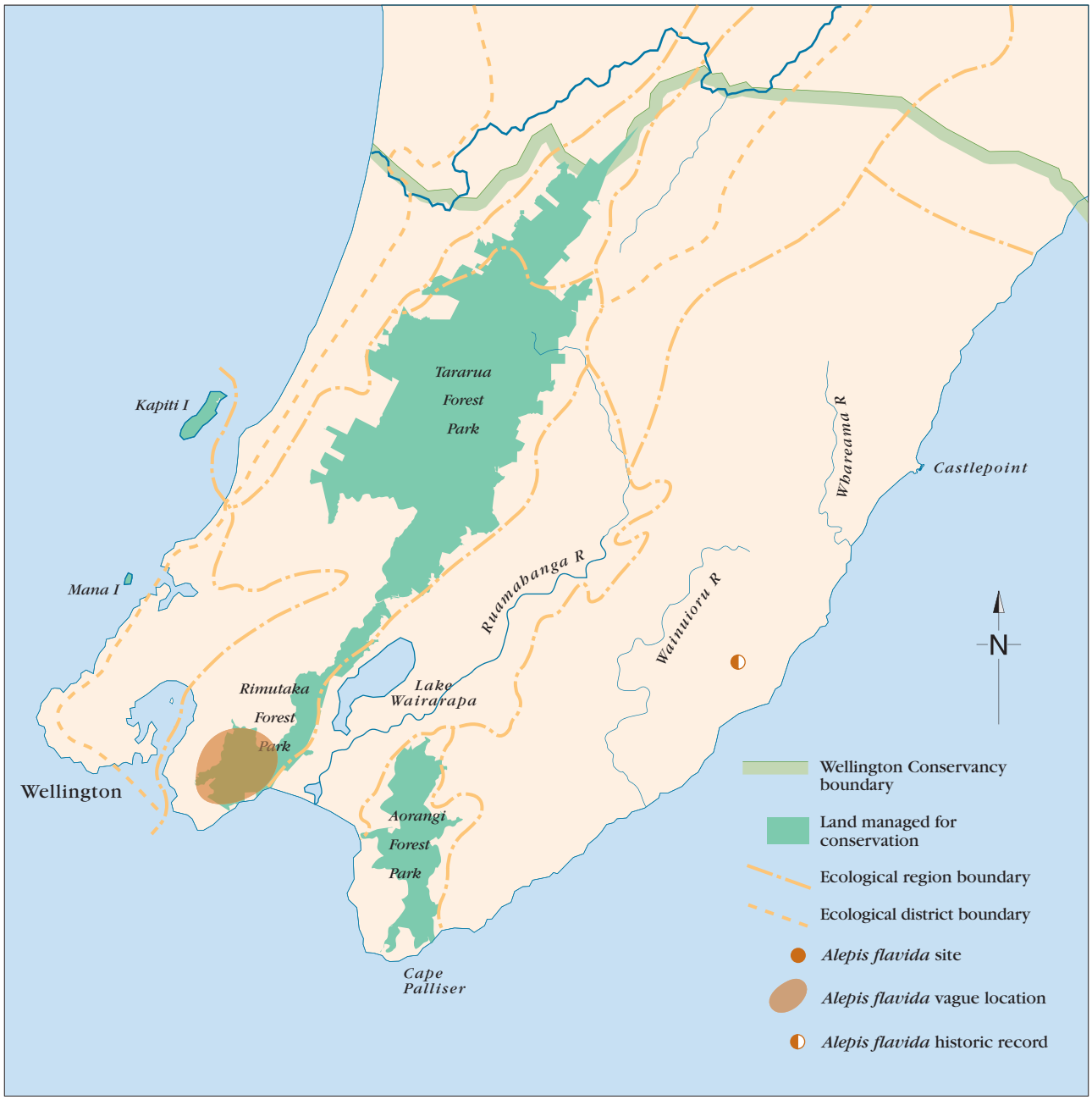
Flowering and fruiting

Flowers: December–February.
Fruit: from January.

Status

This species is now believed to be extinct in Wellington Conservancy (Sawyer et al. 1998) despite having been recorded from the Rimutaka Range (Zotov et al. 1938, Druce 1980) and the Kaiwhata River Valley in eastern Wairarapa (by Tony Druce in 1947 – CHR 82231). It has been nationally classified as "Threatened – Declining" by the Threatened Plants Committee of the New Zealand Botanical Society (de Lange et al. 1999).

FIGURE 2: *ALEPIS FLAVIDA* AND ITS WELLINGTON CONSERVANCY DISTRIBUTION



Photos: John Smith-Dodsworth.

4.2 ILEOSTYLUS MICRANTHUS (HOOK. F.) TIEGH.

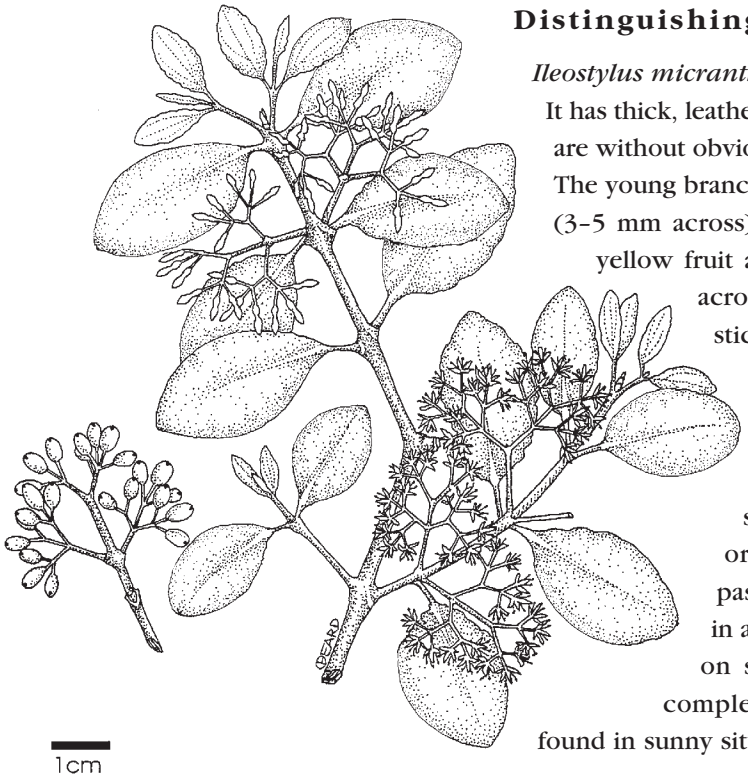


Illustration by Catherine Beard

Distinguishing features

Ileostylus micranthus is a bushy shrub up to 2 m or more across. It has thick, leathery leaves that arise in opposite pairs. The leaves are without obvious veining and are rounded and smooth-edged. The young branchlets are green and flattened. Flowers are small (3–5 mm across) and greenish-yellow with a light scent. The yellow fruit are rounded when ripe (approximately 6 mm across) with green contents, and contain a single, sticky seed.

Habitat requirements

This is a plant of forest, forest margins and shrubland. Host species are found mainly or solely along forest margins and in adjacent pasture. If present within the forest, it is usually in a canopy gap (Druce 1966). It frequently occurs on small-leaved shrubs whose foliage does not completely exclude the sunlight and is most often found in sunny situations (Duguid 1967).

Ileostylus micranthus is dispersed by blackbird (*Turdus merula*) and bellbird (*Anthornis melanura*) (Dopson, in press). It is the least host-specific of all the loranthaceous mistletoes and has been recorded parasitising over 209 taxa (including 92 exotic species and three confined to Norfolk Island) (de Lange et al. 1997; Duguid 1967). Hosts in Wellington Conservancy include: *Podocarpus totara* (totara) and *Coprosma propinqua* (the most common host species), *Coprosma rubra* (at Te Maipi Taipos, Eastern Wairarapa), *Corokia cotoneaster* (at Hokio Dune Forest), *Coprosma virescens*, *C. rigida*, *C. rhamnoides* (Pahaoa) and *C. crassifolia* (on the Wairarapa Plains), *Elaeocarpus dentatus* (hinau) (at Mount Bruce), *Kunzea ericoides* (kanuka) (in Wairarapa), *Melicope simplex* and *Crataegus monogyna* (hawthorn) in Masterton.

