

Aedes aegypti Has an Unlikely Foothold in Metropolitan Washington, D.C.

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Fairfax County
Health Department

Challenges presented by *Ae. aegypti*



Disease

- Dengue
- Zika
- Chikungunya
- Yellow fever



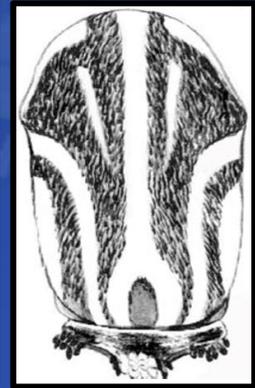
Control

- Resistant to insecticides
- Cryptic larval habitats



Mobility

- Easily spread to new locations



Identification

- Specimen condition
- Low abundance
- Taxonomic keys vary
- Similarity to common species

What we know about the D.C. *Ae. aegypti* population?

- Present since at least 2011 in Capitol Hill, D.C.
 - Sporadic reports as early as 2000
- Routine collections by DC DOH since 2016
- Likely occupying cryptic underground habitats year-round
- Actively flying/feeding after fall diapause of *Ae. albopictus*
- Genetically, most-similar to populations from FL
- 2 laboratory colonies established
 - University of Connecticut Agricultural Experiment Station
 - Uniformed Services University (Bethesda, MD)

Ae. aegypti collections in the National Capital Region

● Maryland

● Baltimore City

- 1987 (1)

● All collections since 1995 from counties bordering D.C

- 1995 (2), 2016 (1), 2018 (1), 2019 (3)

● Virginia

● City of Alexandria

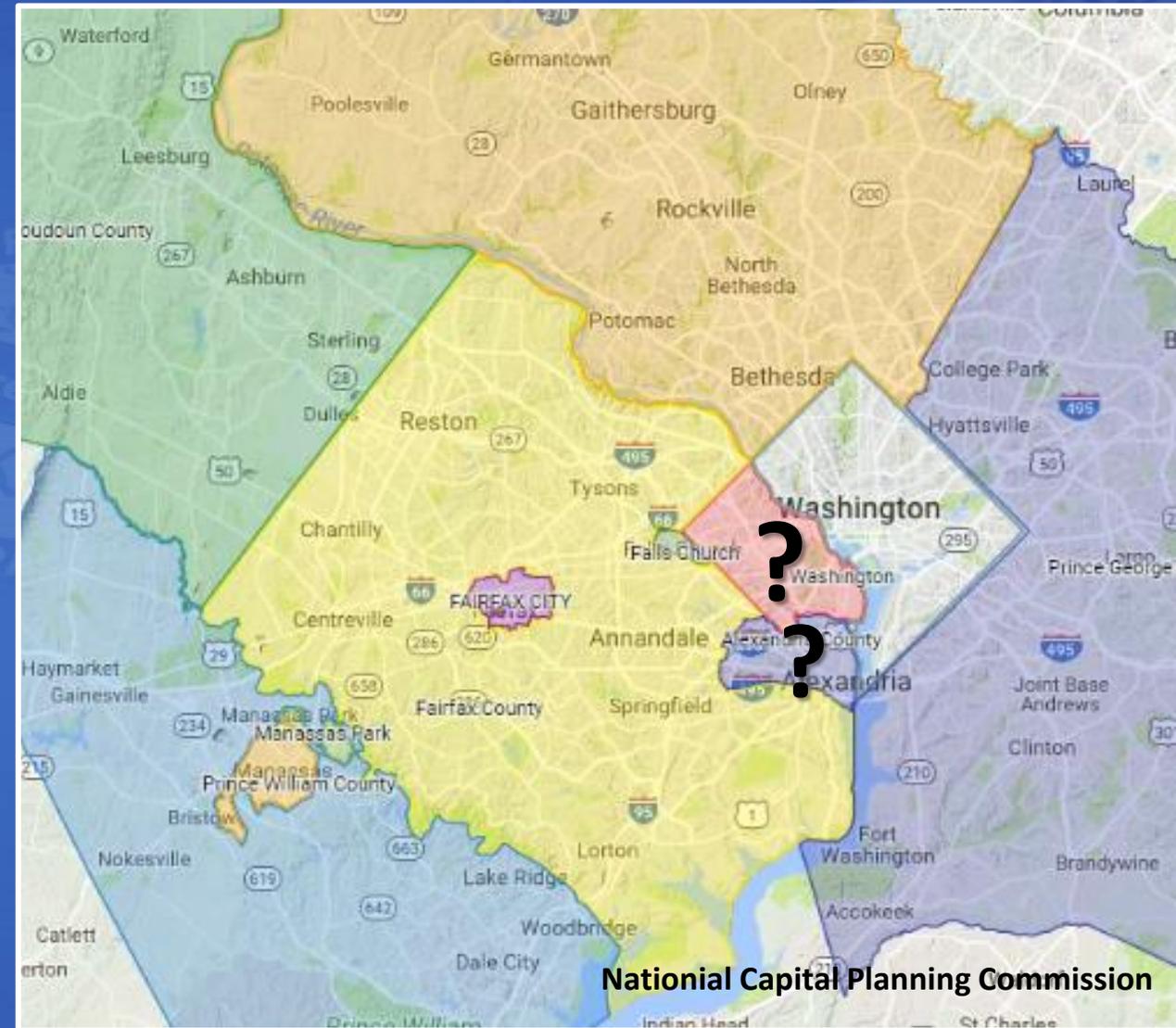
- 2015, 2016 (multiple locations)

