

Container Mosquitoes in California

Bryan Jackson, PhD

Vector-Borne Disease Section
California Department of Public Health



VECTOR-BORNE
DISEASE SECTION
CALIFORNIA DEPARTMENT OF PUBLIC HEALTH



Invasive “Container- Inhabiting” *Aedes* Mosquitoes



Ae. albopictus
2011

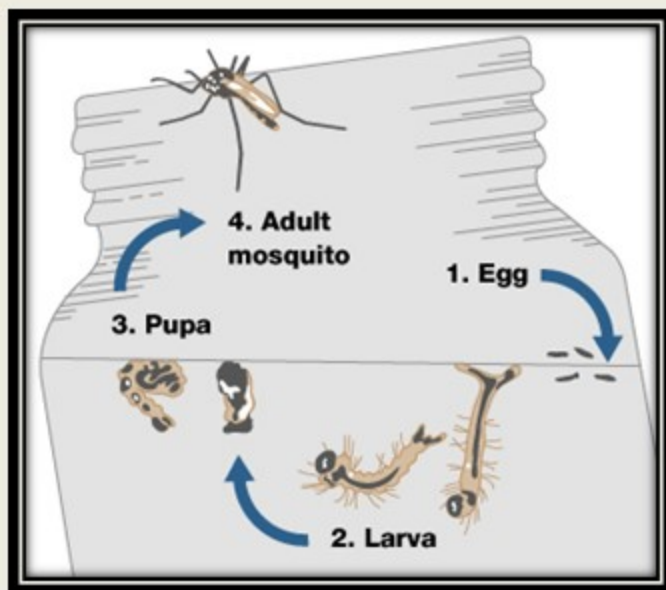


Ae. aegypti
2013



Ae. notoscriptus
2014

“Container Inhabiter”

