Linear population shape reduces ecological and genetic function in a bird–pollinated plant

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Linear strips of native vegetation are prominent features in agricultural landscapes and revegetation projects, yet there has been little study of the impact of linear geometry on ecological and genetic function. We used microsatellite markers, field surveys and fitness trials to investigate the effect of different aspects of habitat fragmentation on the mating system, pollen dispersal, reproduction and progeny fitness in remnant populations of Banksia sphaerocarpa var. caesia, a common bird-pollinated shrub in the southern agricultural region of Western Australia. We found population linearity to be as important as population size in relationships with variables that could potentially affect population viability. Plants in linear populations had smaller seeds and lower seed germination. As population linearity increased, mating neighbourhood size decreased and pollen pool differentiation increased, indicating a decline in genetic function mediated through changes in bird foraging patterns. Neighbourhood size was highly correlated with seed weight, which in turn was highly correlated with measures of seed and seedling fitness, suggesting a strong effect of paternal diversity on progeny fitness. In contrast to these detrimental effects, plants in linear populations were larger and had more inflorescences, cones and follicles than those in non-linear populations, suggesting that increased resource availability in linear populations may partly compensate for negative effects on the mating system and progeny fitness. We suggest that when planning restoration projects, more consideration be given to the potential impacts of linear population shape on ecological and genetic function and consequent long-term population viability.

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