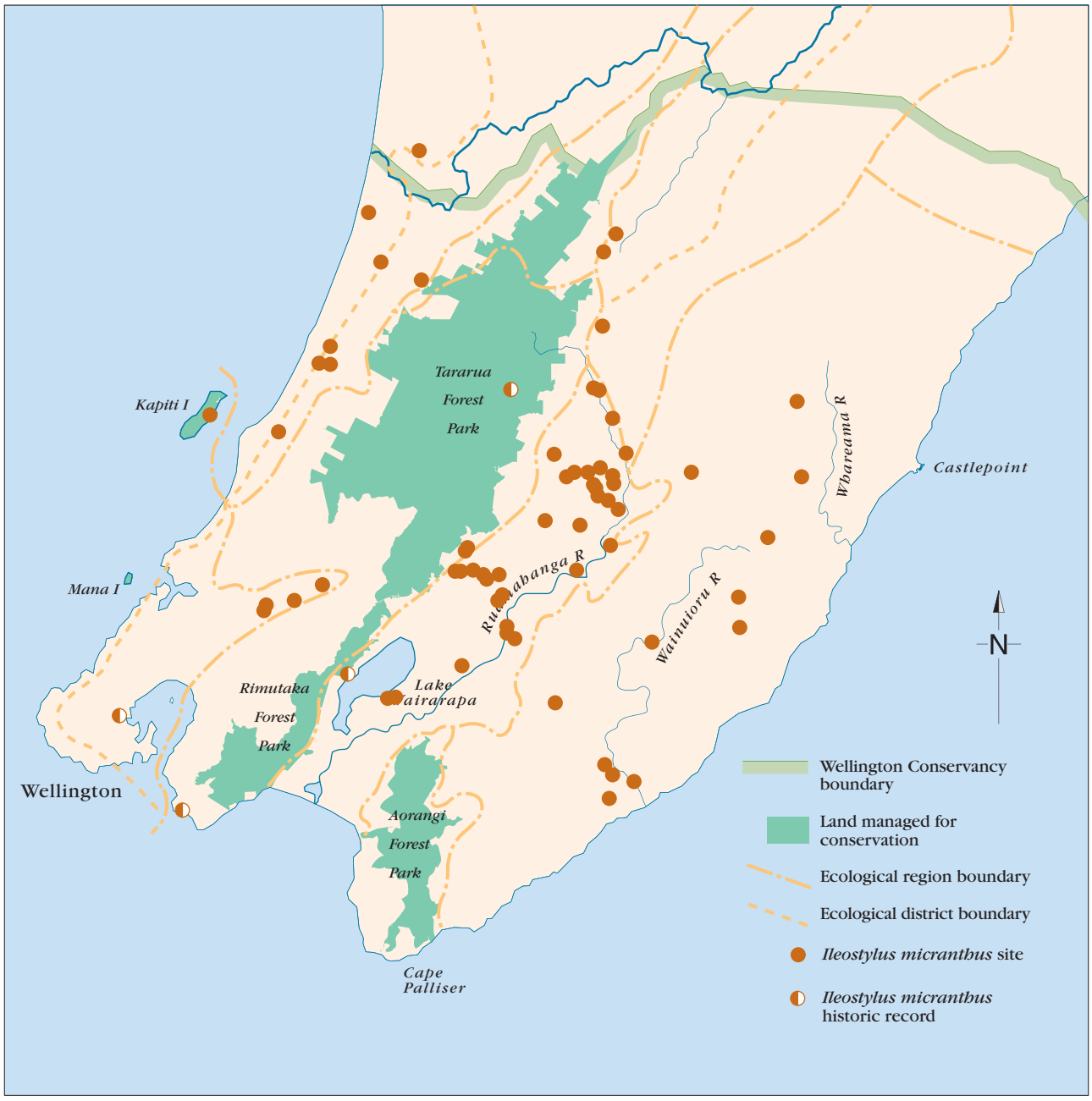
Flowering and fruiting

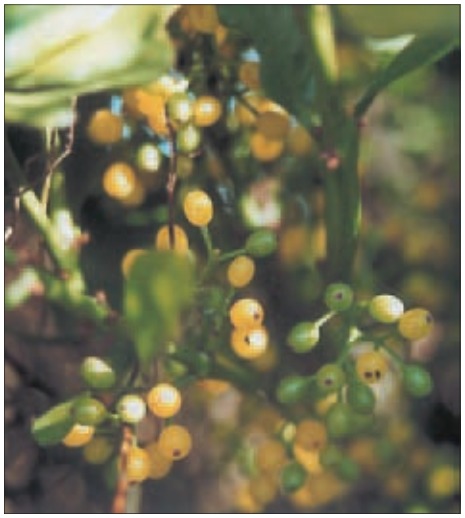
Flowers: September–December (Allan, 1961). Fruit: April–June.

Status

This species is the most abundant of the loranthaceous mistletoes in Wellington Conservancy, however, there are few places where the species occurs in protected natural areas. Many populations have declined in size over the past twenty years although possum control as part of a TB control programme may have contributed to a recent increase in the species. It is now believed to have gone from Wairarapa Lake Shore Scenic Reserve. The population at Benge Park, Upper Hutt has declined in numbers from 22 plants in the mid-1980s to two plants found during a recent survey despite being thought at one time to be relatively well protected there (Moore 1987). It has been classified as "Threatened – Declining" by the Threatened Plants Committee of the New Zealand Botanical Society (de Lange et al. 1999).

FIGURE 3: *ILEOSTYLUS MICRANTHUS* AND ITS WELLINGTON CONSERVANCY DISTRIBUTION





Left: Andrew Townsend.
Centre, above: Aalbert Rebergen.

4.3 *PERAXILLA COLENSOI* (HOOK.F.) TIEGH.

Distinguishing features

This species is a shrub up to 4 m across, sometimes more in the South Island. It grows further out on branches of its host than *Peraxilla tetrapetala*. The leaves are in opposite pairs and are thick with a leathery texture. Leaf margins are usually smooth with red, slightly rough margins. The veins on leaves are hardly evident and only the midrib is conspicuous. Leaf tips are never notched and the leaves themselves are large and never blistered. Masses of scarlet flowers make this plant conspicuous from October to January. Flower heads have groups of 3–10 flowers (Allan 1961) up to 60 mm long. There is also an orange/yellow-flowered morph of this species but it has never been observed in Wellington. The ripe fruit are yellow/golden and are small, fleshy and oval.

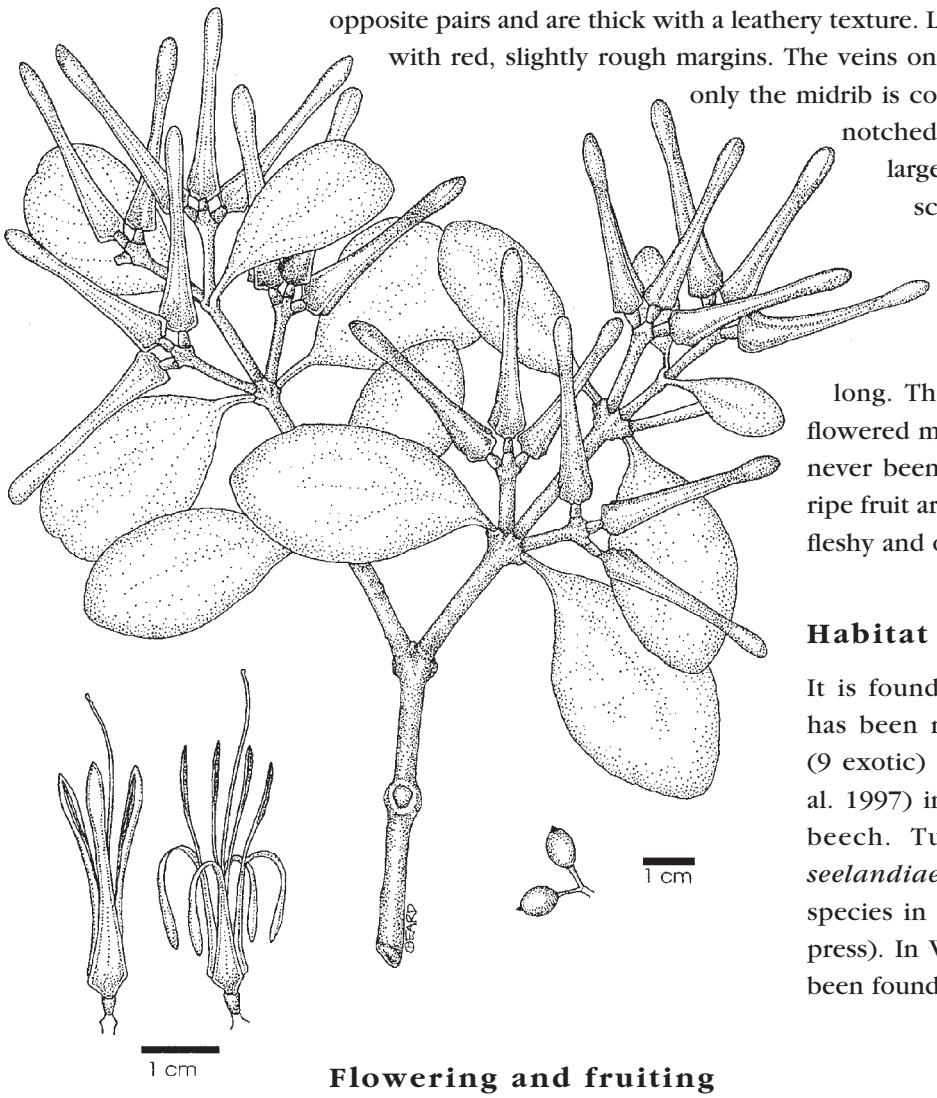


Illustration by Catherine Beard

Habitat requirements

It is found mainly on silver beech but has been recorded on 16 host species (9 exotic) in New Zealand (de Lange et al. 1997) including red beech and black beech. Tui (*Prosthemadera novae-seelandiae*) and bellbird disperse this species in the North Island (Dopson, in press). In Wellington Conservancy it has been found only on silver beech.

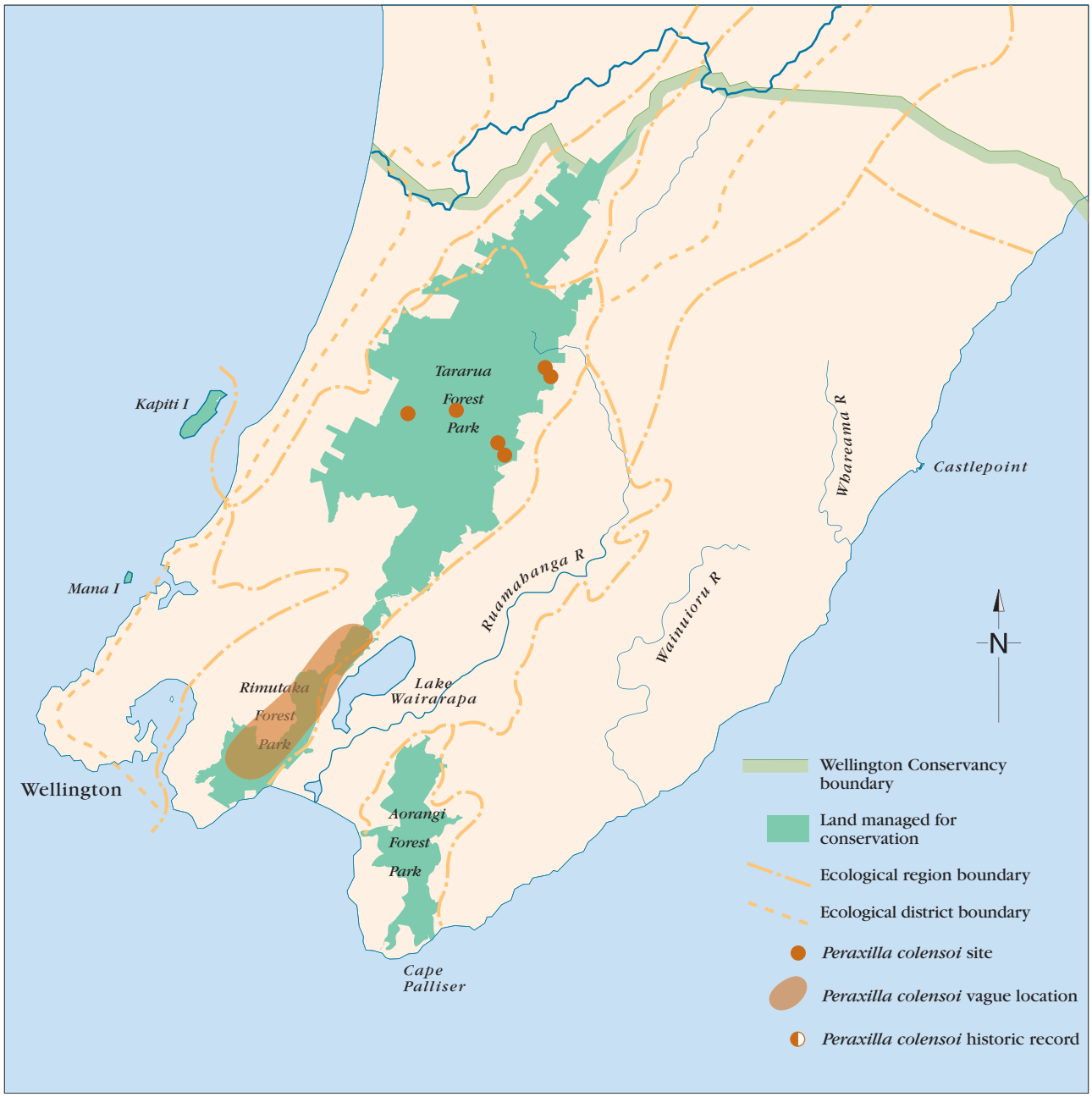
Flowering and fruiting

Flowers: October–January.