● Prince William County

- 2019 (multiple locations)

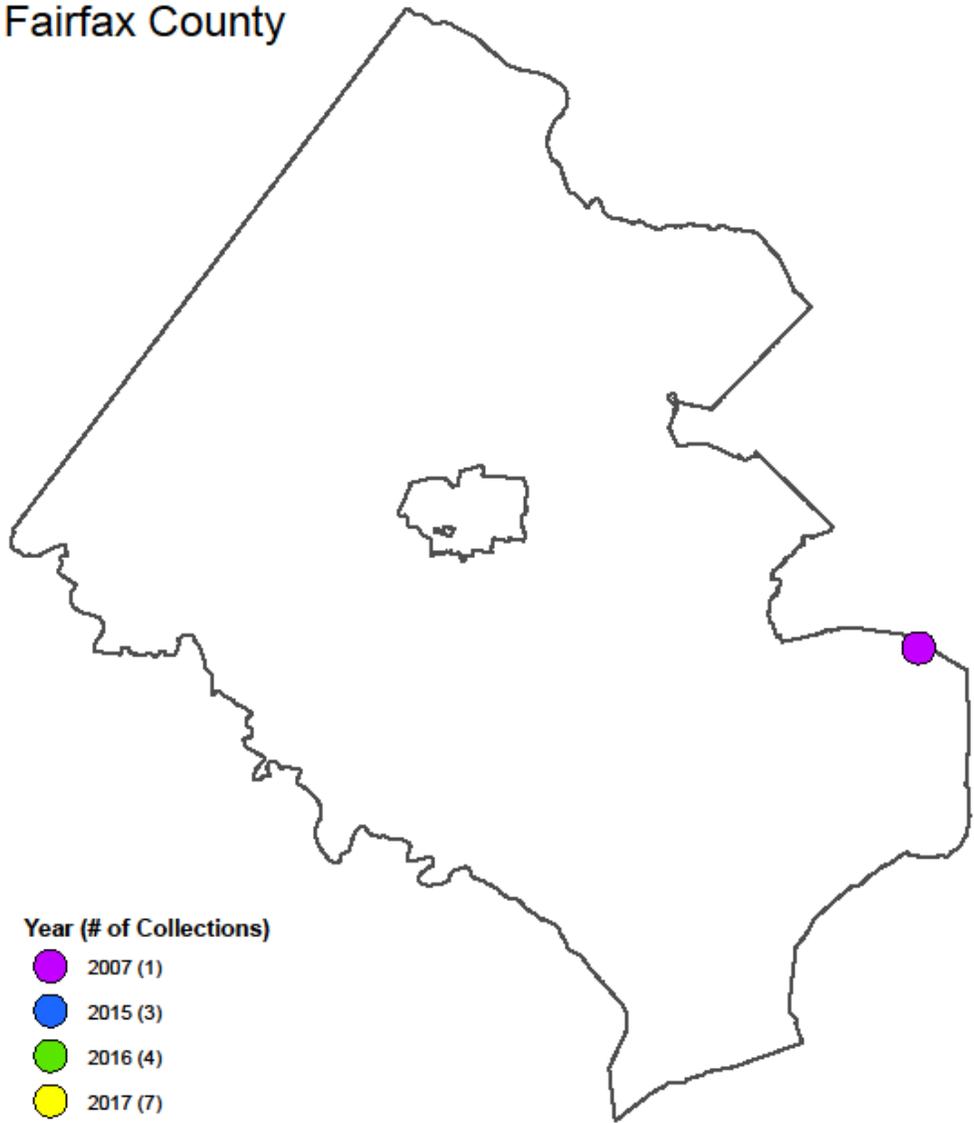
● Fairfax

- 2007, 2015-2019 (multiple locations)