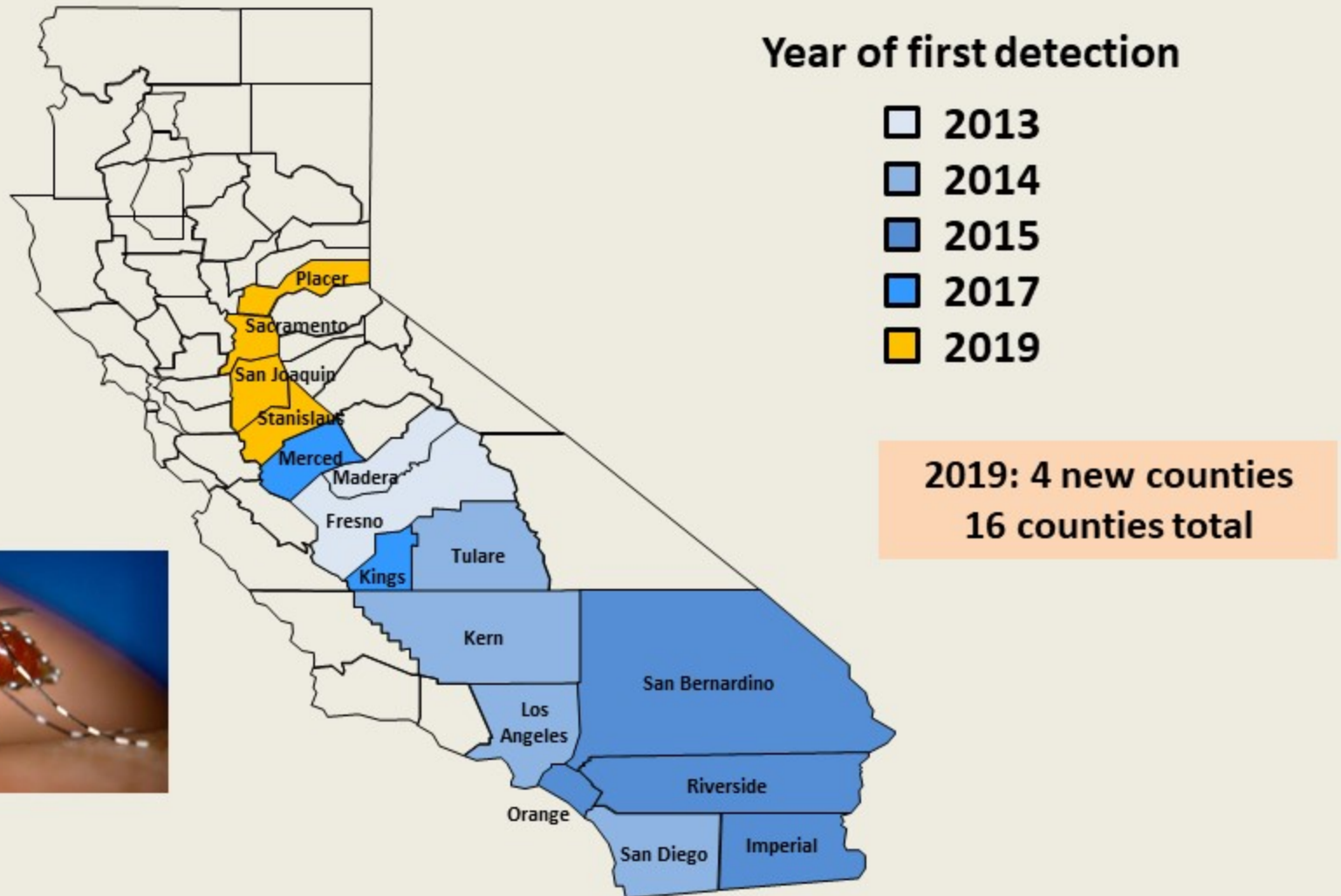


Contributing Factors for Establishment of *Aedes*

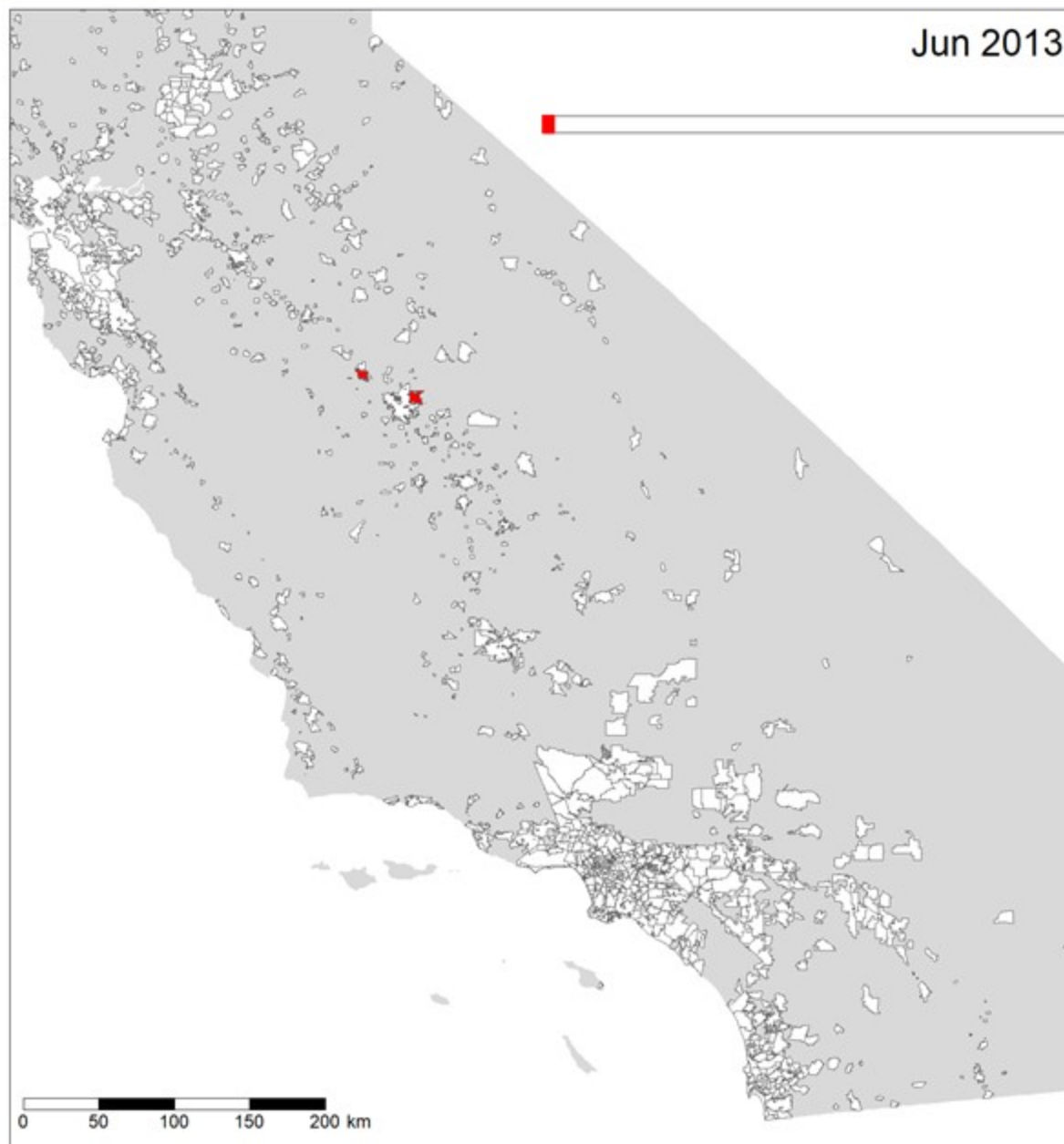
- Egg to adult in 6-10 days
- Short flight range (240 m)
- Isolated, small populations
- Extremely tough, desiccation-resistant eggs
- Minimal requirements for larval / pupal stages
- Lack of predators (i.e. natural biological control) at all life stages
- Cryptic larval sources makes control difficult
 - cultural / physical
 - chemical

