Do some native tree species show imbalances in their populations at regional scales across public conservation land?

Summary

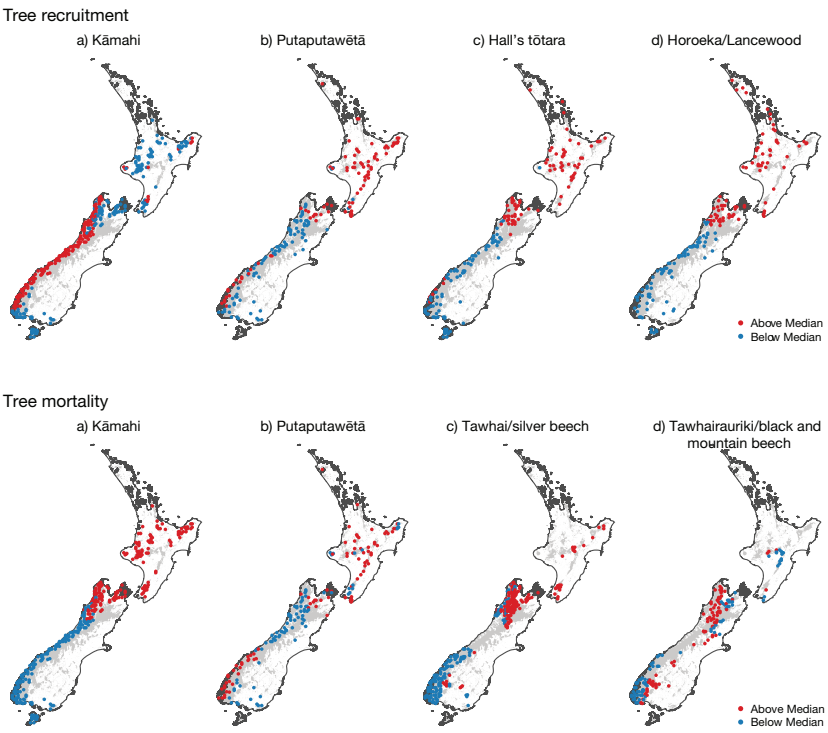
Rates of mortality and recruitment of most of the common trees in New Zealand forests are in balance (i.e. mortality matches recruitment), but some show clear geographic differences. In particular, kāmahi, New Zealand's most common tree, shows greater mortality than recruitment in the north of its range, but the opposite in the south of its range. Finding out the reasons for such imbalances is important, especially if it is in long-term decline in the North Island, since native pollinators and selected economic activities (e.g. honey production) could be unfavourably affected.

Main findings

- At a national scale, the rates of recruitment and mortality of most of New Zealand's common forest tree species are in balance over the last decade, suggesting that their populations are stable. Six widespread trees showed distinct patterns across the country.
- The population of kāmahi is in balance across the whole country, but this is not the case at a regional scale. Higher-than-average numbers of kāmahi died towards the north of its range, whereas higher-than-average numbers of trees became established in the south of its range.
- Populations of putaputawētā are most dynamic (high rates of establishment coupled with high rates of adult mortality) throughout the North Island and in the southwest South Island and least dynamic throughout most of the rest of the South Island.
- Halls tōtara and horoeka show similar patterns of recruitment. Between the two surveys, higher-than-average numbers of these trees became established towards the north of their range.
- Tawhai/silver beech shows a very similar pattern of mortality to kāmahi, with higher-than-average numbers dying in the north of its range
- Higher-than-average numbers of tawhairauriki/black and mountain beech died in the northwestern South Island and the eastern parts of Fiordland.

Many factors influence recruitment and mortality rates, for example:

- Latitude – greater energy from the sun in the north of a tree's range can result in high rates of population turnover.
- Forest disturbance – soon after a big disturbance (e.g. tropical Cyclone Ita in 2014), recruitment rates tend to be high.
- Soil fertility – fertile soils can support more dynamic forests than nutrient-poor soils can.



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Why is this important?

Kāmahi is New Zealand's most abundant tree. It's locally dominant, an important source of food for birds and important economically (as a source of honey). It is important to understand why it seems to be declining in the northern part of its range while it is increasing in the southern part. These changes might reflect processes beyond DOC's control. For example, in the North Island, kāmahi is known to have expanded following pre-European fires and it could have benefited in the past from disruption associated with volcanic eruptions. It's present decline could be related to less disturbance, and it now being outcompeted by other tree species. Possums, deer and goats also consume kāmahi preferentially and could accelerate its decline in the North Island. On the other hand, possums, deer, and, to a lesser extent, goats are widespread through many of the forests in the South Island where kāmahi populations seem to be increasing. Forests with increasing populations of kāmahi include those in upland Westland, where possums are often common and where kāmahi mortality has been attributed to possum browsing.

Definitions and methodologies

- This uses information from Measure 5.1.1 ("Size-class structure of canopy dominants") assessed across all forests on public conservation land (Tier One systematic national sampling).
- Recruitment and mortality rates were assessed for eight of the tree species that occurred most frequently on survey plots in forests across public conservation land in New Zealand. These common species were kāmahi (*Weinmannia racemosa*), putaputawētā (*Carpodetus serratus*), Halls tōtara (*Podocarpus laetus*), horoeka/lancewood (*Pseudopanax crassifolius*), tawhai/silver beech (*Lophozonia menziesii*), and tawhairauriki (combining black beech (*Fuscospora solandri*) and mountain beech (*Fuscospora cliffortioides*)). The species chosen for presentation were those where some spatial pattern was shown.
- This information comes from 586 survey plots (20 m × 20 m) distributed across forests on public conservation land throughout New Zealand. Each of these plots was first surveyed between 2002 and 2007. All trees with trunk diameters greater than or equal to 2.5 cm when measured at 1.35 m height (called 'diameter at breast height' or DBH) were tagged and identified. The same plots were resurveyed between 2009 and 2014. Any trees present in the first survey but missing from the second were recorded as dead. Any trees that died between surveys were also recorded as dead. Any trees not recorded in the first survey but recorded in the second as having a trunk greater than or equal to 2.5 cm DBH were recorded as newly established trees.
- Statistical analyses were carried out to assess whether there were spatial patterns in the data and whether these patterns were associated with major environmental gradients, such as latitude and/or modelled soil moisture.

Where can I find more information (links)

http://www.landcareresearch.co.nz/publications/researchpubs/Department_of_Conservation_biodiversity_indicators_2014_assessment.pdf

http://www.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Land/widespread-indigenous-trees.aspx

http://www.stats.govt.nz/browse_for_stats/environment/environmental-reporting-series/environmental-indicators/Home/Land/distribution-indigenous-trees.aspx