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**Regeneration of the native sand dune plant  
*Pimelea arenaria* in the lower North Island, New  
Zealand**

**A thesis presented in partial fulfilment of the  
requirements for the degree of**

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## Abstract

New Zealand has 300,000 ha of coastal sand dunes in which many native species and introduced plant and animal species are established. One native plant inhabiting dune ecosystems is *Pimelea arenaria* (Thymeleaceae), the native sand daphne, which is gynodioecious with female and hermaphrodite flower types and listed as nationally declining. The cause of the decline is unknown, but anecdotal evidence suggests recruitment failure is occurring. This thesis looked at four *P. arenaria* populations in the lower North Island of New Zealand. The aims were (1) examine the population structure and establish whether recruitment failure was evident, (2) whether any failure was due to problems with pollination, and (3) whether house mice (*Mus musculus*) or birds had any impact on *P. arenaria* by removing fruit.

The *P. arenaria* populations ranged from 0.53-4.05 plants/ha, with female plants comprising the smaller portion of each population, the exact sex ratios varying between the sites. The standing crop of nectar of hermaphrodite flowers is modest and varies from 24 to 56  $\mu\text{g}$ /flower. The pollen:ovule ratio (1987: 1), as well as casual observations, suggest that insects are the main pollen vectors. Recruitment failure in *P. arenaria* occurred with few or no seedlings found at any site, the maximum height above substrate and the surface area of substrate covered suggesting an adult biased population. Profuse flowering occurred (360-510 flowers/ $\text{m}^2$ ), leading to viable seed from both female and hermaphrodite plants. Less than 50% of seed germinated from either flower type, regardless of pollination method (natural, hand out-crossed, or autonomously selfed). Female plants observed higher germination success in seeds in both hand out-crossed and natural pollination. *P. arenaria* seed weight remained constant between sexes and treatments, however the pulp weight was variable, with hermaphrodite autonomously selfed fruit having the smallest amount of pulp, but this was not significant ( $p=0.37$ ).

Graded exclosures showed that fruit was removed but this was preventable by bagging the fruit ( $p<0.001$ ). However, the results from the exclosures were unable

to distinguish between mice and birds suggesting that both have similar, possibly cumulative, effects on fruit loss. Within the bagged fruit there were peaks of fruit loss at the start and end of the fruiting season suggesting that selective abortion of ovules is occurring, possibly because of low abundance of pollen sources or pollen vectors. Fruit loss occurred, but there was no direct field evidence of predation by mice and birds. A feeding trial with mice established that both female and male mice eat and destroy *P. arenaria* fruit and seed, and at a low dose rate (3 fruit/mouse) the fruit of *P. arenaria* was not poisonous.

Areas for future work are discussed for each section.



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