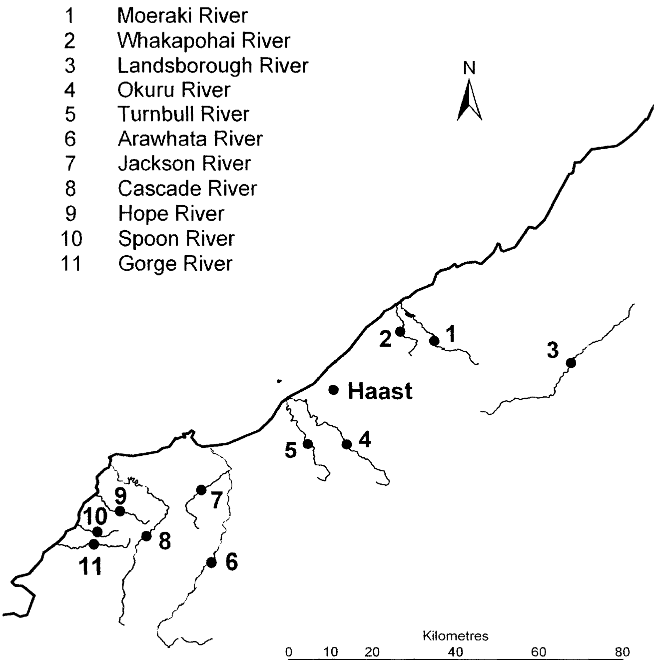
South Westland: Where the mistletoes are

Fiona Bockett and Phil Knightbridge
West Coast Conservancy, Department of Conservation, Private Bag 701, Hokitika

Introduction

South Westland is one of the last strongholds for the scarlet mistletoe *Peraxilla colensoi*. Two other species of beech mistletoe (*P. tetrapetala* and *Alepis flavida*) and the green mistletoe (*Ileostylus micranthus*) are also present. *P. tetrapetala* is occasionally found on silver beech hosts, usually above 500m altitude, although it is more common in the Landsborough Valley at lower altitudes (places mentioned in the text are shown on Fig. 1).

Fig. 1: Map of South Westland showing the location of places referred to in the text.



Ileostylus is common on a range of hosts on the alluvial flats of the lower reaches of the major South Westland valleys.

Prior to 1998 the only record of *Alepis* in South Westland was Peter Wardle's 1978 record from the mid-Cascade (CHR 311193). Since then clusters of *Alepis* have been found in the Arawhata, Hope and Spoon catchments and at three other locations in the Cascade catchment. One of these records was on red beech, the remainder being on mountain beech hosts. Further fieldwork is expected to show that *Alepis* is present in South Westland wherever mountain beech is present, at least from the Arawhata south.

The absence of browsing pressure from the Australian brushtail possum (*Trichosurus vulpecula*) is believed to be the main reason why good populations remain in South Westland (Ogle & Wilson 1985). This paper describes efforts made over the past 10 years to maintain these mistletoe populations and highlights advances in understanding the threats and management needs.

POSSUMS – THE MAIN AGENT OF MISTLETOE DECLINE IN SOUTH WESTLAND

There has been considerable debate over the causes of mistletoe population decline. Ogle & Wilson (1985) linked it to the spread of possums, while Norton (1997) suggested that possums are not the sole cause. Robertson et al. (1999) demonstrated that at two South Island sites there were too few bird pollinators visiting mistletoe flowers to allow full fruit set, which may lead to declines in mistletoe populations due to reduced recruitment. Birds are also required for mistletoe fruit dispersal. However this does not currently appear to be a major threat to mistletoe (Ladley & Kelly 1996).

Given that two major bird predators, stoats and ship rats, have been present in South Westland for more than 100 years, if reduced bird pollinator numbers were the main cause of declines in mistletoe populations in South Westland, major declines should have have occurred by now. We can't be certain whether some decline has occurred over the last 100 years, but we do know that scarlet mistletoe densities of 30 to 40 per hectare in silver beech forest below 600m altitude have been estimated at two South Westland sites where possums were recent colonisers (Norton et al. 1997; F. Bockett unpublished data). Similar densities (41 and 21 scarlet mistletoes per hectare) were found on two possum free islands in Lake Waikareiti in Te

Urewera National Park (Francis 2003). In contrast, two North Island mainland sites in Tongariro National Park had densities of 0.8 and 0.4 scarlet mistletoe per hectare (Francis 2003).

