How resilient are our podocarps to deer antler rubbing?

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Of all Canterbury's native trees, the podocarps seem to evoke the strongest feelings of admiration. The sheer size of old-growth trees is perhaps the most obvious feature that captures our attention. A stroll among the lowland tōtara stands around Geraldine and Peel Forest usually leaves us musing whether a few more of those trees might somehow have escaped the saws, axes and fires that accounted for the vast majority. Most of us will have wished we could somehow turn back the clock and catch a glimpse of those ancient forests - replete with all their wildlife. If only they could speak, some of those giants could surely tell us wonderful stories of their youth. Today's 800 year old tōtara giants could have had moa, South Island kōkako, kiwi, weka and a host of other birds rummaging about them when they were mere saplings. That web of life depended to varying degrees on the podocarps, especially on seasonal fruit production. Many of those birds are now gone, some of them forever (Dawson and Lucas 2011).

A few of the oldest surviving podocarps would have been saplings when the first canoes were paddled down the coast, and escaped the flames as early fires swept across the drier country. Centuries later they might have been sighted by the first European explorers as their vessels sailed along the coast. Again a few of them survived the onslaught of early land clearance by European settlers, perhaps too isolated to be felled and processed for buildings, fencing or firewood. Again fires, deliberate or otherwise, would have destroyed many trees. A significant number of surviving old podocarps have fire scars – often most prominent on the uphill side where forest debris had accumulated most heavily against the trunk, thereby exacerbating the fire damage.

Thankfully the value of a few remnants was recognised, and a smattering of primary podocarp stands was protected from exploitation, Pūtaringamotu / Riccarton Bush being among Canterbury's best known examples. However recognition of their significance was far from universal. King Street in present-day Rangiora has an incongruous kink near its southern end. That kink was deliberately formed so that the early street could avoid passing through a small stand of kahikatea forest, a tiny fragment of the more extensive stands that persisted in the Rangiora and Ōhoka areas up to the mid-1800s (Fig. 1, p. 59). The last of the kahikatea trees was reputedly still standing in the mid-1900s; today the locality is dominated by suburban development. Had those trees still been standing we would surely now regard them as regional treasures.

Given that podocarps have the potential to live for centuries, we now have a responsibility to ensure that future generations might have the opportunity to stand under mature trees and experience those same feelings we can today. Many of the most intact remnants are protected by way of reserves or covenants.

Figure 1. The house of C J Boys Esq in southern Rangiora, as sketched by C J Hawdon on 21 November 1854. Note the large podocarps in the background. Picture courtesy of Canterbury Museum, 30 June 2020, ref: 1949.29.23.

Only a few Canterbury remnants still have old-growth podocarps, though many do support good numbers of younger trees that came away after earlier clearance. Being dioecious, both male and female seedlings need to reach a reproductive age to make a remnant population sustainable. In most cases there are sufficient trees producing seed and adequate dispersal mechanisms to enable a fresh cohort of seedlings to be establishing nearby. At first glance it might be assumed that indeed there will be a new generation of podocarp giants in centuries to come. The key question, however, is whether or not today's seedlings and saplings will indeed survive to become the forest giants of future centuries.

When it comes to herbivory, podocarps appear to be less preferred than many broad-leaved species, although fencing and de-stocking can significantly enhance early podocarp recruitment, especially where livestock pressure is great. Most legally protected forest remnants are now fenced, and provided those fences are well maintained and functional, the effects of domestic livestock are likely to be minimal. However, many other constraints are not effectively excluded by conventional farm fences, and require other forms of management.

There were numerous introductions of red deer (*Cervus elaphus scoticus*) to New Zealand in the 1800s. Our forests and tussock-grasslands provided ideal habitat and deer numbers boomed to the point that a state-funded control program was established. It was optimistically envisaged that deer could be eliminated by foot-hunters, although despite large numbers of animals being shot the problem persisted. In the late 1900s an overseas market grew for wild

venison, followed soon after by a demand for live-captured deer to stock a burgeoning deer farming industry. Both were based around helicopter recovery of wild red deer. This resulted in a significant reduction in wild deer numbers, to the point that in some places native species formerly suppressed by the impacts of deer had a window of opportunity to recruit again. The highly palatable five-finger (*Pseudopanax arboreus*) was a species that flourished in most lowland and foothill parts of Canterbury. Many remnants of native scrub or forest have a cohort of five-finger trees that established during that period, sometimes becoming a newly dominant species. Our podocarps also benefitted from the reprieve. Seedlings had improved opportunities to grow through to sapling stage under the reduced disturbance pressure. Many trees from that podocarp cohort are now several meters in height. One might easily assume that because these youngsters are now large enough to be resilient to most browsing pressure, they are thus on an assured trajectory to becoming large trees. Unfortunately this is not always the case.

Red deer stags grow a fresh set of antlers annually, and around February and March each year they strip soft skin off that year's antlers by thrashing them against vegetation. Further antler thrashing occurs in April and May, presumably as competing stags define territory during the roar (the deer mating period). There seems to be a clear preference in the species selected for antler rubbing, and conifers are generally highly sought after. The podocarps mātai (*Prumnopitys taxifolia*), miro (*Pectinopitys ferruginea*) and kahikatea (*Dacrycarpus dacrydioides*) seem to be particularly targeted (Fig. 2). If present, mountain toatoa / celery pine (*Phyllocladus alpinus*) is even more sought after. When targeted species volunteer abundantly the overall impact can be low, but for populations where recruitment is sporadic or isolated, antler damage can have a serious impact.

Figure 2. A group of mātai saplings, recently damaged by antler rubbing.

