Limestone rocks, Lang's Beach

Gigartina alveata, Lang's Beach

***Pachymenia lusoria*, Lang's Beach**

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Lucy Cranwell Grant Report
Indigenous forests in the Raglan Ecological District

Toni Cornes

In the Raglan Ecological District on the West Coast of the North Island, indigenous forests have been reduced from 99% of the total area in 1840 to 13% in 1995. Within the District, 32 plots (9 permanently marked) were established to determine the composition, dynamics and condition of 23 forest patches (Cornes 2006). Three forest strata were measured. Diameters of stems (≥3 cm diameter breast height (DBH); ≥1.35 m tall), and maximum canopy height were recorded in 32 plots of 400m^2. Heights of the sapling layer (<3cm DBH; ≥1.35 m tall) were measured in 59 subplots of 100m^2. To record heights of the seedling layer (<1.35 m tall) were measured in 252 subplots of 1m^2 (and 96, 0.20cm^2 subplots).

Mean densities and mean basal areas of the major woody species were compared between two

bioclimatic zones, two management regimes and two landforms. Population structures of seven key canopy dominants (kahikatea *Dacrycarpus dacrydioides*, kanuka *Kunzea ericoides*, kohekohe *Dysoxylum spectabile*, matai *Prumnopitys taxifolia*, tawa *Beilschmiedia tawa*, totara *Podocarpus totara* var. *totara* and tree coprosma *Coprosma arborea*) were also assessed.

Forests in the lowland bioclimatic zone were composed of greater numbers of mid-late successional forests than the coastal zone. The coastal zone showed greater densities and basal areas of early successional and warm temperate coastal species than lowland forests. Key canopy dominants characteristic of disturbance (kanuka, totara and tree coprosma) also had higher densities in the coastal zone.

Forests in managed areas exhibited better developed understories with significantly higher densities of saplings and seedlings and significantly higher species richness compared with non-managed areas. However, active management of forest patches in the Raglan Ecological District only began 2-45 years ago and therefore is not yet reflected in stem densities between management regimes. Maximum canopy heights were significantly taller in managed areas. The tallest species recorded, kauri was only found in managed areas.

Forests on slopes exhibited significantly greater species richness than forests on plains. Key canopy dominants kahikatea, matai and totara, which tolerate waterlogging and/or cool climates, had higher densities and basal areas on plains. Frost intolerant key canopy dominants, e.g. kohekohe and tawa, reached their highest densities on slopes. Analysis of small stem class densities showed kahikatea and matai regenerated better on plains while kanuka and tawa regenerated better on slopes. Totara's high sapling densities indicated successful regeneration on both landforms.

Cluster analyses identified five major forest types; tawa, kahikatea, kauri, kanuka, and puriri (*Vitex lucens).* Tawa forest comprised mid-late successional forest, containing the highest densities of shade tolerant species. Kahikatea forest typically occurred on poor draining soils, having the highest densities of species tolerant of waterlogging and/or cool climates. Kauri forest characterised drought prone soils, to which kauri was restricted and also had highest densities of drought tolerant species. Early successional kanuka forest contained highest densities of shade intolerant colonizing species. Finally, the puriri type comprised coastal forest, with highest densities of species typical of warm temperate coastal areas. All forest types identified were similar to forests recorded elsewhere in the North Island by national surveys.

Representativeness analysis shows kauri and conifer forests have been preferentially selected for reserve. In contrast secondary broadleaved and small leaved forests and forests containing taraire (*Beilschmiedia tarairi*) are inadequately represented in the reserve network.

Establishment of a permanent plot monitoring network allows future measurement of changes in composition and structure of forests. This will assist the management, prioritization and decision making for protection and restoration of these forests.

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Lucy Cranwell Grant Report
Pollination of Invasive Species: Do introduced bees facilitate invasion in two *Lupinus* species?

Alana Jane Lawrence

It has been suggested that pollination does not limit reproduction of most weeds because traits such as vegetative reproduction and self-pollination ensure reproductive success. However this is not always the case, and small sparse weed populations may be less successful at attracting pollinators than larger denser populations, leading to pollen limitation, and an Allee effect. In New Zealand introduced bees are often responsible for pollinating invasive species, and synergistic interactions between plants and pollinators may increase the invasive potential of both parties.

I studied two *Lupinus* species; *L. arboreus* (tree lupin) in the Manawatu-Rangitikei region and *L. polyphyllus* (Russell lupin) in the Mackenzie basin. These species are both serious weeds in New Zealand, and do not self pollinate or reproduce clonally. Lupins also have specialised floral form that can only be pollinated by bees of intermediate to long tongue length. As all New Zealand native bees are short-tongued, these weeds may rely on pollination by longer tongued introduced bees.