Aedes aegypti Detections by County and Year

2013 - 2019

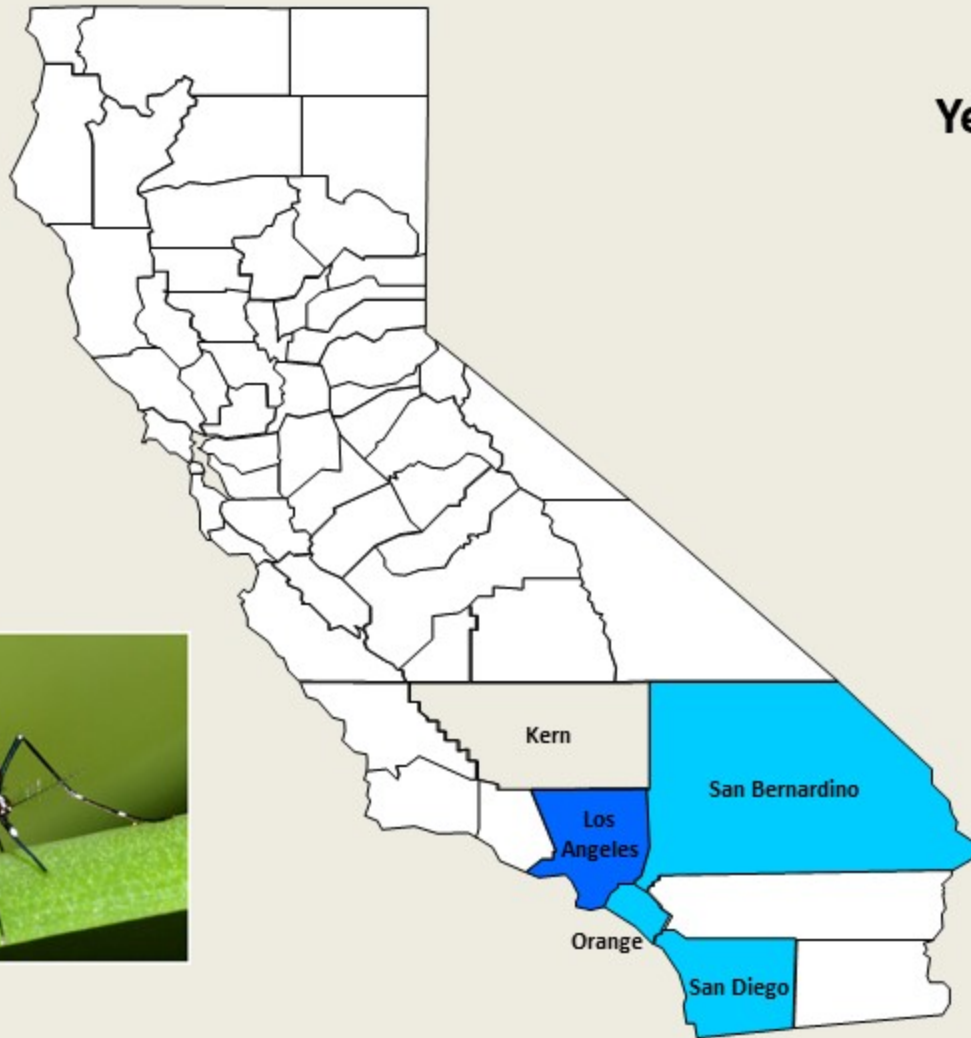


Jun 2013



Barker Lab, UC Davis

Aedes albopictus Detections by County and Year 2011 - 2019



Year of first detection

■ 2011

■ 2015

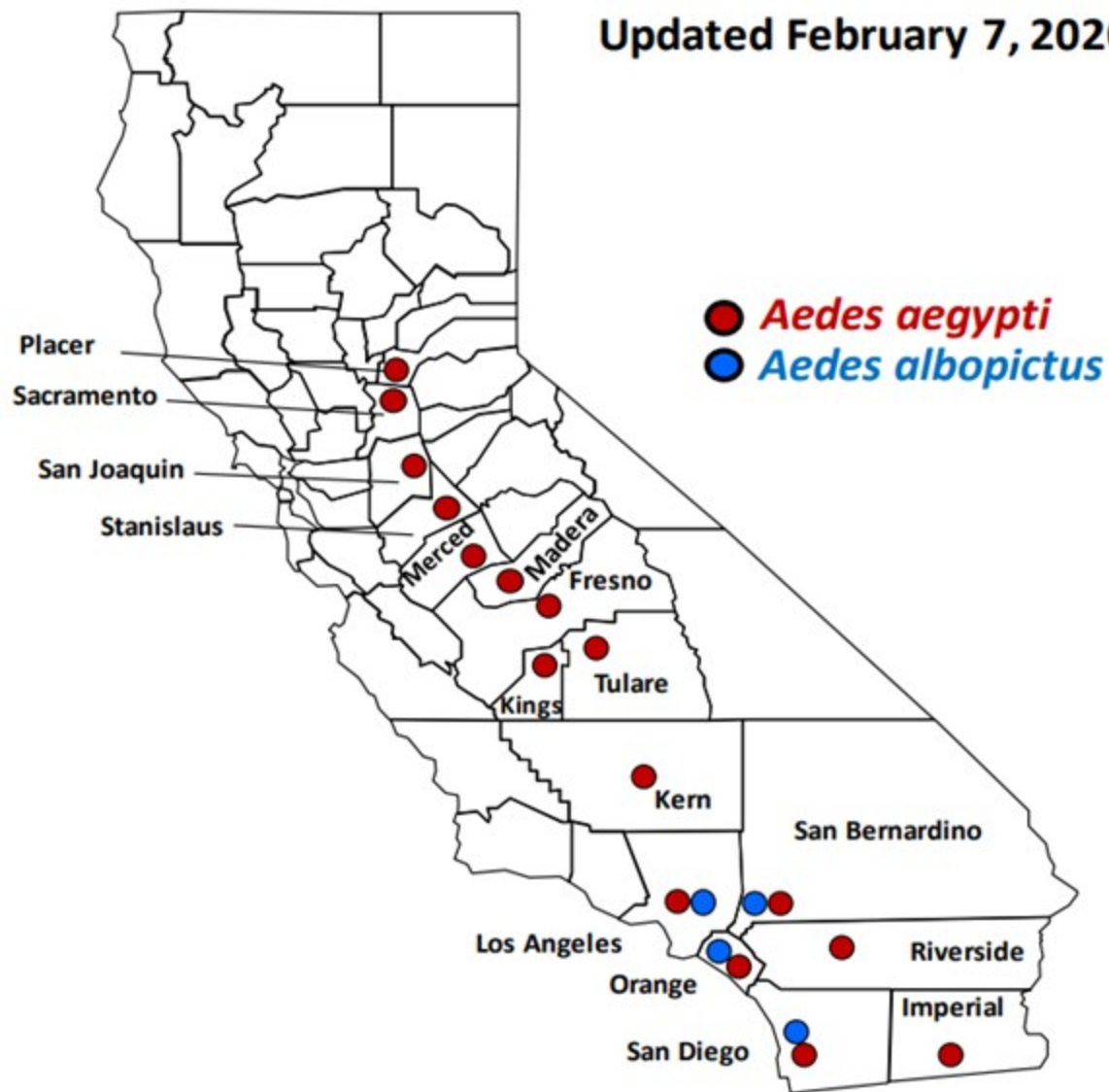
4 Counties
(established)