Aedes aegypti
Collections in
Fairfax County

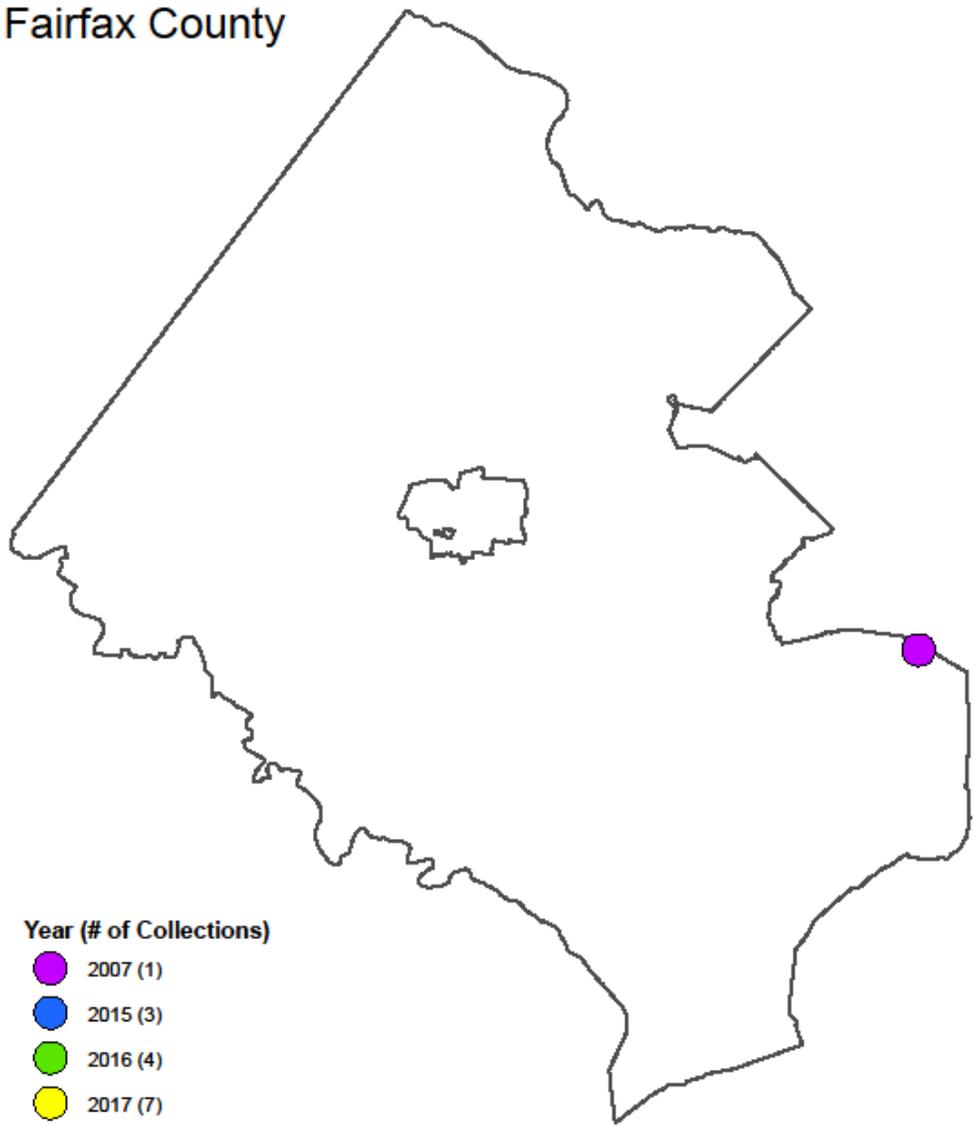
2007



Year (# of Collections)

- 2007 (1)
- 2015 (3)
- 2016 (4)
- 2017 (7)
- 2018 (13)
- 2019 (7)