Status

The scarlet mistletoe was believed to be extinct in the Conservancy (Sawyer et al. 1998) until it was relocated in the Tararua Range in 1998. It is believed that the species was always rare in the Conservancy. It is now known from three locations. As with *P. tetrapetala*, its recurrence may result from on-going possum control in Tararua Forest Park and/or may simply be due to increased awareness amongst botanists to keep an eye out for the species during survey work. It has been classified as "Threatened – Declining" by the Threatened Plants Committee of the New Zealand Botanical Society (de Lange et al. 1999).

FIGURE 4: *PERAXILLA COLENSOI* AND ITS WELLINGTON CONSERVANCY DISTRIBUTION



Left: John Smith-Dodsworth.
Right: Dave Norton.

4.4 *PERAXILLA TETRAPETALA* TIEGH.

Distinguishing features

Peraxilla tetrapetala is a shrub up to 2 m across. It usually parasitises close to the trunk of its host. It has characteristic small, raised blisters or lesions on small, usually rhombic leaves. The flowers are solitary or 2–4 together, bright red up to 40 mm long. The ripe fruit is fleshy, dull green and urn-shaped. Veins on the leaves are hardly evident and only the midrib is conspicuous. Leaf tips are never notched.

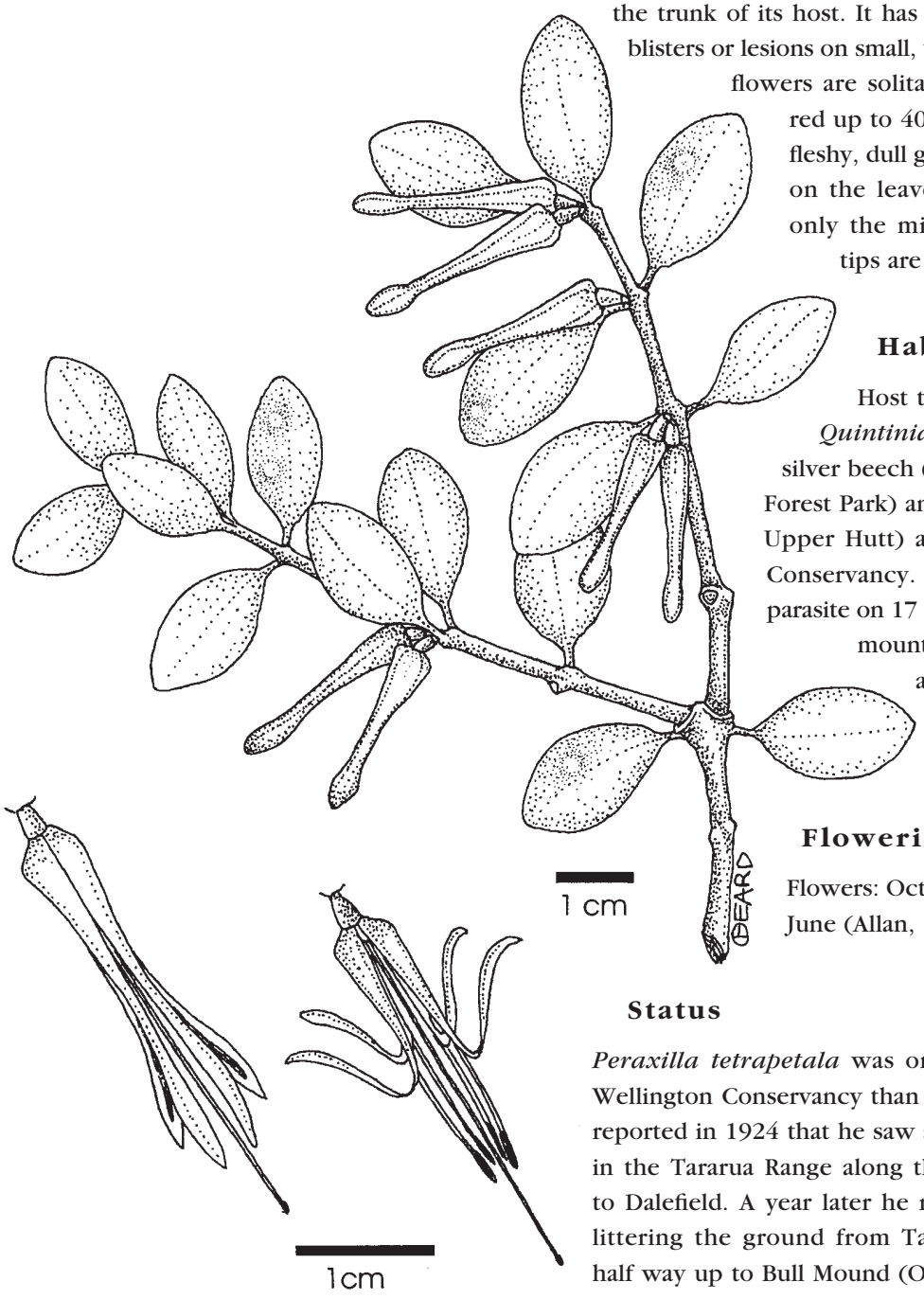


Illustration by Catherine Beard

Habitat requirements

Host trees are typically beech or *Quintinia*. Black beech, red beech, silver beech (in the Blue Range, Tararua Forest Park) and hard beech (at Wi Tako, Upper Hutt) are its hosts in Wellington Conservancy. It has been recorded as a parasite on 17 species (2 exotic) including mountain beech (see de Lange et al. 1997 and Norton et al. 1994 for additional host species).

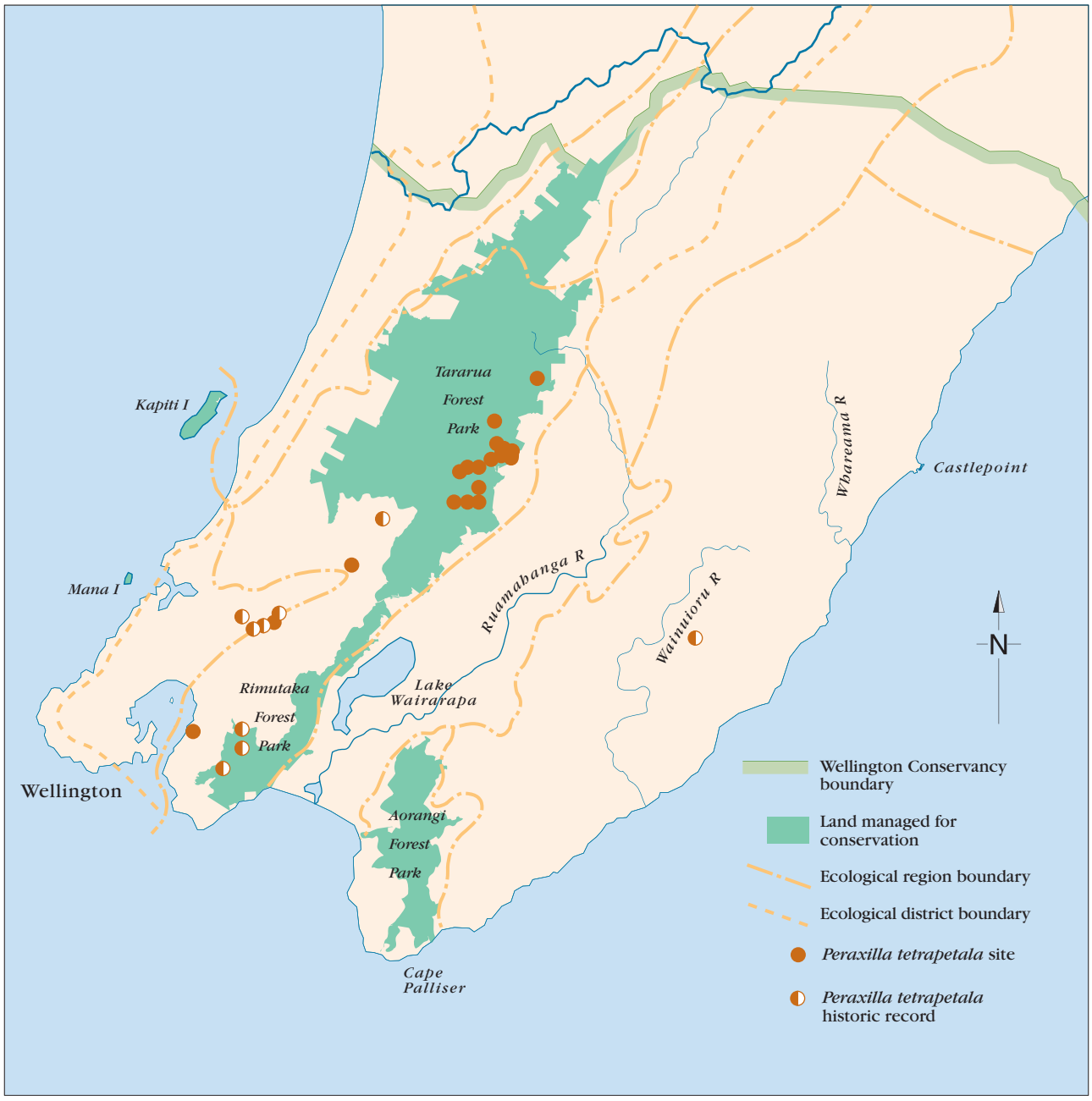
Flowering and fruiting

Flowers: October–January. Fruit: April–June (Allan, 1961).

Status

Peraxilla tetrapetala was once far more abundant in Wellington Conservancy than now. For example, Powell reported in 1924 that he saw a lot of mistletoe on beech in the Tararua Range along the track from Totara Flats to Dalefield. A year later he recorded mistletoe flowers littering the ground from Tauherenikau Hut to about half way up to Bull Mound (Ogle and Wilson 1985). The species has now gone from many places where it was known to occur. For example, it has disappeared from Keith George Memorial Park in the Hutt Valley, from the beech forest behind Wallaceville (also in the Hutt Valley), and from the eastern Wairarapa hill country. A number of plants have been found in the past three years in the Tararua Range perhaps due to increased awareness of what the mistletoe looks like or perhaps because of increased possum control. It has been classified as "Threatened – Declining" by the Threatened Plants Committee of the New Zealand Botanical Society (de Lange et al. 1999).

FIGURE 5: *PERAXILLA TETRAPETALA* AND ITS WELLINGTON CONSERVANCY DISTRIBUTION



Left: John Smith-Dodsworth. Above: Ralph Powlesland.

4.5 *TUPEIA ANTARCTICA* (FORST. F.) CHAM. ET SCHLECHT.

Distinguishing features

This shrub forms a bush approximately 1–2 m across with fleshy, coriaceous, opposite leaves variable in shape. It has pale pubescent stems and the sexes are on separate plants (dioiceous). It has small, yellowy-green, lightly to strongly scented flowers 3–5 mm across. The fruit is round, fleshy and white with purple speckles when ripe. The fruit contains one small sticky seed.