Aedes aegypti and *Aedes albopictus* Mosquitoes in California

Detection Sites by County/City

Updated February 7, 2020



Counties with

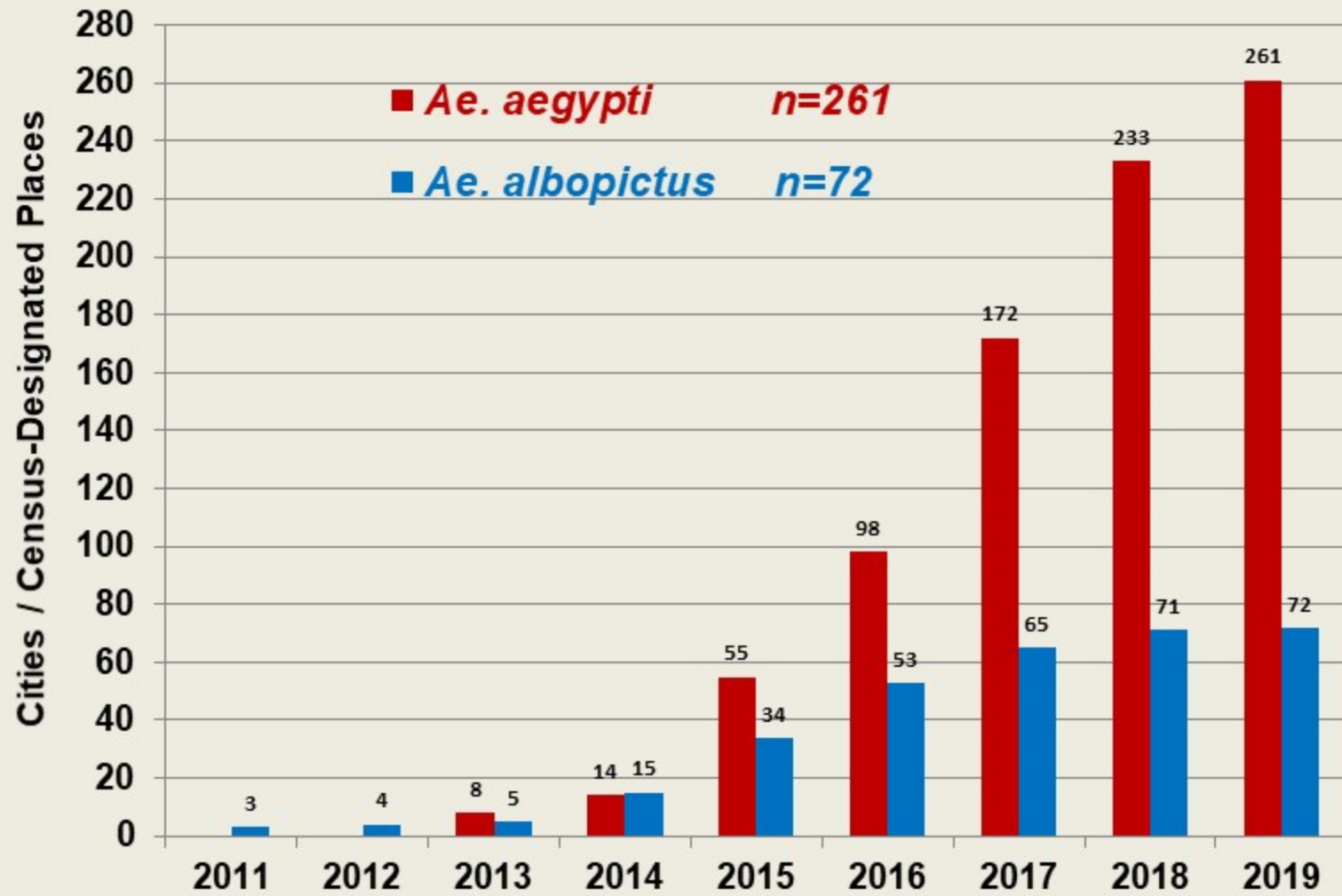
Aedes aegypti only:

Fresno, Imperial, Kings, Madera, Merced, Placer, Riverside, Sacramento, San Joaquin, Stanislaus, Tulare