To confirm the role of possums in mistletoe decline in South Westland, data on individual mistletoe health and an index of possum abundance have been collected since 2000 at a range of sites, that have been occupied by possums for different lengths of time. Only data collected prior to possum control was used in the analysis.

Mistletoe health was assessed using a slightly modified version of the Foliar Browse Index (Payton et al. 1999). The main modifications were that the location of each mistletoe was clearly noted on a photo, and that the distance from the host tree where the mistletoe was viewed for scoring was recorded. The standard possum trap-catch method was used as an index of possum abundance (National Possum Control Agencies 2004).

The results are very clear: mistletoe condition (as indicated by the amount of foliage cover) steadily declines as possum density increases following establishment of a possum population (Fig. 2). This in turn leads to declines in mistletoe populations due to reduced flowering and fruiting and increased mortality. These results are consistent with those from other recent quantitative studies of possum impacts on mistletoe (e.g. Sessions et al. 2001; Sweetapple et al. 2002).

Further evidence for the impact of possums comes from a recent analysis of possum stomach contents undertaken for West Coast Conservancy by Peter Sweetapple of Landcare Research. The 26 stomachs were collected between October and December 2003 from catchments where possums have been present for less than ten years (true left of the Cascade River, and Hope, Spoon, and Gorge Rivers). Mistletoe foliage (both *Peraxilla* spp. and *Alepis*) averaged 32% of the diet (measured as percentage of wet stomach content). Ten of the stomachs sampled contained no mistletoe foliage, but of the 16 containing mistletoe foliage, this comprised 5% to 98% of the diet. The other major components of the diet were pohuehue (*Muehlenbeckia australis*) foliage (21%), fuchsia (*Fuchsia excorticata*) foliage (15%) and flowers (7%), and pokaka (*Elaeocarpus hookerianus*) fruit (10%). Mistletoe foliage was also an important component of possum diet (4%) in the Arawhata Valley in 1997, and was shown to be very highly preferred (Sweetapple et al. 2004).

The results of these two diet studies contrast markedly with those presented by Owen and Norton (1995) for the upper Haast Valley in 1991. They found that mistletoe foliage comprised only 0.5% of the annual diet, but it was still a highly preferred source in November, when it peaked at 1.4%.

There are a number of possible reasons for the lower amount of mistletoe in possum diet reported by Owen and Norton. Mistletoe may have been less abundant at this site in the upper Haast Valley than in the Arawhata or catchments we surveyed in 2003. The methods of diet analysis differed. Owen and Norton sieved the stomach contents and identified remaining fragments, whereas Sweetapple et al. (2004) separated out, identified and weighed the discrete layers typically present in possum stomachs (termed the layer-separation technique). The layer-separation technique was also used for the South Westland possum stomachs sampled in 2003. During the analysis of these stomachs Peter Sweetapple tested how much mistletoe foliage was retained in 2mm sieves. Only 2.6% (range 0.1 - 13.2%) was retained. The stomachs that retained the most mistletoe foliage contained newly flushed leaves that were small, thin and soft and were therefore ingested in large fragments. Mature mistletoe foliage was finely chewed and thus passed easily through the sieve. In comparison, 30.1 % (23.4-35.5%) of fuchsia foliage and 15.4% (5.4-35.9%) of pohuehue foliage was retained. This confirms that compared to other species, the proportion of mistletoe in possum diet is underestimated using the sieving technique.

In summary, although factors such as reductions in mistletoe pollinator abundance are likely to cause decline in mistletoe populations, in South Westland possums appear to be the main agent of decline.