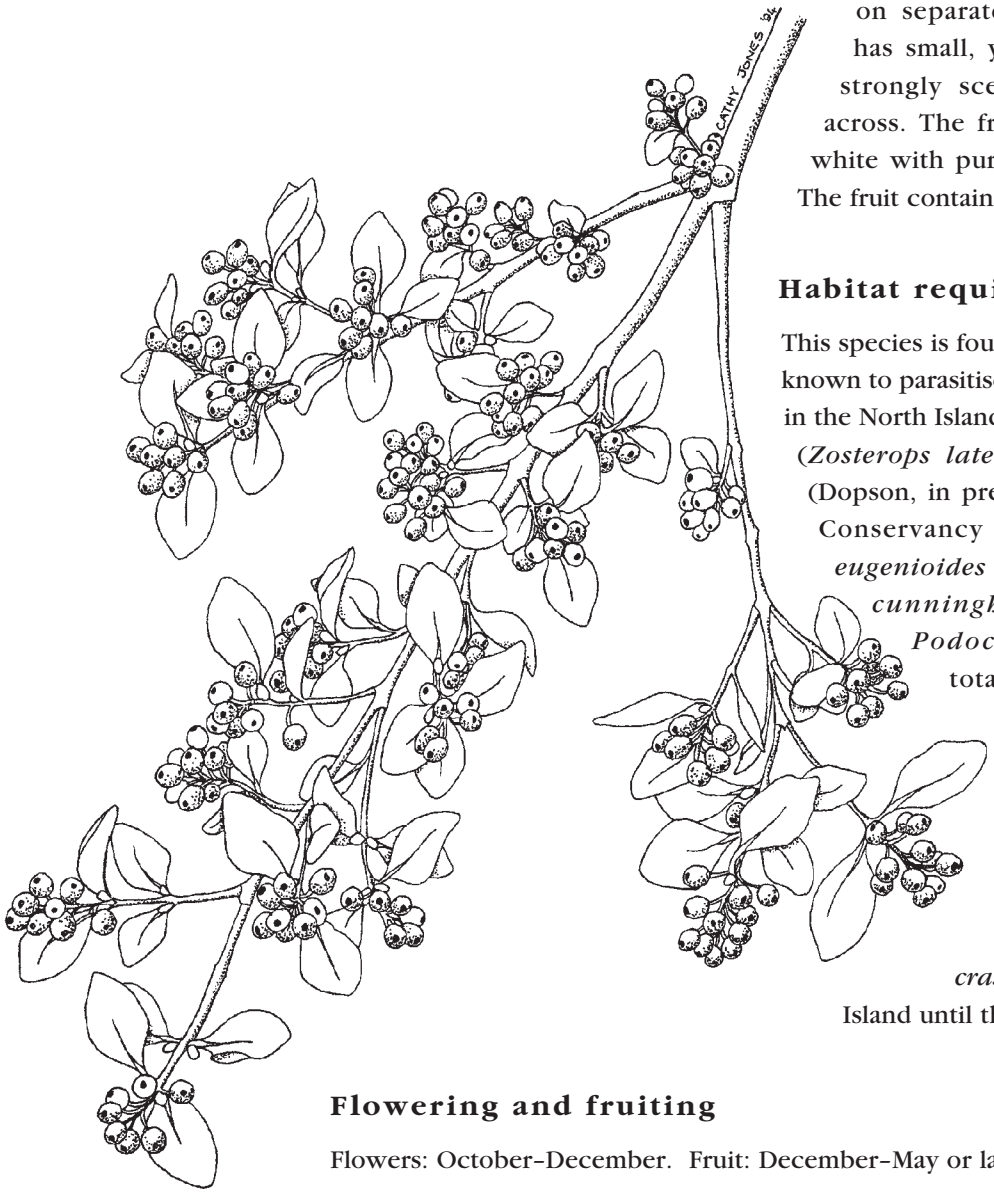


Illustration by Cathy Jones.

Habitat requirements

This species is found in forest or scrub. It is known to parasitise 48 hosts (11 exotic) and in the North Island is dispersed by silvereye (*Zosterops lateralis*), tui and bellbird (Dopson, in press). Hosts in Wellington Conservancy include: *Pittosporum eugenioides* (lemonwood), *Nestegis cunninghamii* (black maire), *Podocarpus hallii* (Hall's totara), *Nestegis montana* (narrow-leaved maire), *Carpodetus serratus* (putaputaweta) and *Plagianthus regius* (lowland ribbonwood). It was also known to occur on *Pittosporum crassifolium* (karo) on Kapiti Island until the host tree died.

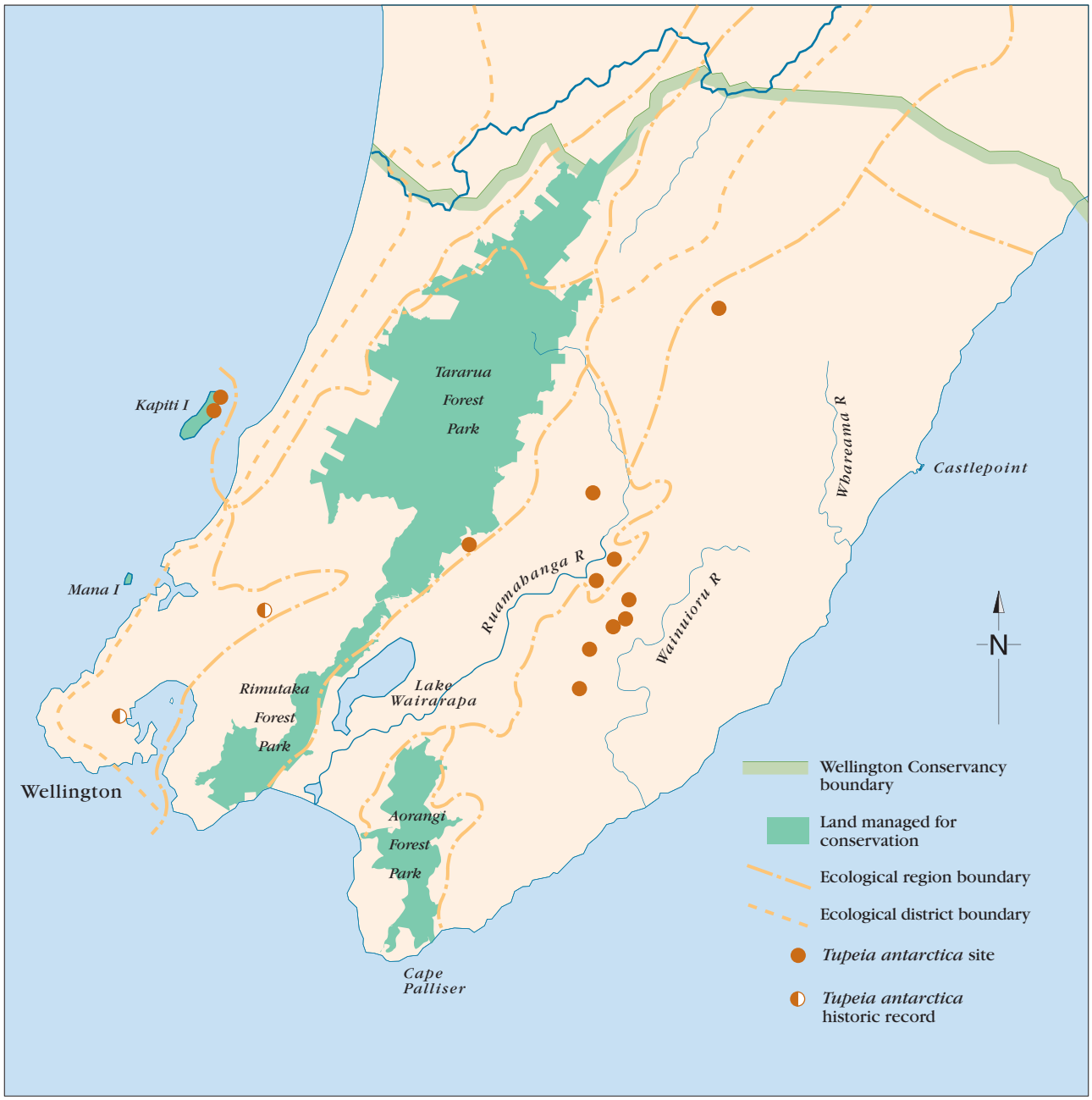
Flowering and fruiting

Flowers: October–December. Fruit: December–May or late summer.

Status

This species was only ever recorded once in the Wairarapa (Townson AK 3859) and until recently it was thought the only extant occurrence in Wellington Conservancy was of 11 plants on Kapiti Island. John Buchanan recorded the species from Wellington Botanic Garden (Buchanan 1875) but it cannot be found there now. It has recently been found (in the last 4 years) at 6 sites in the Eastern Wairarapa and 3 in the Wairarapa Plains Ecological District. It is strongly believed that this is a result of increased possum control effort in the Wairarapa during the past 8 years. It has been classified as "Threatened – Declining" by the Threatened Plants Committee of the New Zealand Botanical Society (de Lange et al. 1999).

FIGURE 6: *TUPEIA ANTARCTICA* AND ITS WELLINGTON CONSERVANCY DISTRIBUTION



Left: John Smith-Dodsworth. Above: Gillian Crowcroft.

4.6 *KORTHALSELLA SALICORNIOIDES* (CUNN.) TIEGH.

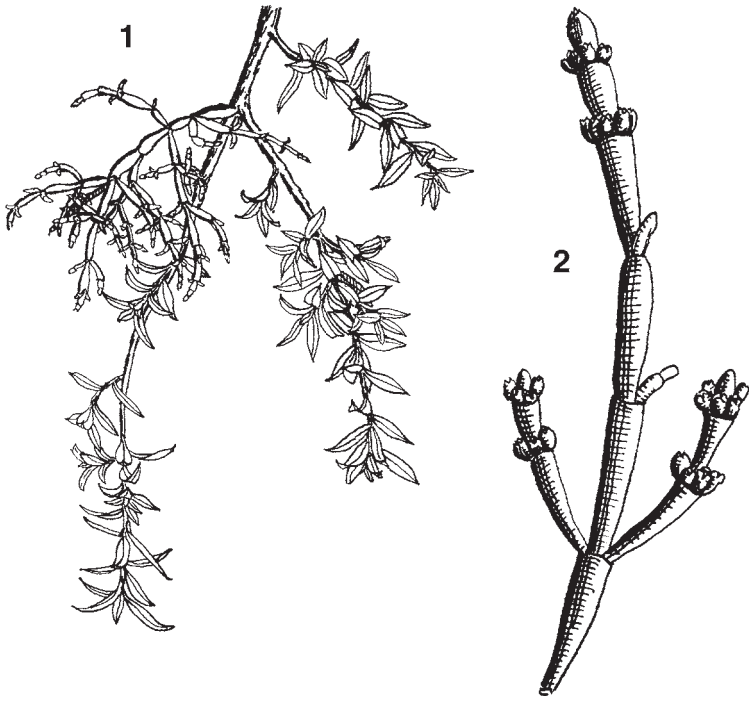


Illustration reproduced with permission from: Stevenson, G. B. 1934: The Life history of the New Zealand Species of the Parasitic Genus *Korthalsella. TRSNZ 64(2)*:175–190. 1. Habit of young plant of K. salicornioides parasitic on *Kunzea ericoides*. Natural size. 2. *K. salicornioides* shoot in fruit. x 4.