Aedes aegypti 2007-2014
Collections in
Fairfax County

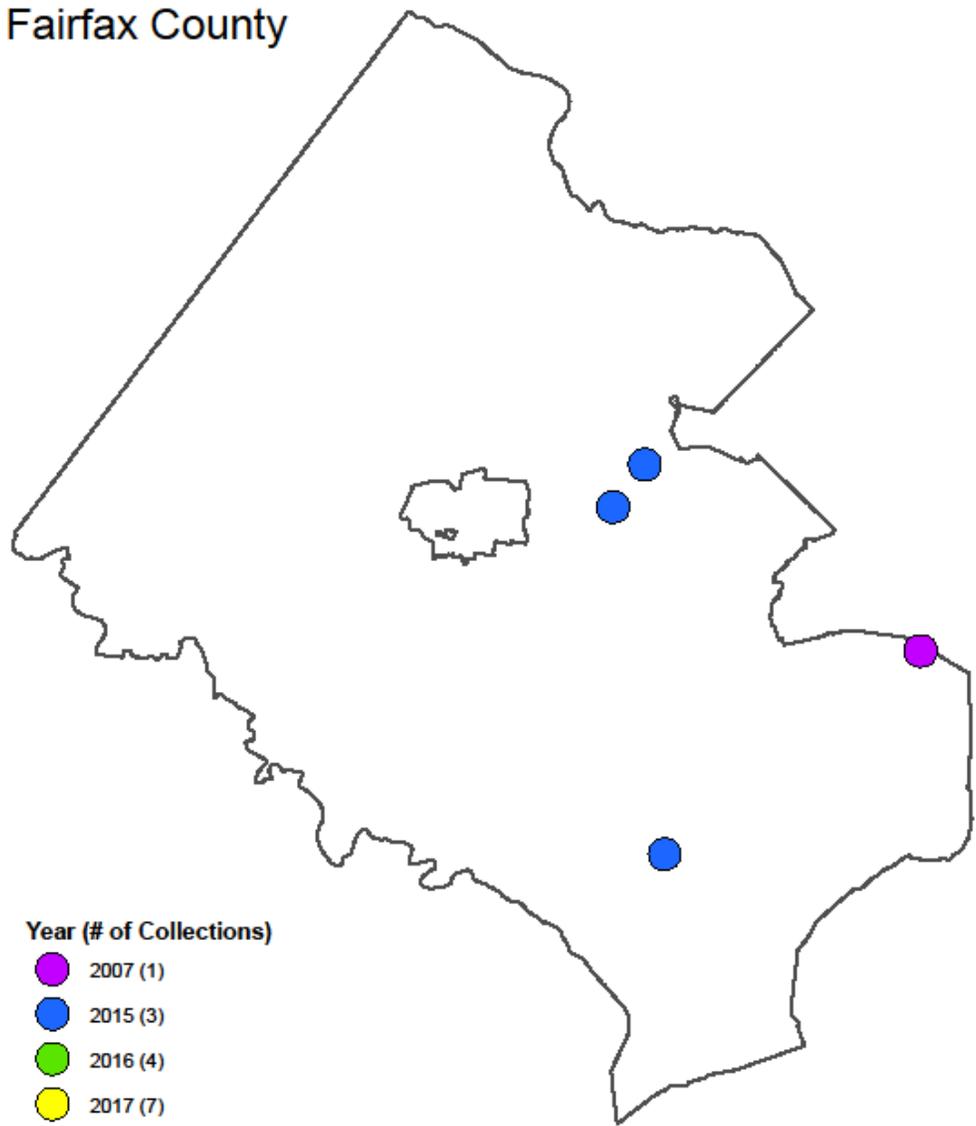


Year (# of Collections)

- 2007 (1)
- 2015 (3)
- 2016 (4)
- 2017 (7)
- 2018 (13)
- 2019 (7)

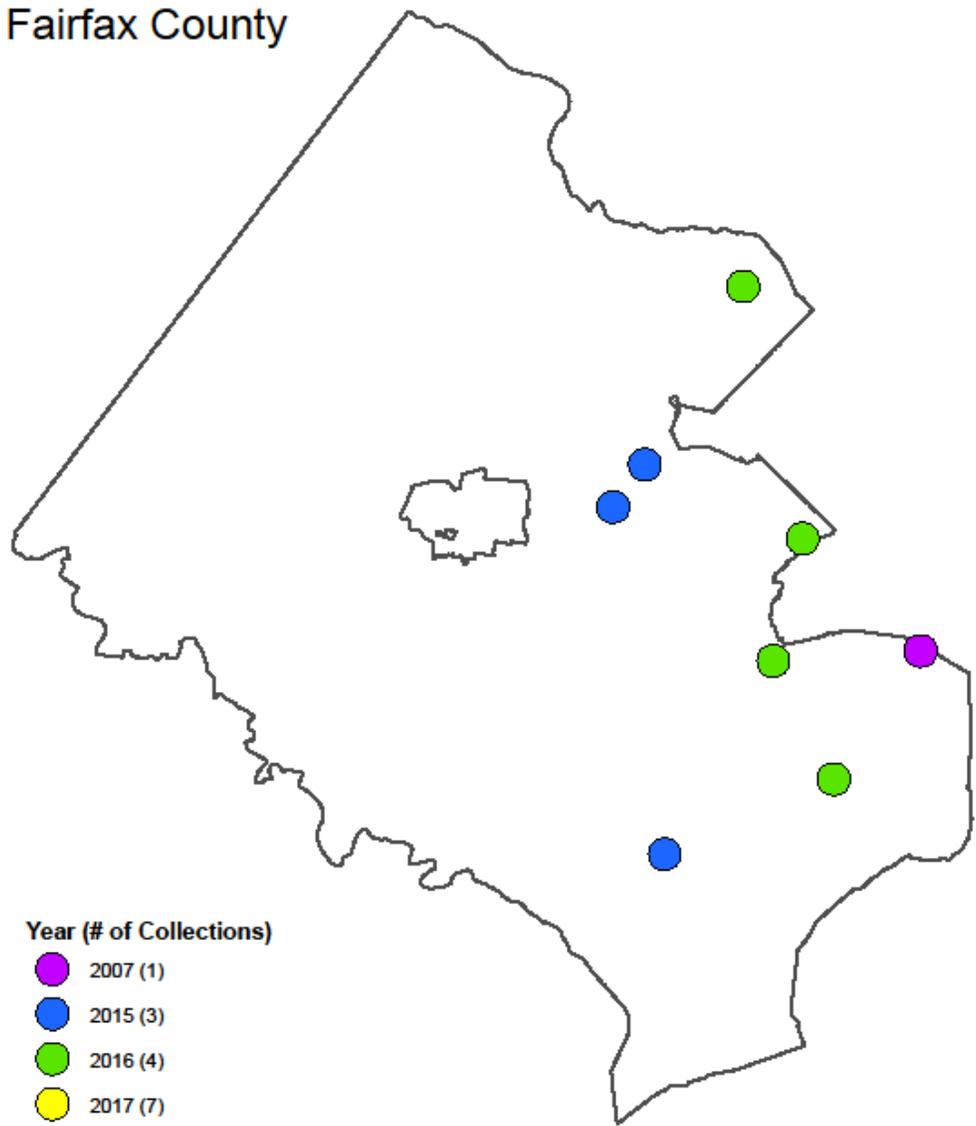
Aedes aegypti
Collections in
Fairfax County