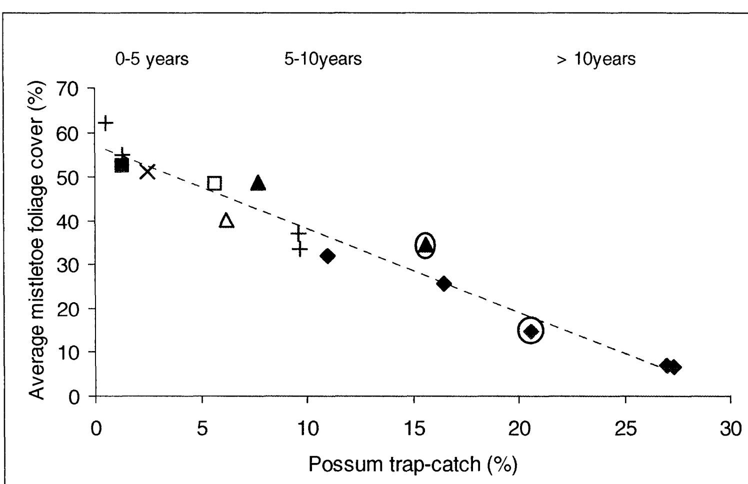
TRENDS IN MANAGED POPULATIONS

Possum control has been underway in the mixed beech-podocarp-hardwood forests of South Westland since 1990. The area treated has increased as more funding has become available and as possums have colonised new areas. The aim has been to prevent colonising possum populations reaching peak population levels, as previous research suggests this minimises possum impacts (e.g. Rose et al. 1993; Sweetapple et al. 2004). Operations have aimed to reduce the possum captures to less than 5% of the traps set each night (trap-catch index), and have been conducted every three to four years at each site.

This control strategy appears adequate to protect mistletoe at some sites. In the Landsborough Valley, scarlet mistletoe foliage cover averaged between 51% and 55% from 1997 to 2002 and annual mortality averaged just over 1% between 1994 and 2002.
However, at other sites this strategy seems insufficient to protect mistletoe populations. In the Turnbull and Okuru Valleys, average scarlet mistletoe foliage cover declined from 47% to 16% from 1998 to 2003 and annual mortality (excluding individuals where the host tree had died) averaged 8% between 1993 and 2003.

Furthermore, the trend towards declining mistletoe condition with increasing possum density at sites recently colonised by possums (Fig. 2) confirms that

Fig. 2: Relationship between average scarlet mistletoe (*Peraxilla colensoi*) foliage cover and possum trap-catch index at South Westland sites being colonised by possums. All sites measured in summer except Hope October 2003. Approximate length of possum colonisation is shown at top of graph. For each site points represent subsequent measurements over time along the x axis. The trap-catch index explains 94.8% (R^2=0.948) of the variation in mean mistletoe foliage cover between sites and years.
+ Hope (2001, Jan 2003, Oct 2003), x Whakapohai (2001), ■ Spoon (2003), Δ Stafford (2000), ▲ Thomas (2000. 2003), □ Mid Gorge (2003), ◊ Cascade TR (2003), ♦ Jackson (2000,2001,2002,2003,2004). Circled possum trap-catch values are estimates based on an intrinsic rate of increase (r_m) of 0.25 (Hickling & Pekelharing 1989).



if we are to maintain healthy mistletoe populations, i. e. foliage cover above 45%, possum trap-catch must not exceed 5%. If trap catch reaches 15 % or more before repeat possum control, high levels of mistletoe mortality are likely and the average foliage cover of surviving mistletoe will decline to less than 30%.

THE FUTURE

Work over the past 10 years has confirmed that South Westland remains a stronghold for beech mistletoe, particularly scarlet mistletoe. However, in the absence of effective possum control it will not remain so.

Five key areas for mistletoe conservation in South Westland have been identified: Whakapohai, Landsborough, Hope, Gorge/Spoon, and Cascade. A sixth small area in the Moeraki catchment is an experimental trial of intensive possum control using a combination of aerial 1080, kill traps, and encapsulated cyanide. Possum control at all these sites will need to become more intensive to prevent possum abundance increasing above 5-8% trap-catch.

Although new control tools such as possum kill traps are being trialled, given the nature and scale of the terrain, aerial application of 1080 remains the only cost effective means of achieving this level of possum control. Secure long term funding combined with access to the most effective control tools for possums and other threats to the beech forest ecosystem are the best hope for maintaining the scarlet bloom of the mistletoe in at least some of South Westland's forests.

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