Distinguishing features

The plant is small (5–10 cm tall), with many rounded, succulent brown branches. It is often hidden among the leaves of its host and therefore difficult to see, although it can show up like yellow candles against the dark foliage of the host tree. It is a leafless mistletoe with circular internodes (the stem sections in between where leaves are attached) that are expanded at their tips. It has 4–8 flowers that appear at the node (the place where the leaf is attached) of the jointed branches forming a ring. In this way it uis similar to *K. clavata*, as there are no definite inflorescences. Flowers are tiny and each small oval fruit contains a single sticky seed. *Korthalsella lindsayi* and *Korthalsella clavata* are similar but have flattened stems.

Habitat requirements

This mistletoe is found in forest and shrublands (Poole & Adams 1990). In Wellington Conservancy it is parasitic on *Leptospermum scoparium* (manuka), *Kunzea ericoides* (kanuka) and *Coprosma tenuicaulis* (at Allsops Bay, Lake Wairarapa).

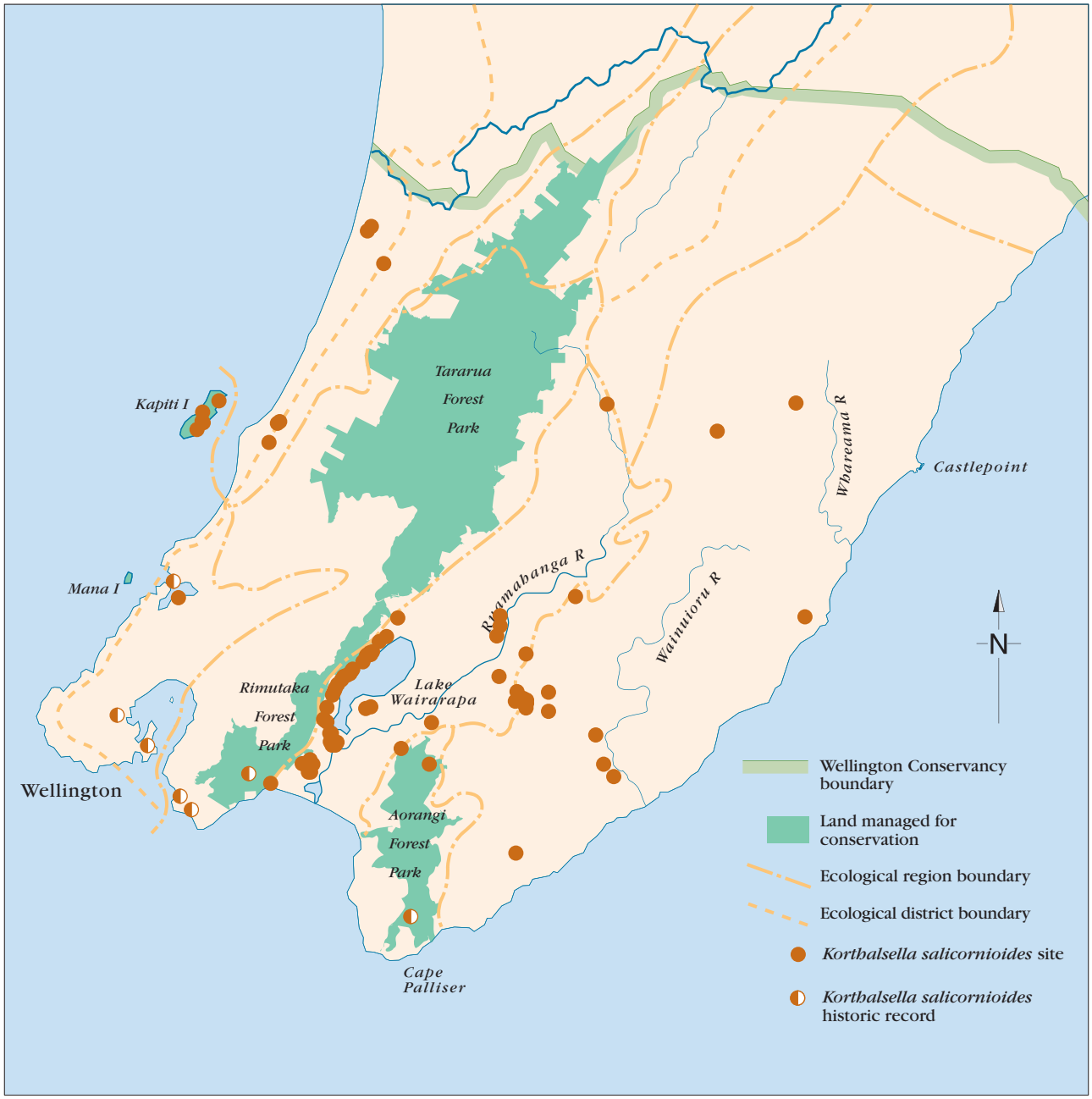
Flowering and fruiting

Flowers and fruit: November–February (Allan 1961).

Status

This species has now disappeared from a number of places where it was recorded previously. It was once known from the Wellington Botanic Gardens (Buchanan 1875) but has not been seen there recently. It may yet be re-located at sites where it has not been found in the last ten years, such as on Mount Matthews and in the Orongorongo River valley in Rimutaka Forest Park. It has been classified as "Naturally uncommon – Sparse" by the Threatened Plants Committee of the New Zealand Botanical Society (de Lange et al. 1999).

FIGURE 7: *KORTHALSELLA SALICORNIOIDES* AND ITS WELLINGTON CONSERVANCY DISTRIBUTION



Left: Andrew Townsend.
Right: Aalbert Rebergen.

4.7 *KORTHALSELLA CLAVATA* CHEESEM.

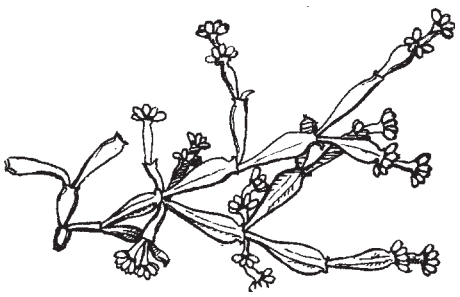


Illustration reproduced with permission from: Stevenson, G. B. 1934: The Life history of the New Zealand Species of the Parasitic Genus *Korthalsella*. *TRSNZ 64(2)*:175–190. Habit of *K. clavata*. Natural size.

Distinguishing features

This plant grows up to 8 cm long. It is mostly golden brown in colour but can also be dark olive green. The plant has few branches and these occur at a wide angle to the stem. The flowering branches are usually narrower than those without. It has the general appearance of *K. lindsayi* but is distinct because the flowers occur in whorls at the upper nodes of the branches and not on inflorescences as is *K. lindsayi*. *K. clavata* also has more slender vegetative parts.

Habitat requirements

It is found mainly on the fringe scrub of wetlands. In Wellington Conservancy it is found almost exclusively on *Coprosma propinqua* but it has also been recorded on *Myrsine australis*, and *Muehlenbeckia complexa* at sites to the east of Lake Wairarapa, and *Olearia solandri* at Turakirae Head Scientific Reserve.

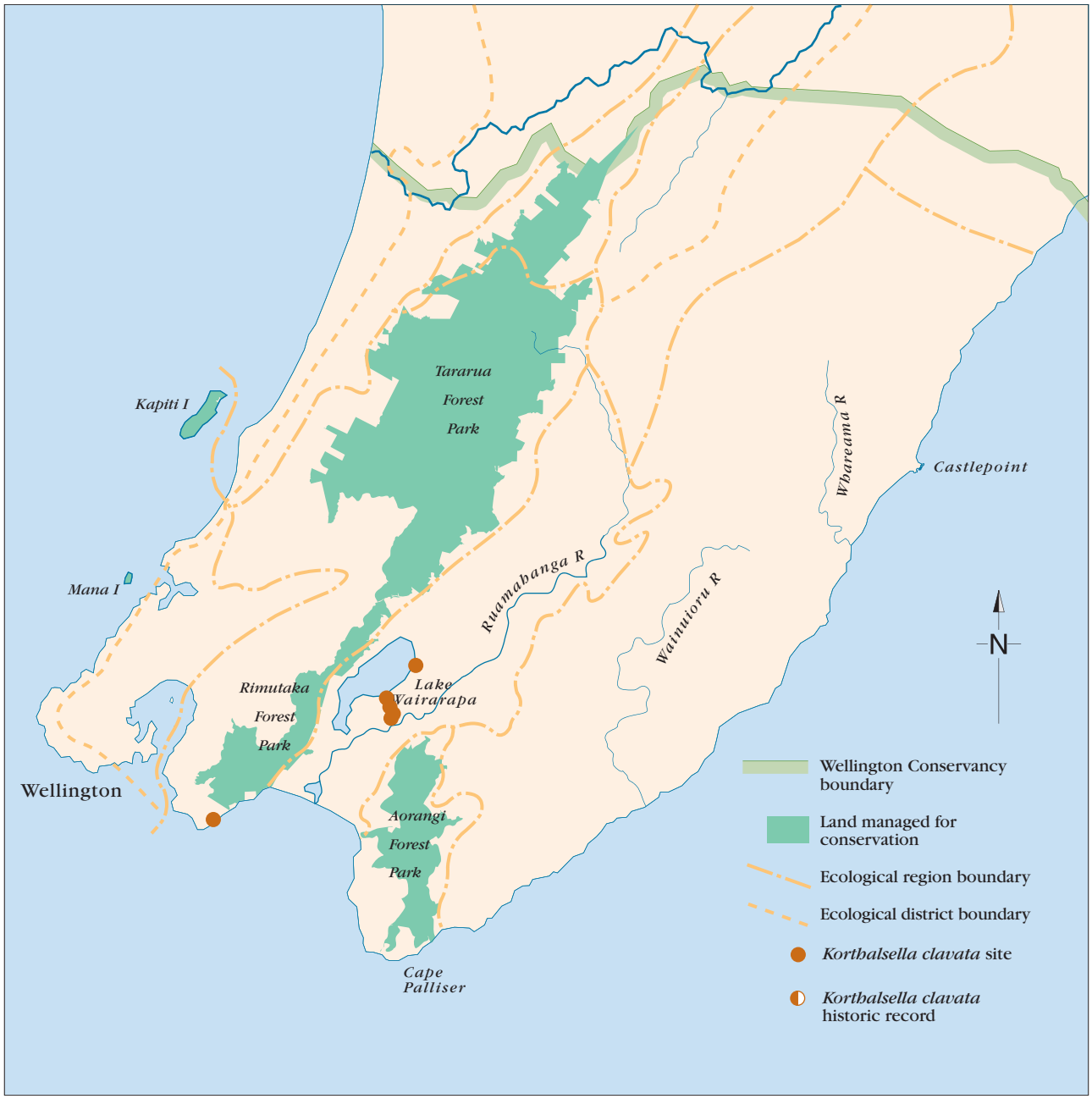
Flowering and fruiting

Flowers: November–February.

Status

This species was first recorded in Wellington Conservancy in 1997. It is very rare in the region having been recorded at only 4 sites and is regarded as a regionally threatened plant in Wellington and listed in the regional Plant Conservation Strategy (Empson & Sawyer 1996). It is more common elsewhere in the country and is not listed as a nationally threatened plant species.

FIGURE 8: *KORTHALSELLA CLAVATA* AND ITS WELLINGTON CONSERVANCY DISTRIBUTION



Left: Aalbert Rebergen. Above: Peter de Lange.