2007-2015

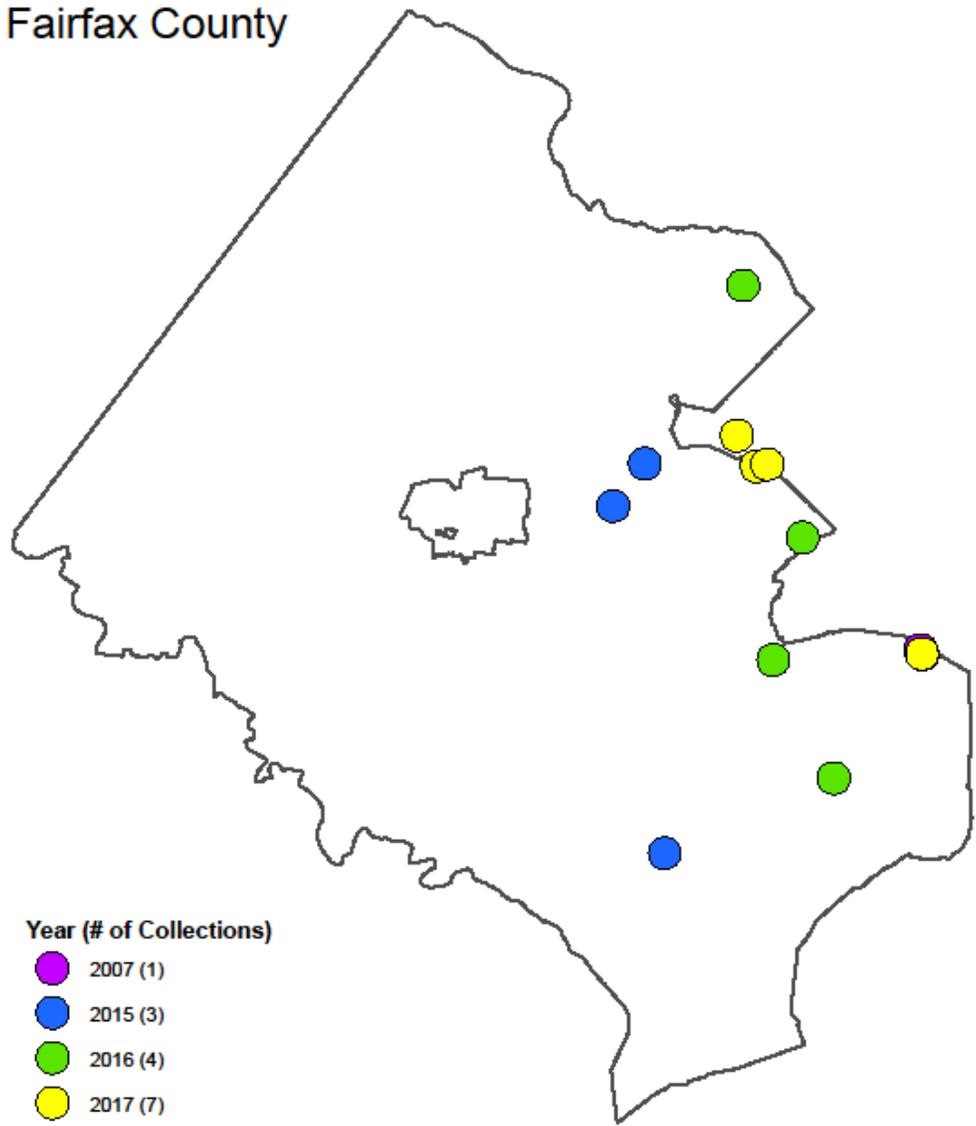


Aedes aegypti
Collections in
Fairfax County

2007-2016



Aedes aegypti 2007-2017
Collections in
Fairfax County

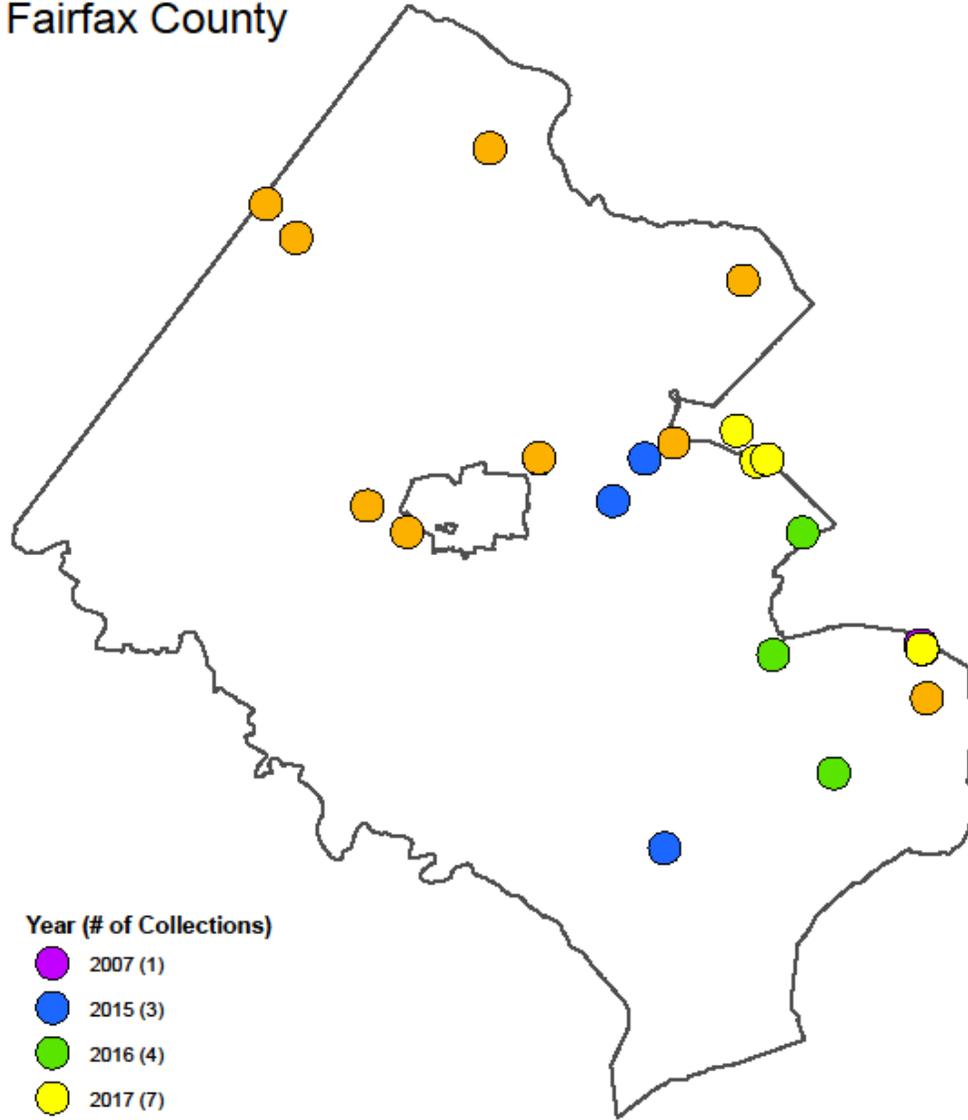


