First field release of the Cape-ivy shoot tip-galling fly along the California coast

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Agricultural Research Service
Cape-ivy (*Delairea odorata*, Asteraceae)

- Vine-like perennial.
- Native to South Africa.
- Flowers in the winter.
- Highly invasive in California!
World distribution of Cape-ivy
Cape-ivy distribution in California

- Riparian habitats
- Coastal scrub
- Non-coniferous mountain forests
- Urban/agricultural areas

Found all along California coastline.

Big Sur, CA

Half Moon Bay, CA
Current Cape-ivy management methods

Manual removal

Herbicide treatments

- Glyphosate
- Triclopyr
- Clopyralid

“Friends of Five Creeks” volunteers hand-pulling Cape-ivy.
Are these methods working?

- Cape-ivy grows and spreads too rapidly to be effectively managed with manual removal or herbicide treatments.
- Often found in locations that are too difficult or too hazardous to access.

**Biological control is a better way!**
Weed biological control equilibrium
Cape-ivy shoot tip-galling fly

*Parafreutreta regalis* (Tephritidae)

galled plant vs. healthy plant

Cape-ivy shoot tips

Galled shoot tips

galled plant

Day 59
Flies released in field cages.

Cages removed after 3-4 weeks.

Plots surveyed for galls.
- Moonstone – Humboldt Co.
  Trinidad Land Trust
- Elk – Mendocino Co.
  Elk Cove Inn & Spa
- Timber Cove – Sonoma Co.
  Harrison Ranch
- San Francisco – San Francisco Co.
  The Presidio
- Oakland – Alameda Co.
  Leona Canyon Park
- Fremont – Alameda Co.
  Mission Peak Park
- Half Moon Bay – San Mateo Co.
  Quarry Park
- Big Sur – Monterey Co.
  Glen Deven Ranch
- San Luis Obispo – San Luis Obispo Co.
  Land Conservancy of SLO
- Santa Barbara – Santa Barbara Co.
  Toro Canyon Park

Parafreutreta regalis releases 2017
# Field production – 2017 release

<table>
<thead>
<tr>
<th>Location</th>
<th>County</th>
<th>Release Date</th>
<th>Total Galls</th>
<th>Galls w/ windows</th>
<th>Galls w/ exit holes</th>
<th>Adults emerged</th>
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</thead>
<tbody>
<tr>
<td>Timber Cove</td>
<td>Sonoma</td>
<td>May, 23</td>
<td>17</td>
<td>13</td>
<td>13</td>
<td>23</td>
</tr>
<tr>
<td>Leona Canyon Park</td>
<td>Alameda</td>
<td>May, 24</td>
<td>14</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Mission Peak</td>
<td>Alameda</td>
<td>May, 24</td>
<td>37</td>
<td>33</td>
<td>32</td>
<td>119</td>
</tr>
<tr>
<td>Glen Deven (Valley)</td>
<td>Monterey</td>
<td>June, 2</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Glen Deven (Hillside)</td>
<td>Monterey</td>
<td>June, 2</td>
<td>16</td>
<td>7</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>The Presidio</td>
<td>San Francisco</td>
<td>June, 12</td>
<td>25</td>
<td>18</td>
<td>18</td>
<td>71</td>
</tr>
<tr>
<td>Land Conservancy SLO</td>
<td>San Luis Obispo</td>
<td>July, 19</td>
<td>12</td>
<td>9</td>
<td>8</td>
<td>30</td>
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<tr>
<td>Toro Canyon Park</td>
<td>Santa Barbara</td>
<td>July, 20</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Quarry Park</td>
<td>San Mateo</td>
<td>July, 26</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>17</td>
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<tr>
<td>Elk Cove Inn</td>
<td>Mendocino</td>
<td>August, 10</td>
<td>16</td>
<td>8</td>
<td>7</td>
<td>28</td>
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<tr>
<td>Moonstone</td>
<td>Humboldt</td>
<td>August, 11</td>
<td>3</td>
<td>?</td>
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</tbody>
</table>

- Total field galls = 147
- Total # of adults = 330
2nd generation field galls found at Mission Peak

1st generation adults

field gall

with window

with exit hole

New field galls!

2nd generation adults
During the decline, the plants were still producing galls, but few flies emerged.

Many flies were dying inside the galls – suggesting the flies were sick (inbred).
New insect stock was collected from the field in SA

- April 2018, ~100 *P. regalis* galls were collected from Wilderness, in the Western Cape, South Africa
- Galls from South Africa were brought back to the USDA quarantine facility in Albany CA.
- Flies that emerged from the SA galls were used to start new colonies.
- Flies were reared for 2 generations before they were released into the field.
New colony production Stats

- Average colony output is estimated to increase 3-fold!

Females producing 4.4X more galls!

Plants have 2.7X more galls!
New strategy for field releases (2018-2019)

- Series of five releases at each location.
- Produces overlapping generations in the field.
- Releasing flies over a longer period, increases likelihood of establishment.
Parafreutreta regalis releases 2018

- San Francisco – San Francisco Co.
  The Presidio
- Fremont – Alameda Co.
  Mission Peak Park
- Half Moon Bay – San Mateo Co.
  Quarry Park
- Garrapata State Park – Monterey Co.
  State beach scrub
- Big Sur – Monterey Co.
  Glen Deven Ranch
- Laguna Beach – Santa Luis Cruz Co.
  Coast Dairies State Park
- Santa Barbara – Santa Barbara Co.
  Toro Canyon Park (collaborators at UCSB)
## Field production – 2018 release #1

<table>
<thead>
<tr>
<th>Location</th>
<th>County</th>
<th>Habitat type</th>
<th>Release Date</th>
<th>Total Galls</th>
<th>Galls w/ windows</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Presidio</td>
<td>San Francisco</td>
<td>Scrub</td>
<td>Aug, 24</td>
<td>36</td>
<td>13</td>
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<tr>
<td>Mission Peak</td>
<td>Alameda</td>
<td>Riparian</td>
<td>Aug, 23</td>
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<tr>
<td>Garrapata State Park</td>
<td>Monterey</td>
<td>Scrub</td>
<td>Aug, 27</td>
<td>18</td>
<td>7</td>
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<tr>
<td>Glen Deven (Valley)</td>
<td>Monterey</td>
<td>Riparian</td>
<td>Aug, 27</td>
<td>9</td>
<td>1</td>
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<tr>
<td>Glen Deven (Hillside)</td>
<td>Monterey</td>
<td>Scrub</td>
<td>Aug, 27</td>
<td>22</td>
<td>17</td>
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<tr>
<td>Laguna Beach</td>
<td>Santa Cruz</td>
<td>Scrub</td>
<td>Aug, 28</td>
<td>33</td>
<td>22</td>
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<tr>
<td>Quarry Park</td>
<td>San Mateo</td>
<td>Riparian</td>
<td>Aug, 28</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>Toro Canyon Park</td>
<td>Santa Barbara</td>
<td>Riparian</td>
<td>Sept, 20</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total = 151**  
**Avg / site = 18.9**
Cape-ivy leaf-mining moth

Collapsing Cap-ivy plant

*Digitivalava delaireae* (Glyphipterigidae)
D. delaireae host range tests

Senecio triangularis

No choice test

Larval transfer test
- *P. regalis* field releases in 2017 did not result in establishment.
- New, healthier fly stock was obtained from South Africa, 2018.
- 2018 field releases using multiple release strategy.
- Leaf-mining moth shows promise in lab testing, but has not been permitted for field release.
Acknowledgements

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Questions?

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