4.8 *KORTHALSELLA LINDSAYI* (D. OLIVER) ENGL.

Distinguishing features

This dwarf, leafless mistletoe is a small, branched, succulent plant. It has flattened, obovate internodes (the stem sections). Its flowers occur on definite inflorescences. The flowers are green or brownish. Young parts of the plant look green; older branches and inflorescences look brown.

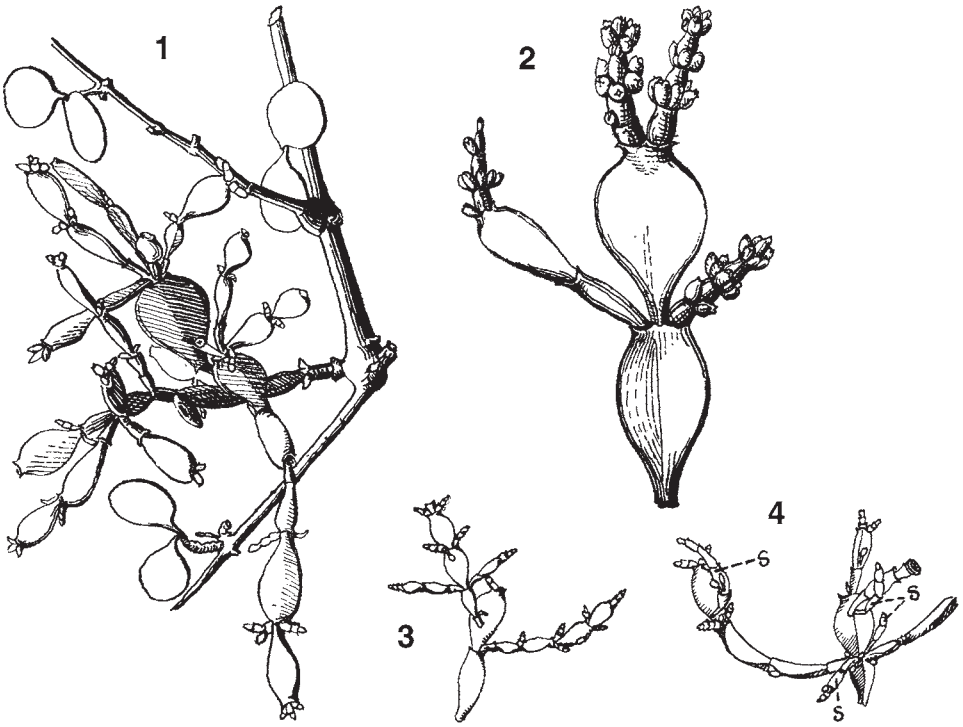


Illustration reproduced with permission from: Stevenson, G. B. 1934: The Life history of the New Zealand Species of the Parasitic Genus *Korthalsella*. *TRSNZ 64(2)*:175–190.
1. *Korthalsella lindsayi* parasitic on *Helichrysum glomeratum*. Natural size.
2. Branch of *K. lindsayi* with inflorescences in fruit. x 4.
3, 4. Seedlings of *K. lindsayi* on *K. lindsayi*. Natural size. s.: seedling. Note also germinating seeds.

Habitat requirements

It is a plant of forest and scrub and grows on "anything except a concrete post" (Elder 1984). Hosts in Wellington Conservancy include: *Coprosma crassifolia*, *C. virescens*, *C. rhamnoides*, *C. rotundifolia*, *C. areolata*, *C. rigida*, *C. rubra*, *Pittosporum obcordatum*, *Lophomyrtus obcordata*, *Lophomyrtus bullata L. obcordata*, *Myrsine australis*, *Myrsine divaricata*, *Olearia solandri* (at Turakirae Head), *Muehlenbeckia australis*, *Muehlenbeckia complexa* and *Melicope simplex*. Many years ago it was also recorded growing on *Ileostylus micranthus* (itself growing on *Muehlenbeckia astonii*) and *Scandia geniculata* at Wainuiomata River mouth.

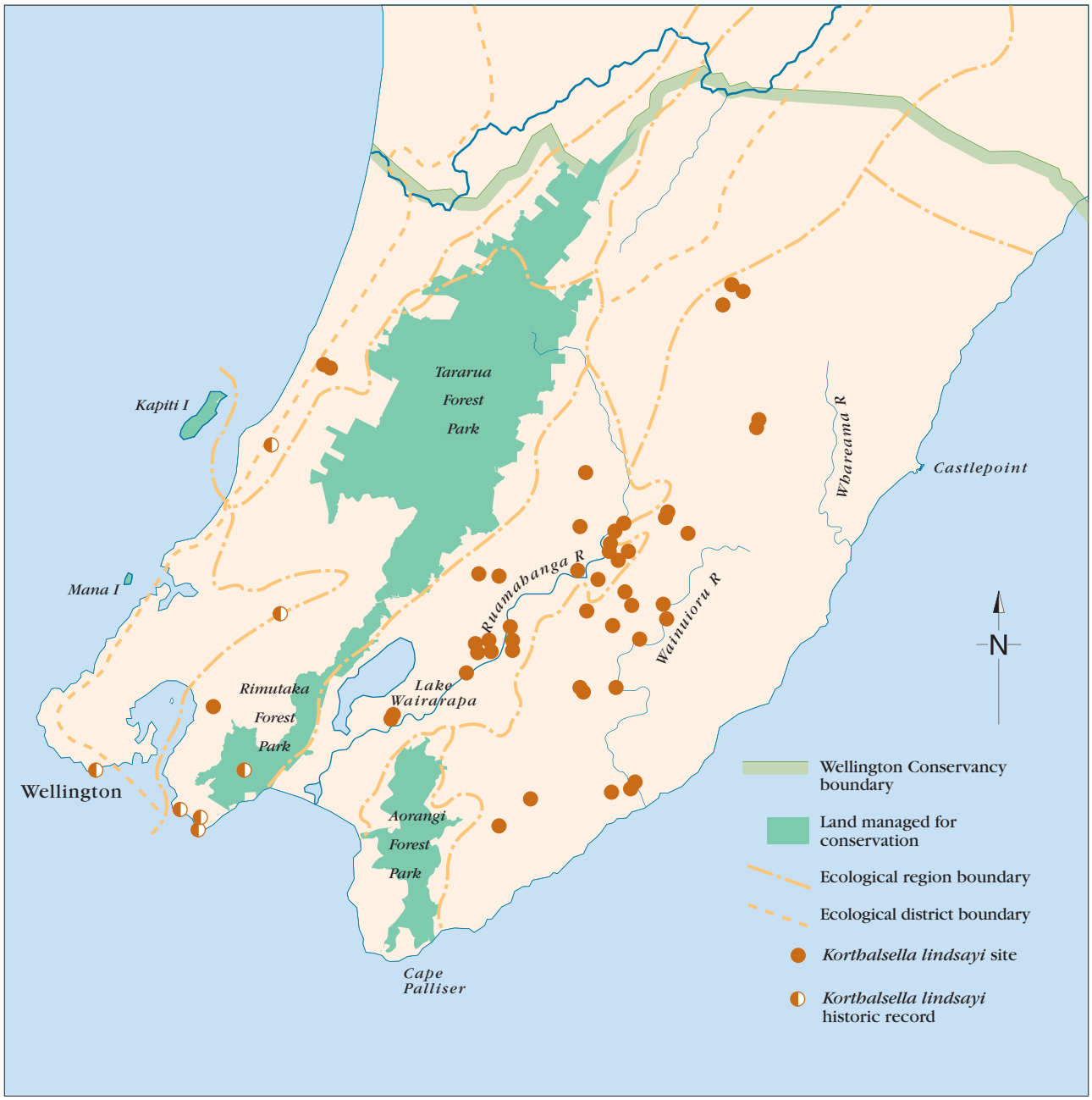
Flowering and fruiting

Flowers and fruit: November–February (Allan 1961).

Status

This species is probably the most abundant mistletoe in Wellington Conservancy. It was ranked as a regionally threatened plant in 1996 in the Conservancy Plant Conservation Strategy (Empson & Sawyer 1996). It is now known to be more abundant than first thought (especially in the Wairarapa). It is not as great a conservation concern as the other mistletoe species and is not a nationally threatened plant.

FIGURE 9: *KORTHALSELLA LINDSAYI* AND ITS WELLINGTON CONSERVANCY DISTRIBUTION



Left: Andrew Townsend. Above: Aalbert Rebergen.

5. Threats to mistletoe species

There are several reasons why the Threatened Plant Committee of the New Zealand Botanical Society classified so many indigenous mistletoe species as threatened.

A review of non-possum threats to loranthaceous mistletoes by de Lange (1997) identified various other factors causing mistletoe decline including: fungal diseases; over-collecting and vandalism; longevity and fitness of host species; and habitat availability. Major threats to mistletoe survival in the wild in Wellington Conservancy are described below.

5.1 PEST ANIMALS

Browsing animals, such as possums, are a threat to mistletoes. Possums eat mistletoes, kill individual plants and can destroy entire populations (Ogle 1997, Norton 1991). However, mistletoe decline cannot be ascribed to possums alone (Norton 1997). In addition, rats eating seeds and seedlings may also limit the spread and expansion of mistletoe populations. Stoats and other mustelids indirectly threaten mistletoes as they kill native birds that pollinate the plants and disperse their seed. The contraction in range and decline in abundance of seed-dispersing species, especially birds, is probably also a major factor in the decline of loranthaceous mistletoes (Ladley 1997, Ladley et al. 1997, Norton 1991). Therefore, animal pests that kill native birds threaten mistletoe survival and regeneration.

Insects may also threaten mistletoes although our understanding of insect-mistletoe associations is poor (de Lange 1997). The survival of three moth species (*Declana griseata*, *Tatosoma agrionata* and *Zelleria sphenota*), that use mistletoes as hosts, is dependent on mistletoe survival (Patrick & Dugdale 2000). One of the most damaging insects to mistletoes appears to be thrips, whose feeding behaviour quickly results in foliage loss and eventually death of the host.

Black and brown scales on *Ileostylus micranthus* at Benge Park are not as debilitating as thrips but can cause damage. Scale has also been recorded on a plant at Eketahuna and the manuka scale (*Eriococcus atkinsonae*) has been recorded on *Ileostylus micranthus* at Greytown in the Wairarapa .

5.2 COLLECTORS

Collectors may be a significant threat to mistletoes. It is known that red mistletoe was collected at Christmas from populations at Ngatawhai, near Jacksons Stream, Te Wharau (Eastern Wairarapa) and that may have caused the demise of the species. Large quantities of *Peraxilla colensoi* sprigs were found on sale at flea markets close to Christmas in the mid-1990s. It is not known how collecting affects species survival but it will certainly affect their ability to set seed and so influence plant recruitment.

In some cases people have killed mistletoes believing them to be pests and threatening the survival of their hosts. For example, at Benge Park (Upper Hutt)

Ileostylus micranthus was cut out of totara trees and that population now consists of only two plants.

The picking of fruit at Benge Park (Upper Hutt) may also prevent mistletoe recruitment by removing the seed source. The extinction of the mistletoe *Trilepedia adamsii* was partly attributed to over collecting (Norton 1991; 1997).