Year (# of Collections)

- 2007 (1)
- 2015 (3)
- 2016 (4)
- 2017 (7)
- 2018 (13)
- 2019 (7)

Aedes aegypti
Collections in
Fairfax County

2007-2018

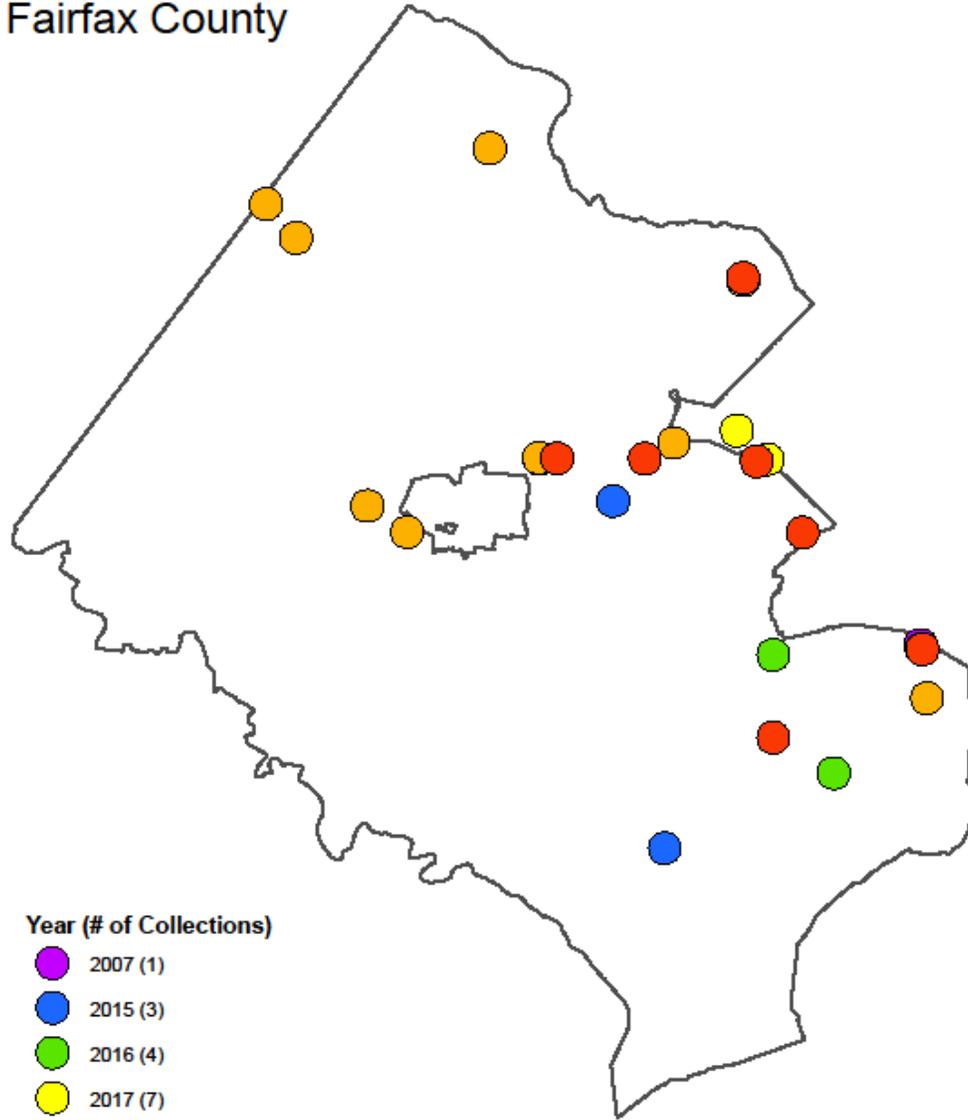


Year (# of Collections)