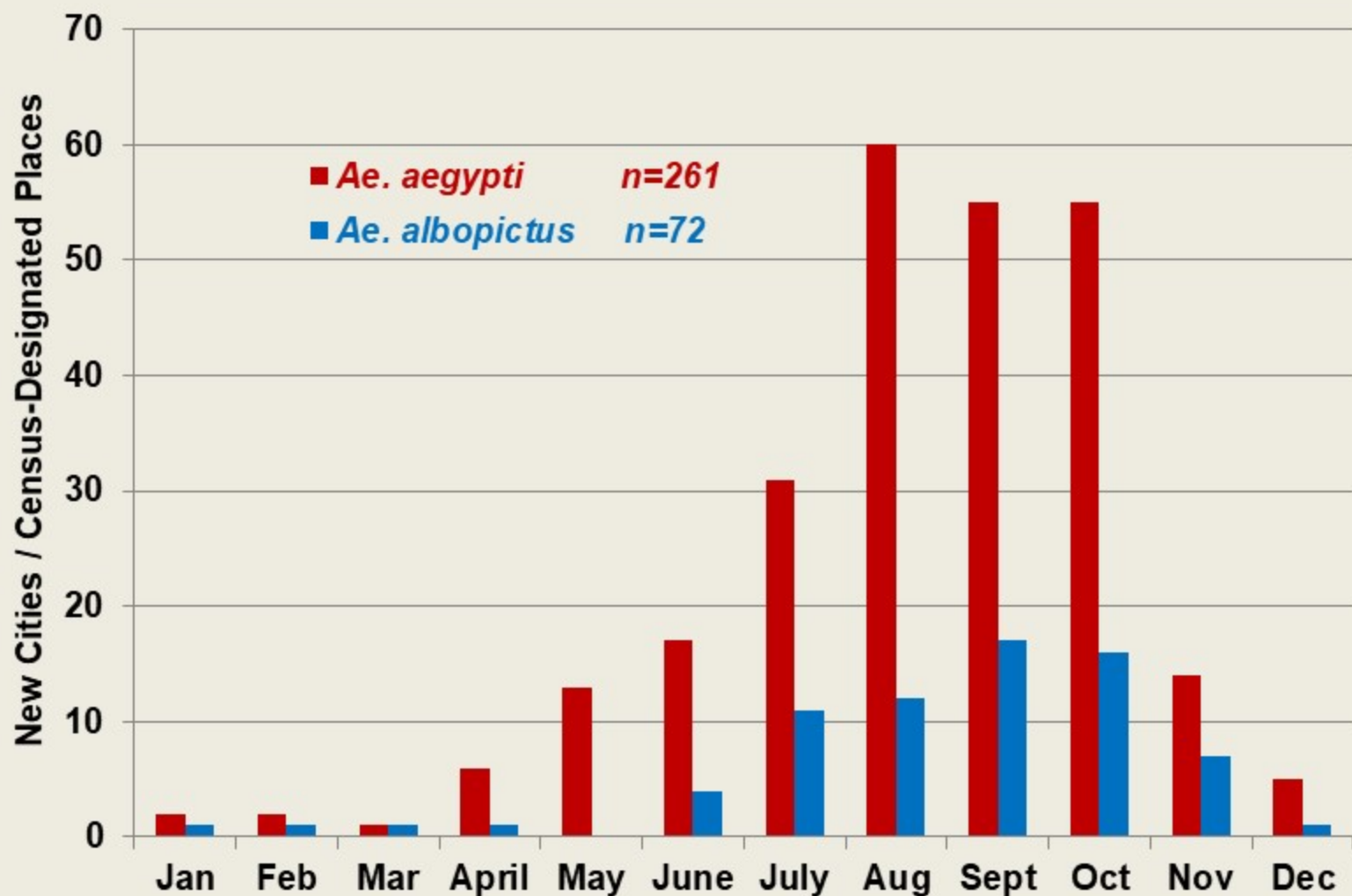
Both *Aedes aegypti* and *Aedes albopictus*:

Los Angeles, Orange, San Bernardino, San Diego

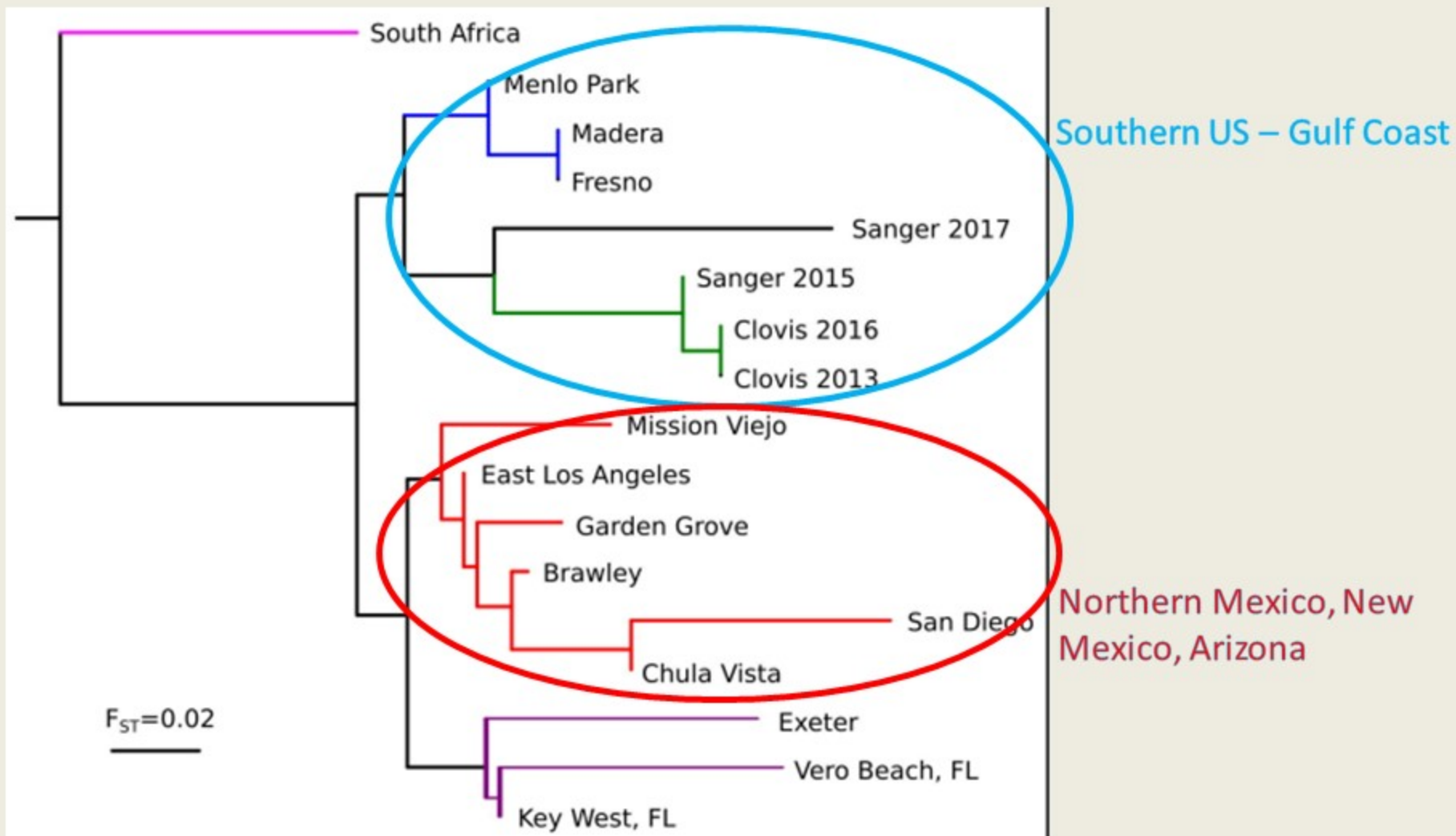
Cumulative Number of City / CDP Detections 2011 - 2019



