Maximising genetic diversity in translocated populations of clonal saltmarsh plants

A case study on *Wilsonia backhousei*

Wetlands Ecology and Management 21, 339-351
Background

Coastal saltmarsh – saline, periodically flooded, many clonal plants

Voyager Point NSW – dry and flooded by a king tide
Background

Coastal saltmarsh is endangered in NSW, vulnerable nationally.

Source: Sydney Olympic Park Authority
Background

*Wilsonia backhousei* – endemic, clonal, individuals hard to distinguish

Who am I really?
Background

*Wilsonia backhousei* – outbreeding, wind pollinated, dispersed by tides

Methods

Study location
Methods

Genetic diversity

• 13 populations, 236 samples

• Individuals identified using 8 microsatellite markers + GenClone2
Methods

Reproductive success

• 3-5 quadrats per site, 5 subdivisions per quadrat
• % cover; number flowers, fruit, seed
• Soil moisture, pH, salinity

Whose bright idea was this?
Results

Diversity not related to site size
- 1 to 26 individuals per site
- One ind. covered 225m$^2$
- No individuals at > 1 site

PCoA and Structure analysis
- Extent of gene flow

Ordinal logistic regression
- Factors affecting seed yield
Results

Gene flow is chiefly within estuaries
Results

Sites that produce seed have sig. more diversity than those that don’t ($P = 0.001$)

<table>
<thead>
<tr>
<th>Site</th>
<th>Avg GD*</th>
<th>Seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabbage Tree Creek</td>
<td>11.06</td>
<td>✓</td>
</tr>
<tr>
<td>Cararma Inlet</td>
<td>10.89</td>
<td>✓</td>
</tr>
<tr>
<td>Newington Nature Reserve - Wharf</td>
<td>7.67</td>
<td>✓</td>
</tr>
<tr>
<td>Newington Nature Reserve - North East</td>
<td>5.64</td>
<td>✓</td>
</tr>
<tr>
<td>Newington Sea Wall - 2</td>
<td>3.53</td>
<td>✓</td>
</tr>
<tr>
<td>Voyager Point</td>
<td>3.39</td>
<td>Rare</td>
</tr>
<tr>
<td>Clovelly</td>
<td>0.83</td>
<td>X</td>
</tr>
<tr>
<td>Ermington</td>
<td>0.60</td>
<td>X</td>
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<tr>
<td>Newington Sea Wall - 1</td>
<td>0.33</td>
<td>X</td>
</tr>
<tr>
<td>Mason Park</td>
<td>0.00</td>
<td>X</td>
</tr>
<tr>
<td>Melrose Park</td>
<td>0.00</td>
<td>X</td>
</tr>
</tbody>
</table>

*GD = genetic distance
Results

Seed yield increased significantly with increasing soil water ($P = 0.003$) and number of individuals in a 5m radius ($P = 0.003$)

![Graph showing correlation between seed yield and genotypes](image)

Pearson Correlation = 0.551, $P = 0.014$
Applications

Maximising adaptive potential

Results explain performance of pops in SOPA

• Nursery area
  • Plants grown from cuttings from one site
  • Material planted into mounds
    ➢ no tide influence, widely separated
  • Only 2 individuals represented
  • Poor seed set

• Engineered creek bank
  • 13 individuals (source not recorded)
  • Tidal influence
  • Good seed set
Applications

Maximising adaptive potential

• Translocation
  • Collect seed, or
  • Collect cuttings from multiple populations
  • Collect from within an estuary
  • Plant a mix of individuals in 5m radius
  • Place within reach of king tides

• Management
  • No seed production indicates
    • Low genetic diversity, or
    • Too much distance between individuals, or
    • Insufficient water
Acknowledgements

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