Communication Design.

GRAPHICS & FIGURES

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@explorpreter
Pollution Sensitive Species

Mayflies, stoneflies and caddisflies are sensitive to degraded stream habitat conditions. Because of their sensitivity, we can tell if a stream is more or less healthy by how many of these macroinvertebrates are found in the stream. They are called “EPT” taxa after their scientific names. The EPT taxa are used as part of a stream health index called the Macroinvertebrate Community Index or “MCI”.

Ephemeroptera - Mayflies

Deleatidium

Plecoptera - Stoneflies

Zelandoperla

Trichoptera - Caddisflies

Olinga

School of Biological Sciences
L. sordidum is the most widespread and visits the widest range of native and exotic plants. At many sites this species outnumbers other native solitary bees throughout the year, and is a successful competitor of *Apis mellifera* (Donovan 2007).

*Lasioglossum* species all nest in the ground and the genus is found in both the North and South Island of New Zealand. These bees are important as pollinators in New Zealand because of both their abundance and their lack of plant specialisation (Donovan 1980).

We studied the pollination systems of three endemic *Gastrodia* species within modified landscapes in the Canterbury Region: *G. cunninghamii*, *G. minor*, and *G. "long column"*. The latter undescribed taxon has quite distinctive flower morphology (Rolfe 2010) and is likely to be described as a separate species (C. Lehnebach, Museum of New Zealand Te Papa Tongarewa, pers. comm.). Specifically, our aims were to determine:

1. How many species of *Gastrodia* grow around urban Christchurch?
2. Are those *Gastrodia* species capable of autonomous selfing?
3. What flower visitors go to *Gastrodia* species?
4. How do sites vary in flower visitation rates and natural fruit-set rates?

### Methods

#### Species studied

*Gastrodia* have perennial underground tubers, which produce non-photosynthetic brown flowering shoots 10–50 cm tall. The species we found were identified using the guide to *New Zealand Gastrodia* (Rolfe 2010), and voucher specimens sent to the Museum of New Zealand Te Papa Tongarewa herbarium (WELT). Both *G. cunninghamii* and *G. "long column"* have inflorescences >30 cm in height carrying 20–50 flowers per stalk. The latter species has a very short column whereas that of *G. cunninghamii* is the length of the labellum (Fig. 1). Also, *G. "long column"* has a yellow labellum tip which distinguishes it from *G. "long column black"* (Rolfe 2010).

*Gastrodia minor* Table 1:

<table>
<thead>
<tr>
<th>Species</th>
<th>Site</th>
<th>Stems (bagged stems)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Gastrodia</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victoria</td>
<td>11 (3)</td>
<td>22 (15)</td>
</tr>
<tr>
<td>&quot;long column&quot;</td>
<td>CBG</td>
<td>8 (5)</td>
</tr>
<tr>
<td>Addington</td>
<td>–</td>
<td>14 (5)</td>
</tr>
<tr>
<td>Ohoka</td>
<td>–</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Little Hagley</td>
<td>–</td>
<td>17 (8)</td>
</tr>
<tr>
<td>Gastrodia</td>
<td>Hook.f.</td>
<td>–</td>
</tr>
<tr>
<td>Victoria</td>
<td>–</td>
<td>3 (0)</td>
</tr>
<tr>
<td>&quot;long column&quot;</td>
<td>CBG</td>
<td>–</td>
</tr>
<tr>
<td>Addington</td>
<td>–</td>
<td>19 (7)</td>
</tr>
<tr>
<td>Ohoka</td>
<td>–</td>
<td>11 (6)</td>
</tr>
<tr>
<td>Gastrodia</td>
<td>Victoria</td>
<td>10 (5)</td>
</tr>
<tr>
<td>&quot;long column&quot;</td>
<td>CBG</td>
<td>13 (6)</td>
</tr>
<tr>
<td>Addington</td>
<td>–</td>
<td>8 (5)</td>
</tr>
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<td>–</td>
<td>11 (6)</td>
</tr>
</tbody>
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Table 1. *Gastrodia* species studied at various sites in and around Christchurch, with number of stems (and bagged stems) observed each year. CBG, Christchurch Botanic Gardens; –, site not used in that year.

Methods

#### Apogamic selfing

Apogamic selfing is a self-fertilisation process in which the pollen supplies the male gametes. This is a common mechanism in many plants. In *G. cunninghamii*, a unique selfing mechanism involves a specialized flower structure called the "long column" (Rolfe 2010). The long column is a sterile structure that projects from the flower and functions in pollen release. This mechanism has been studied in detail (Rolfe 2010).
Cow

Grass

Clover

Tomato

Wheat

Phyllospora in roots

Mycorrhizal fungi

one or more gut parasites or mites

kneeticks

Gut of leecher parasites

nematode

Caterpillars

ants

mites

Cereal aphids

Hybrid

Cereal aphids

Wild

basil

lettuce

oats

radish

Aphids

Scurvy mound of some cereal fungi
### Habitat Type

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Percentage</th>
<th>Thousand fields</th>
<th>Mode/type</th>
<th>Uncertainty</th>
<th>Rescaled uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>2.861</td>
<td>268</td>
<td>4 aggregate counts</td>
<td>0.490067</td>
<td>0.952163938</td>
</tr>
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<td>268</td>
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</tr>
<tr>
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<td>4 aggregate counts</td>
<td>0.490067</td>
<td>0.952163938</td>
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<tr>
<td>Coffee agroforest</td>
<td>2.861</td>
<td>268</td>
<td>4 aggregate counts</td>
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### Predictive Capability ($R_{M}$)

<table>
<thead>
<tr>
<th>Habitat Type</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>0.81</td>
</tr>
<tr>
<td>Pasture</td>
<td>0.82</td>
</tr>
<tr>
<td>Forest</td>
<td>0.83</td>
</tr>
<tr>
<td>Coffee agroforest</td>
<td>0.84</td>
</tr>
</tbody>
</table>

### Correlated Preferences

The table above shows the aggregate counts, specified preferences, and correlated preferences for different habitat types. The predictive capability ($R_{M}$) is calculated using these values.

The figure on the right visualizes the correlated preferences for each habitat type, with different patterns representing different habitats.

The predictive capability ($R_{M}$) is shown along the x-axis, ranging from -15 to 0, with 0.8 to 0.9. The color gradient reflects the predictive capability, with higher values indicating stronger predictive capabilities.
How.
Know your message
Start at the end
Remove the junk
Save the rainbows
What the font
Make it flow
Diminish the low value stuff
Layer the information
Understand file formats
Be consistent