Month of First Detection of *Aedes* Mosquitoes 2011 - 2019



*As of Nov 1, 2019



Genome-wide divergence among invasive populations of *Aedes aegypti* in California. 2018

Yoosook Lee, Hanno Schmidt, Travis C. Collier, William R. Conner, Mark J. Hanemaaijer, Montgomery Slatkin, John M. Marshall, Joanna C. Chiu, Chelsea T. Smartt, Gregory C. Lanzaro, F. Steve Mulligan, Anthony J. Cornel

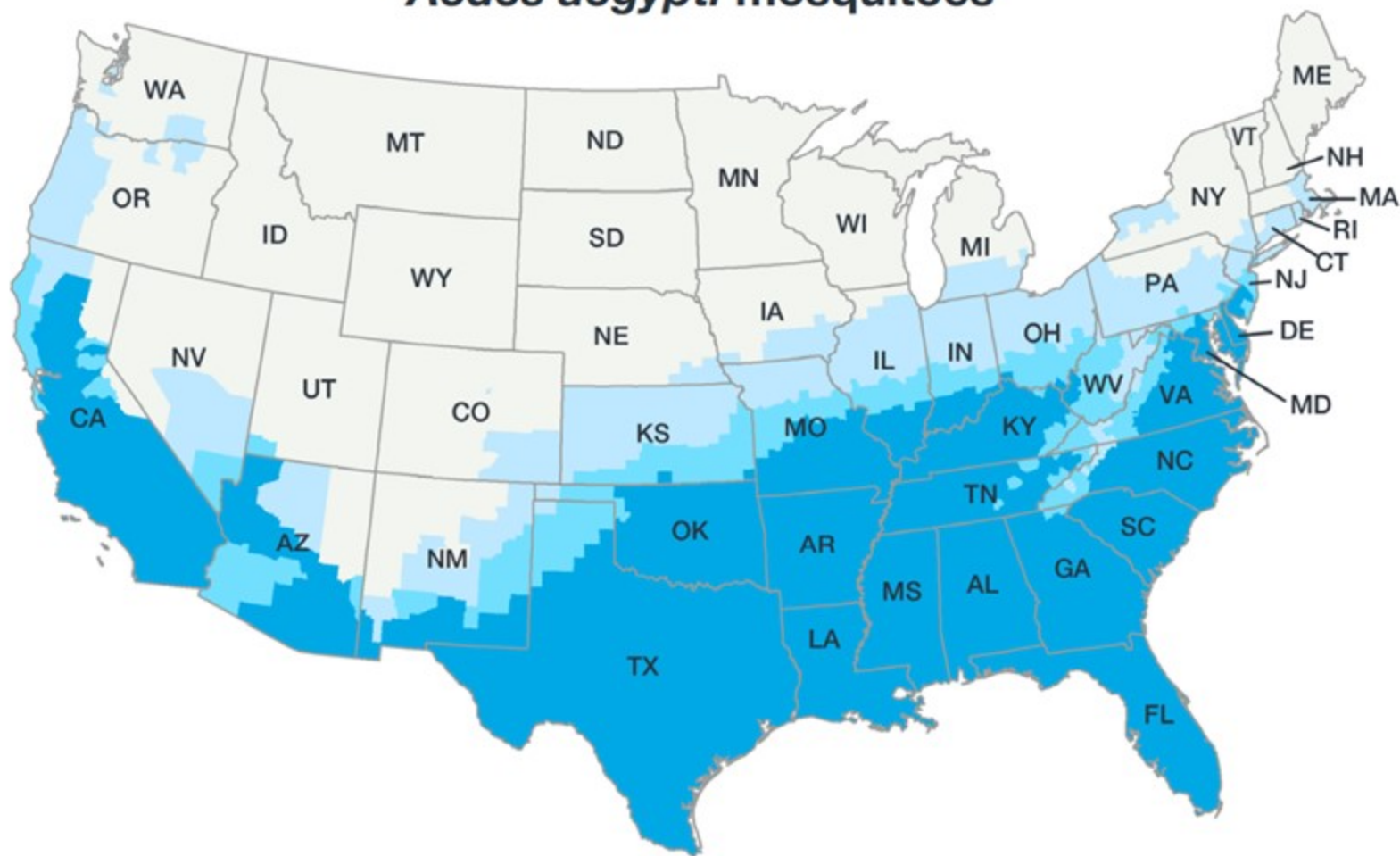
Multiple introductions of the dengue vector, *Aedes aegypti*, into California. 2017

Evelyn Pless, Andrea Gloria-Soria, Benjamin R. Evans, Vicki Kramer, Bethany G. Bolling, Walter J. Tabachnick, Jeffrey R. Powell

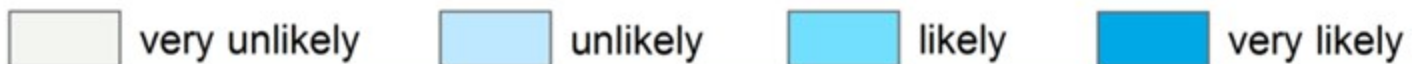
Origin of the Dengue Fever Mosquito, *Aedes aegypti*, in California. 2014

