Screwworm Outbreak: Florida 2016 - 2017

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Florida Key deer (*Odocoileus virginianus clavium*)

Wisconsin Glaciation Period (25,000 – 21,000 years ago)

1st Written report by Fernando Escalante Fontaneda, 1550s

Declared Endangered in 1967
Florida Key Deer

- Found from Sugarloaf Key to Bahia Honda
- Easily swim between islands in search of fresh water
- Range Includes About 26 Keys
- Corresponded to the Infested Zone
- Approximately 330 km²
Do not feed, touch or disturb wildlife

Feeding deer kills deer
Violators are subject to fine and/or arrest

No Stopping on Road
Be Courteous; Pull off road to view wildlife

Drive with caution you are entering an endangered species area

Speed kills
Key Deer

Refuge Headquarters
Right into Shopping Center

Key Deer road kills
Total last year 119
So far this year 62

Co-op Art Gallery
Rutting Season
New World Screwworm
*Cochliomyia hominivorax* (Coquerel)
Florida Department of Agriculture and Consumer Services
Notified on 29 September 2016
6 October 2016 the USFS Reported there had been 51 Positive Cases:

47 Key Deer
4 Pets

First Case: 8 July 2016

84 days (4 Life Cycles)
Euthanized Deer in Truck Bed
Boneyard, Key Deer Refuge, Big Pine Key

Elimination of 41 bodies (estimate of 32,800 fertile flies), 1,265 flies per square kilometer, sterile release 12,265 / km²
Placement of Ground Release Chambers
Sterile Pupae From Panama
- Five Hour Flight
- 38 Liters/Ice Chest
- Shipped With Ice Packs
- Kept In Refrigerated Trailer at 10 Degrees Celcius
- First Placement in the Field on 11 October
9.5 Liters/GRC
ca. 8,000 Pupae/Liter
76,000 Pupae/GRC
97% Emergence =
73,720 Flies/GRC
2 GRCs/Site = 147,440
2X/Week = 294,880 Flies/Site
294,880 X 9 Sites = 2,653,920 Sterile Flies Released Each Week At The Epicenter
USDA Used Ground Release Chambers to Eradicate Outbreaks In Aruba In 2004 And 2011

**Differences**

**Aruba**
- Little Favorable Habitat
- Domestic Animal Hosts
- Confidence In Case Numbers

**Florida Keys**
- A Lot Of Favorable Habitat
- Predominantly Wild Hosts
- Lower Confidence In Case Numbers

**Similarities**
- Strong Winds
- Small In Size
- Notified After Numerous Cases
- Ground Dispersal To Assure Placement of Sterile Flies In Favorable Habitats

180 km²

146 km²
Fly Surveillance With Rotting Liver

- Ca. 0.5kg Liver
- 60 Minutes/Site
Surveillance of NWS in the Florida Keys

Intensive Surveillance: 56 Square Kilometers 424+ hours
Surveillance of NWS in the Infested Zone of Florida Keys
Screwworm Infested Zone in the Florida Keys

13 Keys Infested
Seven Mile Bridge
Morning of 6/1/2017
Evening of 6/I/2017

- Notification of a positive case in a stray dog near Homestead, FL
- Initiated intensive surveillance on the morning of 7/I/2017
- Not allowed to speak with the resident who found the dog until 9/I/2017
- Dog taken to a veterinarian who extracted 9 larvae on 19/XII/2016
- Sample not submitted by veterinarian until 5/I/2017
19 empty puparia
13 dead flies (9 females, 4 males)
All screwworm
Evidence of release of fertile flies
Decided necessary to release sterile flies
13 January 2017 Sterile Pupae 1st Placed in GRCs
17 March Sterile Pupae Last Placed in GRCs
Flight Lines for Aerial Dispersal Scenario Number 1

- 540 Linear Miles
- 3.3 Hours
- 208 Gallons of Jet Fuel A
Scenario 1. MD aerial release 12.5 miles north of index case:
~ 1100 sq. nautical miles;
3.3 million flies/week;
$24,483/week

Scenario 2. MD aerial release HWY-41; 26 miles north of index case:
~ 2050 sq. nautical miles;
6.2 million flies/week;
$28,538/week ($53,021/week total)

Scenario 3. MD aerial release HWY 75; 53 miles north of the index case
~ 3650 sq. nautical miles;
11 million flies/week;
$34,028/week ($87,049/week total)
Intensive Survey:
518 square kilometers
248+ hours
Timeline of Presumptive and Confirmed Cases

- Timeline only presents distinct cases in distinct areas, not total numbers.
- “Animal Group” is a specific number of deer that met the presumptive positive case definition.
Presumptive and Confirmed Cases by Species

Key Deer, 135

Dog, 5

Cat, 2

Pet Pig, 2

Raccoon, 1

Legend:
- Key Deer
- Dog
- Pet Pig
- Cat
- Raccoon
Timeline of Key Milestones in NWS Infestation and Eradication in Florida 2016 - 2017
Key Largo Interdiction Station: October 2016 – 19 March 2017

- Voluntary
- Over 17,000 Inspections
- No infested animals detected
USFWS Biologists Estimate For Every Known Mortality, 1 Deer Dies Undetected In Nature
Key Deer Cases
Projected Key Deer Cases