6.3 VEGETATION SUCCESSION

Vegetation succession from scrub to forest can also result in mistletoe habitat being lost or mistletoe species being shaded out. Succession may threaten mistletoe survival if they are dependent on pioneer plant communities for their habitat. For example, the replacement of kanuka by broadleaf forest as dominant vegetation on Kapiti Island may cause the local extinction of *Korthalsella salicornioides*. Shading out of *Ileostylus micranthus* by host species may also result in the decline of some populations. For example, *Podocarpus totara* at Ohau may shade out *Ileostylus micranthus* (Duguid 1967). At Carter Scenic Reserve, *Ileostylus micranthus* may soon be shaded out by the growth of nearby trees. This may already have led to the loss of this species from Western Lake Shore Scenic Reserve.

Sucessional loss of mistletoes is a natural and is usually balanced by new habitat becoming available in younger forest. Forest reduction reduces the likelihood of mistletoes colonising new habitat. In this way local extinctions may result.

6.4 HABITAT DESTRUCTION AND SURVIVAL OF HOSTS

Destruction of mistletoe habitat through destruction of hosts or their surrounding vegetation is a significant threat to all mistletoes. Clearance and logging of native forests is, therefore, a threat to mistletoe survival.

Road construction or road widening is another threat to mistletoe populations. For example, the widening of State Highway 1 may destroy a number of populations of Ileostylus micranthus. Similarly in the Wairarapa there are many occurrences of *Korthalsella* spp. growing beside roads that would be vulnerable if the road were widened or re-routed.

Cutting kanuka and manuka scrub for firewood will cause the demise of mistletoes such as *Korthalsella salicornioides* and *Ileostylus micranthus*. Fire and vegetation clearance are both threats to mistletoe survival.

Mistletoes are dependent on their hosts for survival, so natural senescence of host trees will cause the loss of mistletoe plants, especially when there is no regeneration of hosts. Death of host trees can result from natural senescence, the effects of the parasite or other factors. Throughout Wellington Conservancy, especially in Wairarapa, no regeneration of host species is a major threat to mistletoe survival. Death of manuka at Waikanae Park on the Kapiti Coast is leading to a rapid decline in the *Korthalsella salicornioides* population.

Fire is a threat to mistletoes and their hosts. The burning of scrub that supports mistletoes can cause their decline. Continued accidental destruction of host trees

by park users also leads to mistletoe decline. For example, children climbing host trees at Benge Park (Upper Hutt) may have caused the death of some *Ileostylus micranthus*.

5.5 FUNGAL DISEASES

Nine fungi have been recorded in association with dead or dying loranthaceous mistletoes (de Lange 1997). Three of these have been identified as potential pathogens. Species of *Fusarium* pose the most significant threat to mistletoe plants as they can cause sudden wilt and total collapse of apparently healthy plants (de Lange 1997). In 1999, a rust fungus seriously affected the *Ileostylus micranthus* at Bartons Bush, Upper Hutt. The mistletoe was reduced in size by 80 percent.

6.6 SEX IMBALANCE

The existence of single sex populations of *Tupeia antarctica* means that in many places the species will never naturally regenerate. Populations will have to be hand-pollinated with pollen from outside or plants of the other sex will have to be introduced so that natural regeneration can occur.

6. Management requirements

This section provides general advice and options for conservation management to protect mistletoe populations in Wellington Conservancy. It does not provide detailed management prescriptions for each mistletoe population. Action plans have already been prepared for populations of threatened mistletoe species (see Townsend et al. 1998) and work will continue to implement these. Further management plans will be developed as required when new threatened mistletoe populations are found. Conservation management of mistletoe populations will involve various combinations of the following activities.

National management requirements of New Zealand's mistletoes are outlined in the Loranthaceous Mistletoes Recovery Plan (Dopson, in press).

6.1 LEGAL PROTECTION

In Wellington Conservancy many mistletoe populations are located in protected natural areas administered by the Department of Conservation, the QEII National Trust, the Wellington Regional Council and/or local authorities. For example, all populations (except one) of Korthalsella clavata in Wellington Conservancy are found in reserves on the eastern shores of Lake Wairarapa.

However, some species are rarely found in protected natural areas. For example, Korthalsella salicornioides occurs at numerous unprotected sites on the Wairarapa Plains and is therefore a priority for protection. A conservation covenant of forest and wetland at Allsops Bay, Lake Wairarapa was a recent initiative to protect, amongst other things, a large population of *Korthalsella salicornioides*. Other species, such as **Korthalsella lindsayii** and *Tupeia antarctica*, are poorly represented in the Protected Natural Area Network.

Negotiation of legal protection for unprotected populations of mistletoe will continue. Such consultation will be with landowners and will involve raising awareness of the options for nature protection on private property (Department of Conservation, 2000).

6.2 SURVEY

Surveys will be done at sites where mistletoe populations were recorded historically. For example, surveys to locate *Alepis flavida* in the Kaiwhata River valley in eastern Wairarapa and in the Rimutaka Range will continue. Survey work will also be done in areas surrounding existing mistletoe populations to determine if species are more widespread. Records of mistletoes will be made when found during vegetation survey work throughout the region. An annual survey programme will be developed to identify which old records are to be checked and which populations deserve survey in the surrounding habitat.

6.3 CONTROL OF VEGETATION SUCCESSION

The survival of some mistletoe populations may depend on maintaining a certain vegetation succession. For example, replacement of kanuka by succeeding vegetation on Kapiti Island may cause the demise of *Korthalsella salicornioides*. Similarly shrubs in the lowland forest on the Wairarapa Plains that host *Ileostylus micranthus* may be succeeded by forest trees and so bring about the local extinction of mistletoe populations. Therefore, plants overtopping mistletoe hosts may be cut back to protect mistletoe populations in high priority situations.

6.4 PEST ANIMAL CONTROL (SEE ALSO 6.8)

Pest animal control will be done in areas that support mistletoes. Possums and other wild animals, such as stoats, that threaten mistletoes will be controlled. The distribution of mistletoe populations will be used in the development of pest animal control programmes in the Conservancy so that mistletoes are included in areas subject to treatment.

Predator control will improve nectar-feeding bird populations, so increased pollination, seed production and dispersal will occur.

6.5 DATABASE MANAGEMENT

Data entry to the regional plant database will continue in order to provide up-to-date, accurate information about mistletoe status in Wellington Conservancy. This involves inputting new mistletoe records as and when they are discovered and reported. The results of mistletoe surveys or botanical surveys during which mistletoe populations are found and recorded shall also be added to the database. Repeat records of mistletoes at sites where they have been recorded previously will be added to the database so that a picture can be obtained of the changing status of individual populations over time. Ecological information about mistletoes will be entered onto the database.

Information for inclusion on the database may be sent to the Department of Conservation (see Section 8 and Appendix 4).

6.6 MONITORING

Regular inspections of mistletoe populations are valuable in detecting changes in their condition. It also provides a means to determine the effectiveness of management. Monitoring can involve measuring certain population characters such as: the number of plants; the size of plants; their spatial distribution; the number of infected hosts; and the species of host. Monitoring can also involve regular inspection of bands to make certain they are not constricting growth of the host. It can also involve photographing populations or individual plants repeatedly over time to determine if and/or how they are changing. A representative sample of mistletoe populations of all species will be inspected regularly as part of a Conservancy and national monitoring programme.

6.7 FENCING

Fencing of vegetation containing mistletoes is important to prevent damage to mistletoes and the host species. A regular evaluation will be made of significant mistletoe populations and the vegetation that support them to determine priorities for fencing. The condition of existing fences will be monitored as part of DOC's fence maintenance programme in Wellington Conservancy.

6.8 BANDING OF HOST TREES AND CAGING OF PLANTS

Banding of mistletoe hosts is a useful tool for protecting mistletoe plants from possum browse. The methods for banding are described elsewhere (Jones 1993, 1997). Banding may be required above and/or below the plant and may also involve banding nearby trees so animals cannot cross from them to the host. Fixing cages around plants can also be used to protect them, especially where the plants are too close to the ground for the host to be banded or where banding is impractical.

Existing bands will be inspected regularly to ensure that they do not strangle the host as the tree grows. Bands may not be necessary where there is no possum threat such as on possum-free islands. Where possum numbers are low, bands may not be required as the threat of animals browsing mistletoes will be small, however, some bait stations may be necessary. Possums may preferentially browse other lower vegetation ahead of mistletoes high up in the canopy (Owen & Norton 1995).

Cages may have to be removed for periods in summer to allow for pollination and seed dispersal by birds. An annual assessment will be made to determine which mistletoes require bands or cages to protect them, or require bands to be checked. Management of pests (e.g., possum control) is preferable to caging as it allows for protection and regeneration of the entire plant community.

6.9 EX-SITU CONSERVATION

In Wellington Conservancy none of the mistletoes are protected ex-situ. One of the reasons for this is the difficulty of growing and maintaining mistletoes in cultivation. Research will be done to determine how to establish mistletoes in an ex-situ location (see 7.10). Suitable locations for establishing mistletoes ex-situ will be chosen that are secure in the long-term.

6.10 RESEARCH

Research is required to provide ecological explanations for observed mistletoe distribution patterns (ecological biogeography). This form of research will provide insights into the factors that limit mistletoe distribution and survival and so improve our understanding and management of threats to these species. Studies of the autecology of mistletoe species are required, especially of nationally and regionally threatened species.

6.11 TRANSLOCATION

Techniques for translocation of mistletoe species are not well developed. Many attempts have been made to infect potential hosts with mistletoe species and only a few have been successful. In Wellington Conservancy the first documented attempt to translocate *Ileostylus micranthus* was made in Pukerua Bay (Ogle 1987; 1988). In this case the mistletoe seed was "planted" on a garden shrub (*Coprosma rotundifolia*). The translocation proved to be successful for a couple of years until the host died.

The most recent attempt was the successful translocation of *Ileostylus micranthus* to Te Marua Bush from Benge Park (both in Upper Hutt). Seed was collected and transferred in early June 1996 (Tony Silbery, pers. comm.) and it was placed on the same host species (*Melicope simplex*). After four years the plants are thriving. This site will be monitored and further attempts will be made to translocate *I. micranthus* to new locations including islands such as Kapiti, Mana and Matiu/ Somes Island.

In Wellington Conservancy, attempts have also been made to translocate *Peraxilla tetrapetala* (red mistletoe). In most cases (Mount Bruce National Wildlife Centre, Otari Wilton's Bush, Rimutaka Forest Park, and in the Eastbourne Hills) such 'plantings' have failed. This may be because the seeds were planted on branches that were too large or were placed on an inappropriate host. The most successful trials in Wellington Conservancy have been carried out in the Wairarapa where *P. tetrapetala* has been successfully established on adventitious shoots of *Nothofagus solandri* var. *solandri* and *Nothofagus fusca* (Trevor Thompson, pers. comm.). Seed collected in December 1998 and 1999 were planted on pencil sized branches in newly light filled areas, preferably placed between 3 and 9 o'clock on the lower side of the branch. Fifteen plants are still surviving, all with leaves, including one from 1998 that has nine leaves.