Andrea Gloria-Soria, Julia E. Brown, Vicki Kramer, Melissa Hardstone Yoshimizu, Jeffrey R. Powell

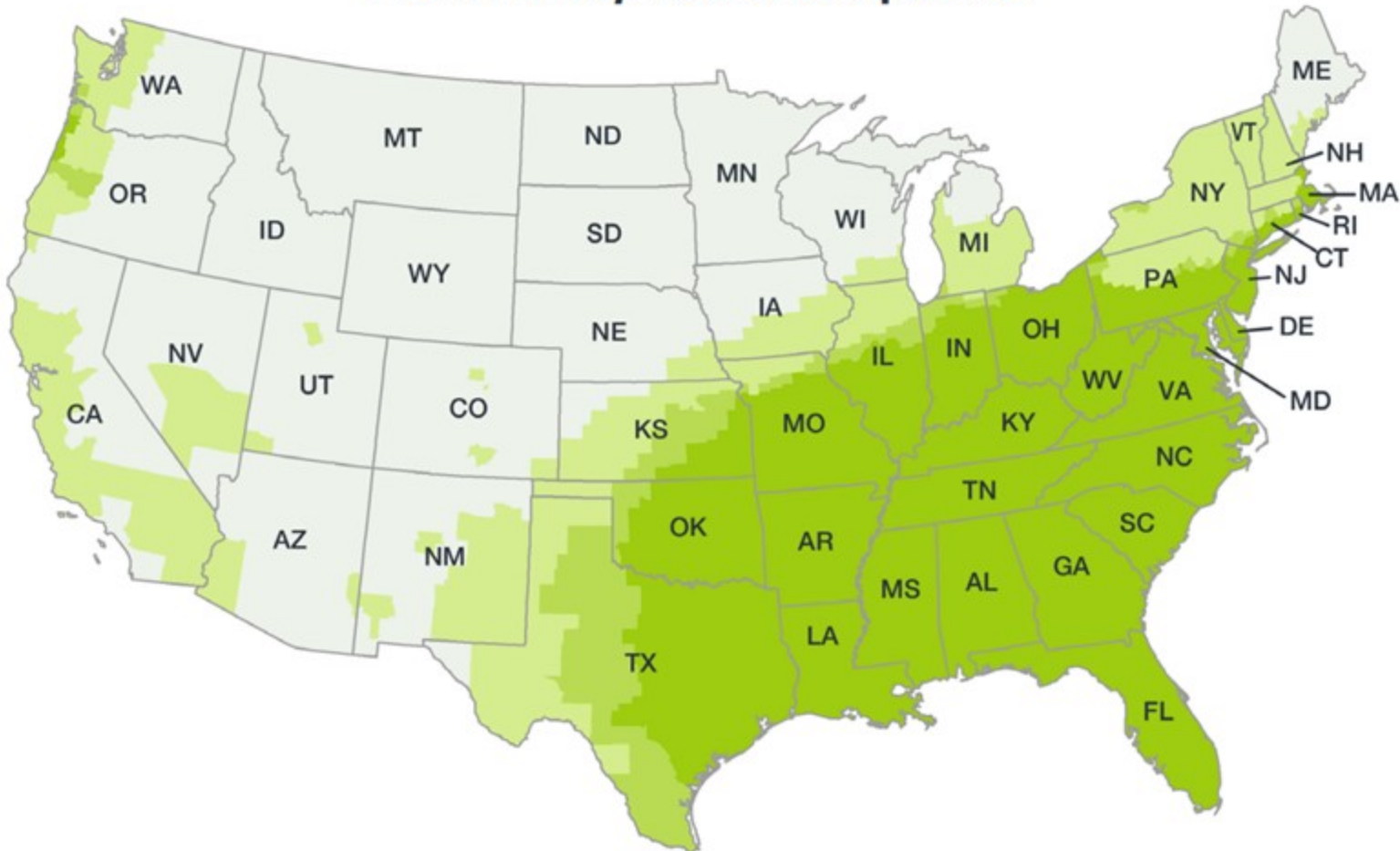
Aedes aegypti mosquitoes



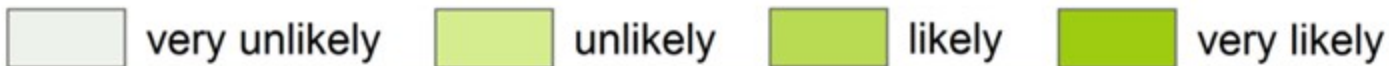
Mosquitoes' ability to live and reproduce