Week 15 – First Dispersal of Sterile Flies
Areas of Fly Surveillance

- SIT release site
- Wild flies
- Sterile flies only
- Both wild and sterile flies
- No flies
Infested, Barrier, and Surveillance Zones 24/X/16 – 1/IV/17
Area of Animal Surveillance
Screwworm Infested Zone in the Florida Keys

43 Keys Sampled
13 Keys Infested
Approximately 188,236,880 Sterile Flies Released

<table>
<thead>
<tr>
<th>Zone</th>
<th>Estimated # of Flies Released</th>
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<tbody>
<tr>
<td>Infested</td>
<td>176,563,200</td>
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<tr>
<td>Barrier</td>
<td>5,529,600</td>
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<tr>
<td>Mainland Sites</td>
<td>6,144,000</td>
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</tbody>
</table>
### Sterile Fly Release in the Florida Keys

<table>
<thead>
<tr>
<th>Location</th>
<th># of Release Sites</th>
<th># of Releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Pine Key</td>
<td>9</td>
<td>431</td>
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<tr>
<td>No Name Key</td>
<td>2</td>
<td>114</td>
</tr>
<tr>
<td>Cudjoe Key</td>
<td>2</td>
<td>109</td>
</tr>
<tr>
<td>Big Torch Key</td>
<td>2</td>
<td>108</td>
</tr>
<tr>
<td>Sugarloaf Key</td>
<td>2</td>
<td>102</td>
</tr>
<tr>
<td>Summerland Key</td>
<td>3</td>
<td>97</td>
</tr>
<tr>
<td>Little Torch Key</td>
<td>1</td>
<td>54</td>
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<tr>
<td>Middle Torch Key</td>
<td>1</td>
<td>54</td>
</tr>
<tr>
<td>Ramrod Key</td>
<td>1</td>
<td>53</td>
</tr>
<tr>
<td>Little Pine Key</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Howe Key</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Little Knockemdown Key</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Big Munson Key</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>City of Marathon</td>
<td>4</td>
<td>72</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>31</strong></td>
<td><strong>1,361</strong></td>
</tr>
</tbody>
</table>
Sterile Fly Release in Miami – Dade County

<table>
<thead>
<tr>
<th>Location</th>
<th># of Sites</th>
<th># of Releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homestead (Miami-Dade)</td>
<td>4</td>
<td>80</td>
</tr>
</tbody>
</table>

![Google Earth map showing release sites](image-url)
Surveillance and Diagnostics

- In total, 736 fly assessments were conducted in the State of Florida.

- Enhanced surveillance with 279 assessments in the Miami-Dade County/Everglades National Park area was conducted from 7 January through 17 February with only one fertile fly collected on 11 January.

- In the Keys, 457 fly assessments were conducted on 43 islands from 6 October 2016 – 15 March 2017 with the last fertile fly collected on 7 November.

- As of 20 November, all presumptive positive cases were sent to NVSL for confirmation.

- Visits were made to all known livestock owners, veterinarians, groomers and feed stores within a 10 mile radius of the Miami-Dade County positive case detection site.

- Visits were made to all known home owners/potential animal owners within a 3 mile radius of the Miami-Dade County positive case detection site.

- State/Federal personnel continue to investigate any suspicious case of myiasis.
Sterile Fly Releases

- Panama immediately increased production of sterile flies.
- Panama sent personnel to assist with pupal placement, fly assessment, and training.
- Panama fabricated & sent the Ground Release Chambers.
- In total, there were 1441 placements of sterile pupae in Ground Release Chambers.
- Overall emergence was 97%! 85% is considered acceptable.
- Release sites increased from 9 to 35.
- Placement of pupae was generally completed within 3 - 4 hours.
Significant Items:

• Genetic analysis of screwworm samples from the Lower Keys did not match samples published in the literature. South America?

• Genetic analysis of the screwworm samples from the dog in Miami-Dade County matched those samples from the Lower Keys.

• Used satellite imagery to identify favorable habitats to sample for the presence of screwworm flies and placement of Ground Release Chambers.

• First screwworm outbreak in the United States to be eradicated using only Ground Release Chambers to disperse sterile flies.

• Although water serves as a barrier under certain conditions, screwworm flies will cross bodies of water.
Significant Items:

- In the Lower Keys, sterile flies dispersed approximately 20 miles to the south to Key West.
- In the Miami – Dade area, sterile flies dispersed up to 15 miles.
- More sterile flies were collected downwind from release sites than upwind.
- Mangroves, palm and fruit orchards can serve as favorable habitats in addition to wooded or forested habitats.
- Although it is preferable to initiate eradication activities as quickly as possible during an outbreak, outbreak populations can be eradicated in a timely manner when first reported after several generations in the field.
- Pupae shipped from Panama to Florida were chilled for 34 to 66 hours before placement in the field.
ACKNOWLEDGEMENTS

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Florida Keys Mosquito Control District
USDA Agricultural Research Service
USDA APHIS Veterinary Services
USDA APHIS International Services
USDA APHIS Wildlife Services
USDA APHIS Plant Protection and Quarantine
USDA APHIS Legislative and Public Affairs
US National Park Service
US Fish and Wildlife Service
Boy Scouts of America
Thank You