Location can provide some respite. Trees in less accessible refuges are less likely to be damaged than trees in accessible open sites, though considerable effort is sometimes made to antler-rub a preferred species in what might seem to be a well-protected location.

Exotic conifers also get targeted. Young plantations can suffer significant damage, whilst outlier wilding pines are often sought out, fortuitously suppressing their spread (Fig. 3). While young whippy stems are generally chosen, even quite mature trunks of conifers can be targeted – perhaps the resins excreted from damaged bark are somehow attractive (Figs. 4 & 5, p. 62). Several other species of deer have also been introduced to New Zealand, each seeming to have slightly different preferences and impacts when antler rubbing.

Figure 3. The damaged trunk of an outlier wilding pine (*Pinus radiata*) exuding copious resin after being targeted for antler rubbing. Whilst not specifically targeted, several close-by mānuka trunks have also been damaged.

A few hardwood species also seem to attract particular attention. Single-stemmed saplings, young trees, and low branches of older tawhairauriki / black beech (*Fuscospora solandri*), mountain beech (*Fuscospora cliffortioides*) and tawhairaunui / red beech (*Fuscospora fusca*) can occasionally get all their bark thrashed off.

Similarly, repeated browsing of the foliage of palatable broad-leaved species can prevent their recruitment, eventually leading to their elimination in all but the

least accessible locations. A few species of broad-leaved trees are also vulnerable to bark-chewing by deer, most notably whauwhaupaku / five-finger (Fig. 6, p. 63). In South Canterbury a parallel impact is created through bark-chewing by wallabies. Bark chewing damage tends to be most evident in late winter when alternative food sources are scarce. Even mature trees can be ring-barked or suffer enough damage to weaken the trunks and lead to eventual collapse.

Figure 4. Even mature mātai can be vulnerable to antler rubbing and gouging by deer.

Figure 5. Resin exuding from a recent antler gouge in mature mātai bark.

Figure 6. A mature five-finger tree (*Pseudopanax arboreus*) recently ring-barked by the teeth of red deer.

When it comes to the podocarps, occasional browsing of the foliage of saplings may temporarily set those trees back but seldom kills them. However, any bark damage resulting from antler rubbing generally has more serious, often permanent consequences. Badly damaged mātai usually die, whilst kahikatea sometimes sprout fresh shoots from the base to form a multi-stemmed plant which may survive, albeit eventually with a modified form. Tōtara saplings can occasionally resurrect a replacement leader from a leafy branch below the antler damage, but if no such branches are present the damaged plants are likely to die. Even plants several decades old are at risk. Mātai and kahikatea trees with trunks well over 20 cm thick are still vulnerable to enough damage to cause death (Fig. 7, p. 64). Badly damaged survivors are liable to subsequent breaking of the damaged trunk years after the damage was done (Fig. 8, p. 64). Mātai has surprisingly thin bark, predisposing it to damage. An individual tree only needs one visit by an antler-rubbing stag during its first few decades to have its future jeopardised. Some trees retain evidence of repeated antler rubbing events, cumulatively threatening the life of trees that can be several decades old (Fig. 9, p. 64).

Since about 2000 a reduction in the wild deer recovery industry has resulted in wild red deer numbers rising again. Similarly some of the other deer species are extending their distributions into previously unoccupied areas. This means that the cohort of podocarp saplings that established and grew following the deer-recovery years is now at increased risk.

Figure 7. Repeated antler rubbing damage to a mātai trunk (diameter 16 cm).

Figure 8. A mātai tree (diameter 31 cm) weakened by the scars of previous antler rubbing.

Figure 9. This mātai is likely to be well over 100 years old, but its bark is still being damaged by repeated antler rubbing.

How then can we assure that today's podocarp saplings have a good chance of becoming the giants of future centuries? Recreational and commercial hunting go some way to reducing deer abundance, although observations indicate that

podocarp survival and development is again being constrained. Given the difficulty in reducing deer density at a landscape scale, there is the opportunity to at least exclude deer from some protected remnants by ring-fencing them with deer fences rather than conventional fences. Deer fences are not much more expensive than conventional stock fences, but can provide a significant advantage. Some covenant funders now offer an increased level of contribution towards deer fencing, to encourage covenanting landowners to adopt the more secure alternative. Comparison of these deer-fenced areas with nearby conventionally-fenced covenants will provide an opportunity to assess the benefits relative to both browsing and antler-rubbing. The benefits from reduced browsing are likely to become apparent soon after deer are excluded, though the advantages to podocarp development may not become fully apparent for decades. Other constraints to podocarp recruitment may also need to be addressed, including seed consumption by rodents and limitations on seed dispersal.

At a time when landowners are being encouraged to plant native trees, thought needs to be given not only to maximising short term establishment success, but also to future-proofing such plantings against predictable threats, such as deer. The often-promoted method of creating clear light-wells in mānuka or kānuka scrub into which saplings are planted has short-term advantages, but can also create vulnerabilities. Such clearings can present a susceptible species "on a dinner plate" to browsers and to antler-rubbing deer. Thought also needs to go into means of somehow protecting those exposed planted trees. This can be especially difficult for species like mātai and kahikatea, which retain vulnerabilities for such a long period. Like it or not, deer are now a common component of our rural landscape and are likely to stay that way.

I have grandchildren, and hopefully one day they will have their own grandchildren. Like all grandparents I want them to be able to enjoy a healthy life without being deprived of those treasured things that I have been so lucky to experience. Being able to stand under a huge podocarp and say "Wow!" is one of those experiences.

Acknowledgements

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Reference

Dawson J, Lucas R. 2011. New Zealand's native trees. Nelson: Craig Potton Publishing.