- 2007 (1)
- 2015 (3)
- 2016 (4)
- 2017 (7)
- 2018 (13)
- 2019 (7)

Aedes aegypti
Collections in
Fairfax County

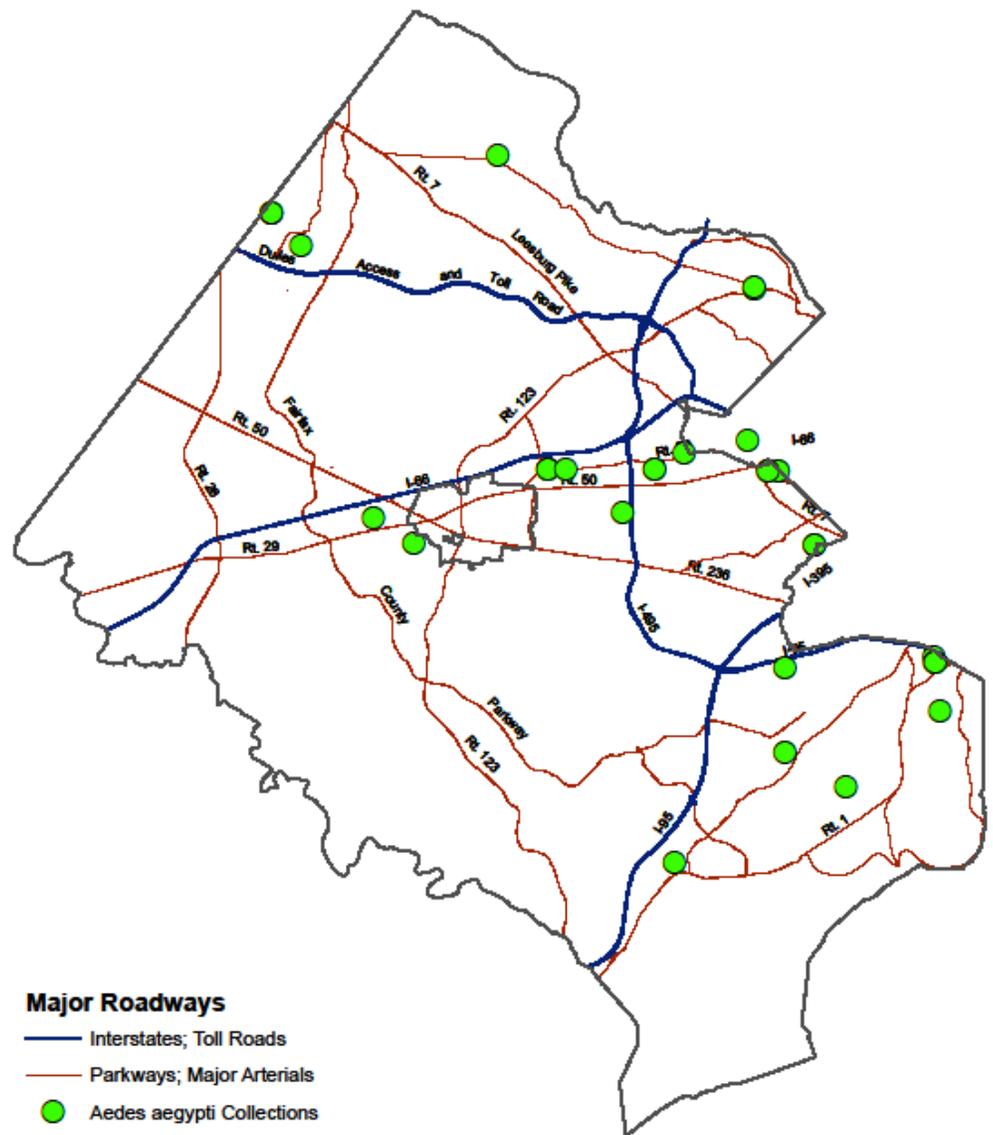
2007-2019



Year (# of Collections)

- 2007 (1)
- 2015 (3)
- 2016 (4)
- 2017 (7)
- 2018 (13)
- 2019 (7)

Aedes aegypti Collections in Fairfax County, Virginia
2007-2019



Why more *Ae. aegypti* in past 5 years?

- Aging underground infrastructure in D.C.?
- Warmer inside urban heat bubble of D.C.?
- Increase in # of commuters as Fairfax Co. population grows?
 - Mass transit, individual
- Nuisance treatments by homeowners more effective at killing *Ae. albopictus*, but allow for survival by *Ae. aegypti*?
- Rebounding from initial competition with *Ae. albopictus* from late 1990s to present?

