Pityopsis ruthii

- Perennial herb.
- Endemic to short stretches of the Hiwassee and Ocoee rivers.
- Occurs in rock crevices.
  - Primarily limited to Phyllite.
- Federally listed as endangered
Distribution of *Pityopsis ruthii*
Laurentide Ice Sheet

Shoreline 20,000 bp

Mixed Hardwoods

Shoreline 20,000 bp
Vegetation Encroachment on the Hiwassee River

![Graph showing vegetation encroachment on the Hiwassee River from 1950 to 1990.](image)

- **River Bed Area (ha)**: 10, 8, 6, 4, 2, 0
- **Analysis**: $F = 8.71$, $P < 0.0023$
Seed Fates

Seed Production

Average per Head

Seed Category

Filled  Unfilled  Predated

Hiw  Occ

0  5  10  15  20  25  30  35  40

40  35  30  25  20  15  10  5  0
Pityopsis ruthii

Stigma
Pollination

Pollen Deposition

Flowers (%)

Number of Grains

Hiw
Oco
Seed Set and Viability

Population:
- Hiwassee
- Ocoee

Seeds per Head

<table>
<thead>
<tr>
<th>Population</th>
<th>FT</th>
<th>HR</th>
<th>US</th>
<th>MF</th>
<th>BS</th>
<th>TS</th>
<th>BR</th>
<th>BP</th>
<th>AT</th>
<th>DS</th>
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</thead>
<tbody>
<tr>
<td>Hiwassee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ocoee</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Legend:
- Inviable
- Viable
Pityopsis ruthii

- Low seed set.
  - Pollination - 75% of flowers are pollinated.
    - Only one ovule per flower.
    - Self compatible, so we assume all grains are capable of fertilization.
  - Seed development - only 25% of ovules mature as seeds.
    - Could be high ovule abortion due to inbreeding?
  - Of the seeds developed, 50% are subject to predation.
**Scutellaria montana**

- Perennial herb.
- Endemic to southeast Tennessee and north Georgia.
- Occurs in dry deciduous forest.
  - No particular habitat preference.
- Federally listed as endangered.
Patterns of Reproduction in *Scutellaria montana*

Flower and Fruit Status (1997)

- **Frequency**
  - **Size Class**
    - 2
    - 4
    - 6
    - 8
    - 10
    - 12
    - 14

Legend:
- Yellow: Fruits
- Red: Flowers
- Blue: Vegetative

---

*Flower and Fruit Status* (1997)
Pollen Limitation in *Scutellaria montana*

![Graph showing pollination and fruit set for *Scutellaria montana* in 1996 and 1997.](chart.png)

- Year 1996: 50% pollinated, 10% fruit set
- Year 1997: 60% pollinated, 15% fruit set

*Pollinated* and *Fruit* are indicated on the chart.
Diurnal Patterns of Nectar Secretion

- Morning
- Afternoon
- Evening

Total Sugar

Time of Day
Nectar Robbing

Effect of Nectar Robbing

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Robbed</th>
<th>Not Robbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagged</td>
<td>0.02</td>
<td>0.08</td>
</tr>
<tr>
<td>Standing Crop</td>
<td>0.14</td>
<td>0.12</td>
</tr>
</tbody>
</table>

Total Sugar
Fruiting and Flowering in *Scutellaria*
Selection for ‘Big Bang’ Reproduction in an Iteroparisis Species?
Scutellaria montana

- Low seed set.
  - Pollination- perhaps 50% are pollinated.
    - Long floral tube suggests specialized pollinator.
      - Hawk moth or long-tongued bees.
      - Based on nectar sugar composition.
  - Pollinators are very rare.
    - Has the specialized pollinator been lost?
  - Nectar robbing by short tongued bees.
    - May reduce legitimate pollination?

- Only the largest plants set fruit.
  - Resource limitation?
  - Pollen limitation?