In the past five years, translocation experiments have been undertaken elsewhere in New Zealand with *Ileostylus micranthus*, *Alepis flavida* and *Tupeia antarctica*. For example, *Ileostylus micranthus* has been planted on six different hosts at Manurewa Botanic Gardens, Auckland (including *Coprosma propinqua*, *Carmichaelia odorata* and *Coprosma virescens*. It has established successfully on a number of these hosts (Rebecca Stanley, pers. comm.). *I. micranthus* has also been planted on *Coprosma propinqua* by Kelvin Floyd at Whakatiwai Regional Park. Twelve plants are still surviving several years after translocation.

Experiments with hand planting *Alepis flavida* on *Nothofagus solandri* in the Craigieburn Range, eastern South Island (see Norton & Ladley, 1998) demonstrated the importance of selecting the correct branch size on which to place the mistletoe seed. Seeds planted on small diameter branches (less than 5mm) were more likely to establish.

In June 1998 ripe mistletoe fruit was collected from *Tupeia antarctica* plants at Omori Scenic Reserve (Lake Taupo) and planted onto the same hosts (*Pittosporum tenuifolium*) the same day (Nick Singers pers. comm.). Three seed were planted per branch and ten branches were used for each tree. Branches chosen were all less than 10mm in diameter. The bare seeds were extruded from the fruit pulp onto a paper towel so that no fruit was present on the seed but the sticky glue was still attached. The seeds were then wiped onto branches where they stuck firmly.

Each branch site was tagged with flagging tape for relocation purposes, to save time when relocating the branches. These planted mistletoes were inspected on several occasions. The first inspection was after 6 months when only a haustoria had been produced from the seeds. After about one year some seeds had attached and had produced cotyledons and some had produced 2 or 4 leaves. By 18 months very little additional growth occurred but over the second summer any attached plants grew significantly. At age two some plants had shoots that were 20 cm or greater in length. At around this age where the mistletoes attached themselves to the host trees, distinctive swellings occurred and the mistletoe had also produced numerous resting buds around the point of attachment. These resting buds subsequent sprouted in spring and new shoots of greater than 20cm were produced.

Thomas (1987) described one method for infecting hosts with mistletoe based on his experience in England with *Viscum album*. This involved collecting seed as they ripen and sealing them in a paper bag in a cool dry place until spring. They are then planted on small branches (13–50 mm in diameter) at sites where the outer bark has been gently scraped away. The skin of the berry is then nicked and the berry pressed gently into the branch. Sticky tape can then be used to hold the seed in place until the first shoot appears.

There are a number of general principles common to the above successful mistletoe translocation trials. Plant seed on species that are known to be local hosts of the mistletoe. Find the optimum branch size, usually less than 5mm in diameter. Mistletoes are often recorded on the trunk or larger branches of their host but they probably established when the host was much smaller. Mistletoe seeds planted on larger branches have tended to die. Water is important to mistletoe survival and if seeds dry out before they attach they will die. In some cases adult mistletoe plants die in drought situations while their hosts recover from the drought stress. Mistletoe need lots of water and misting young seeds in times of water deficit may help to increase the chance of success.

The translocation techniques described here may be used throughout the region, not just in reserves and on islands, but also in private gardens.

6.12 PUBLIC AWARENESS

Public awareness will be raised of mistletoe biology, biogeography and conservation needs. This will be achieved by distribution of this report and other literature about mistletoes. The importance of legal and physical protection of mistletoe populations and their hosts and associated plant and animal communities will be advocated. For example, awareness will be raised about the importance of protection of manuka and kanuka scrub where they support mistletoe species. Information about how to protect mistletoe populations will be provided to members of the public who wish to do such work in the Conservancy. The public will also be encouraged to record mistletoe populations whenever they find them (see Section 8) by writing details of their observations on species record sheets (see Appendix 4).

7. How you can help

New information about the distribution and ecology of mistletoe species in Wellington Conservancy can be sent to the nearest Department of Conservation office (addresses below). That information will be stored on the native plant database and used to improve our understanding of the biogeography and ecology of the species and to improve conservation management. Occurrence information may be sent to the Department on a copy of the species record sheet (Appendix 4).

DOC addresses in Wellington Conservancy

Poneke Area Office
P.O. Box 5086
Wellington
Tel: (04) 472 5821

Kapiti Area Office
P.O. Box 141
Waikanae
Tel: (04) 293 2191

Wairarapa Area Office
P.O. Box 191
Masterton
Tel: (06) 377 0700

Biodiversity – Technical Support Team
P.O. Box 5086
Wellington
Tel: (04) 470 8427

If you would like to learn more about mistletoe biology and ecology there are several references included in the bibliography that may be of interest (e.g. de Lange & Norton 1997). Those publications also provide information about mistletoe species not found in Wellington Conservancy.

8. Acknowledgements

We thank the following people for assisting us with this project: Tony Silbery, Garry Foster and Mark Townsend (Department of Conservation, Wairarapa Area) for records of mistletoes found during fieldwork throughout the Conservancy. Ken Wright, Steve Playle, Harvey Phillips, Murray Clark, Owen Spearpoint and other staff at the Wellington Regional Council for recording mistletoes and for their work to protect them.

Members of Wellington Botanical Society for recording mistletoes and for their work protecting Te Marua Bush (a forest remnant that supports one of the last mistletoe populations in Upper Hutt).

Trevor Thompson for work recording and protecting mistletoes in the Wairarapa and for information about his research into how to grow *Peraxilla* spp.

The YMCA Conservation Corps and Wairarapa Community Conservation Corps for their work banding mistletoe hosts in the Tararuas and recording mistletoes during field work.

Nick Singers for providing valuable information about mistletoe translocation trials in Taupo/Tongariro Conservancy.

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Appendix 1

USEFUL ADDRESSES FOR MORE INFORMATION ABOUT MISTLETOES

Wellington Botanical Society
Secretary
P.O. Box 10-412
Wellington 6036
New Zealand

New Zealand Botanical Society
Secretary
C/- Canterbury Museum
Rolleston Avenue
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Phil Knightbridge
Species Recovery Group Leader
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New Zealand

Biodiversity Recovery Unit
Science, Technology and Information Services
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Rob Stone
Poneke Area Office
Department of Conservation
P.O. Box 5086
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Tel: (04) 472 5821

Richard Gill
Kapiti Area Office
Department of Conservation
P.O. Box 141
Waikanae
Tel: (04) 293 2191

Aalbert Rebergen, Tony Silbery and Garry Foster
Wairarapa Area Office
Department of Conservation
P.O. Box 191
Masterton
Tel: (06) 377 0700

John Sawyer
Biodiversity – Technical Support Team
Department of Conservation
P.O. Box 5086
Wellington
Tel: (04) 470 8427

Trevor Thompson
Riversong
Mount Bruce
RD
Masterton
New Zealand

Appendix 2

FLOWERING AND FRUITING TIMES OF MISTLETOE SPECIES IN WELLINGTON CONSERVANCY

FLOWERING TIMES (SHADED BLACK) AND FRUITING TIMES (SHADED GREY) OF LORANTHACEAE MISTLETOE SPECIES IN WELLINGTON CONSERVANCY

NAMES	APPROXIMATE FLOWERING AND FRUITING TIMES											
	J	F	M	A	M	J	J	A	S	O	N	D
Alepis flavida Yellow mistletoe	■	■			▒	▒						■
Ileostylus micranthus Green mistletoe, scrub mistletoe				▒	▒	▒			■	■	■	■
Peraxilla colensoi Scarlet mistletoe	■			▒	▒	▒	▒			■	■	■
Peraxilla tetrapetala Red mistletoe	■					▒	▒			■	■	■
Tupeia antarctica White mistletoe							▒	▒	▒	■	■	■

FLOWERING AND FRUITING TIMES (SHADED BLACK) OF VISCACEAE MISTLETOE SPECIES IN WELLINGTON CONSERVANCY

NAMES	APPROXIMATE FLOWERING AND FRUITING TIMES											
	J	F	M	A	M	J	J	A	S	O	N	D
Korthalsella salicornioides Dwarf mistletoe, leafless mistletoe	■	■									■	■
Korthalsella clavata Dwarf mistletoe, leafless mistletoe	■	■									■	■
Korthalsella lindsayi Dwarf mistletoe, leafless mistletoe	■	■									■	■

Appendix 3

DATABASE OF MISTLETOE RECORDS FOR WELLINGTON CONSERVANCY

Distribution information for the native mistletoe species in Wellington Conservancy is held in the native plants database at the Wellington Conservancy office of the Department of Conservation. This information was used to compile the distribution maps used in this report.

The species are:

1. *Alepis flavida*
2. *Ileostylus micranthus*
3. *Peraxilla colensoi*
4. *Peraxilla tetrapetala*
5. *Tupeia antarctica*
6. *Korthalsella salicornioides*
7. *Korthalsella clavata*
8. *Korthalsella lindsayi*

Explanation of terms used in the database

Species record sheet – Information taken from completed copies of species record sheets (see Appendix 4)

WELT – Information taken from herbarium specimens held at Museum of New Zealand – Te Papa Tongarewa.

WELTU – Information taken from herbarium specimens held at the School of Biological Sciences, Victoria University of Wellington.

AK – Information taken from herbarium specimens held at Auckland Museum herbarium.

CHR – Information taken from herbarium specimens held at Lincoln Herbarium.

MPN – Information taken from herbarium specimens held at Massey University, Palmerston North.

PNAP survey site number – Information taken from survey reports for the Protected Natural Area Programme.

Unpublished species list – Information taken from the Wellington Conservancy plant checklist database held by the Department of Conservation (Sawyer 1998).

NIC – Not in Wellington Conservancy but included in database records because of proximity to Conservancy boundary.

9999 – Year of observation is unknown.

Full references for each occurrence are included in the bibliography to the main report.

Appendix 4

SPECIES RECORD SHEET

<table>
<tr><td colspan="3">SPECIES NAME:</td></tr>
<tr><td colspan="2" rowspan="3">OBSERVER:
NAME:

TELEPHONE NUMBER:

ADDRESS:</td><td>NEAREST MAJOR LOCALITY:</td></tr>
<tr><td>ECOLOGICAL DISTRICT:</td></tr>
<tr><td>OWNER/OCCUPIER OF LAND (if known):</td></tr>
<tr><td>MAP SERIES:</td><td>MAP NUMBER:</td><td>GRID REFERENCE:</td></tr>
<tr><td colspan="3">DATE OF OBSERVATION AND TIME:

LOCATION:

DESCRIPTION OF SITE (INCLUDING HABITAT):

SKETCH MAP OF SITE:</td></tr>
</table>

POPULATION FEATURES:

Number of individuals seen.
An indication of the scope of your survey i.e. is the population more widely spread?
An estimate of the age structure (number of adults, number of juveniles), flowering? fruiting? moulting?
Have you visited site before? If so how does it compare now?

WHAT IS THE CURRENT SITE MANAGEMENT?

ARE THERE ANY THREATS TO THE POPULATION?
e.g. herbivores, predators, land development, recreation, pollution, other.

RECOMMENDATIONS FOR MANAGEMENT OF THE SITE OR POPULATION:

WAS A PHOTOGRAPH TAKEN? Please circle **YES** **NO**

WAS MATERIAL COLLECTED?	**YES**		**NO**
TYPE OF MATERIAL	**SEED**	**CUTTINGS**	**SPECIMEN**

WHERE IS MATERIAL NOW?