What do we know about *Ae. aegypti* in Fairfax Co.?

- Genetically, cluster w/ D.C. *Ae. aegypti* population
- All collected within a mile of major roadways
- Usually “one-offs” at a location, despite additional surveillance effort
- No evidence of winter survival
- Collected at >20% routine surveillance sites

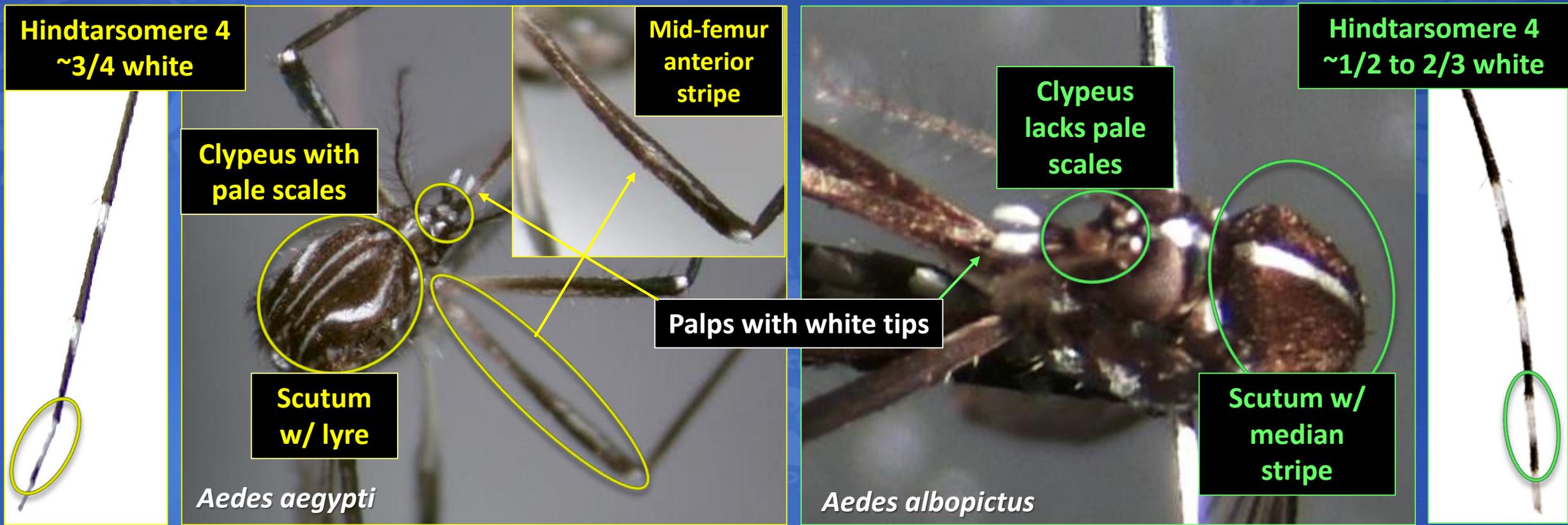
Hypothetical chain-of-events leading to *Ae. aegypti* “one-offs”

- Stowaways via public or individual transportation
 - Unfed females exit vehicle upon arrival in Fairfax Co.
 - Detected by FCHD surveillance
 - Females feed during ride and exit vehicle upon arrival in Fairfax Co.
 - Lay eggs that hatch in Fairfax Co., but share habitat with *Ae. albopictus*
 - Adult female *Ae. aegypti* that emerge are mated by *Ae. albopictus* males
 - ***Ae. aegypti* rendered sterile, unable to establish future generation**



Interesting References

- **Evidence for an Overwintering Population of *Aedes aegypti* in Capitol Hill Neighborhood, Washington, DC.** Lima AS et al. *Am. J. Trop. Med. Hyg.*, 94(1), 2016, pp. 231-235.
- **Origin of a High-Latitude Population of *Aedes aegypti* in Washington, DC.** Gloria-Soria A et al. *Am. J. Trop. Med. Hyg.*, 98(2), 2018, pp. 445-452.
- **Effects of the Environmental Temperature on *Aedes aegypti* and *Aedes albopictus* Mosquitoes: A Review.** Reinhold et al. *Insects* 2018, 9, 158.
- **An impressive capacity for cold tolerance plasticity protects against ionoregulatory collapse in the disease vector *Ae. aegypti*.** Jass, A et al. *Journal of Experimental Biology*, 222, 2019.
- **Fischer, S. et al. Adaptation to temperate climates: Evidence of photoperiod-induced embryonic dormancy in *Aedes aegypti* in South America.** *Journal of Insect Physiology*, 117, 2019.



Hindtarsomere 4
~3/4 white

Mid-femur
anterior
stripe

Hindtarsomere 4
~1/2 to 2/3 white

Clypeus with
pale scales

Clypeus
lacks pale
scales

Scutum
w/ lyre

Palps with white tips

Scutum w/
median
stripe

Aedes aegypti

Aedes albopictus

Distinguishing features of
Ae. aegypti and *Ae. albopictus*



Dark brown and white.
Ventral abdomen "sandy",



Black and white.
Ventral abdomen dark