Aedes albopictus mosquitoes



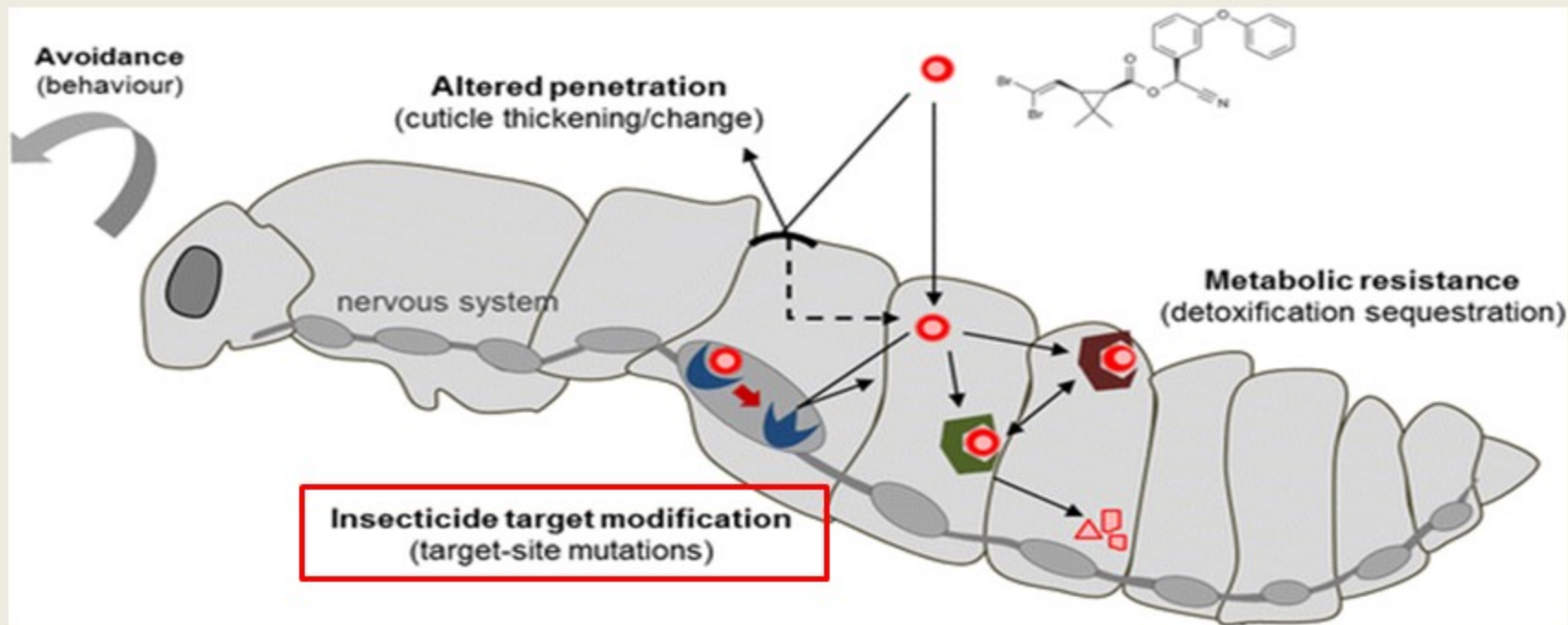
Mosquitoes' ability to live and reproduce



<https://www.cdc.gov/zika/vector/range.html>

Adapted from *Journal of Medical Entomology*, Volume 54, Issue 6, November 2017, Pages 1605–1614.

Mechanisms of Resistance to Chemical Insecticides in Mosquitoes

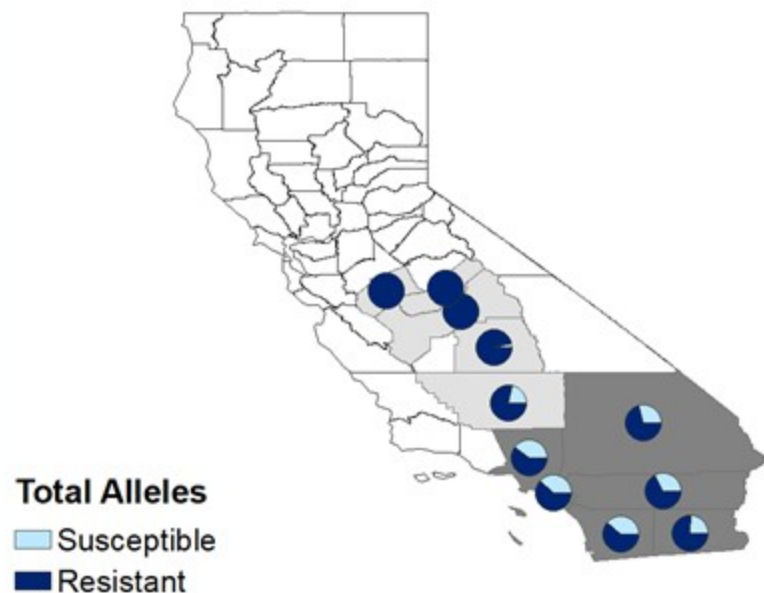


Corbel et al. Parasites & Vectors 10: 278, 2017.

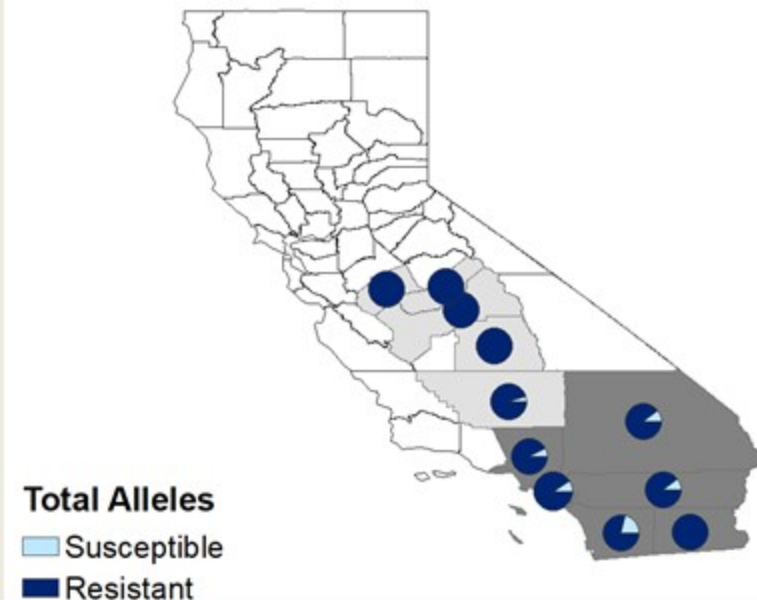
- With knockdown resistance (*kdr*), the sodium channels function properly despite pyrethrin/pyrethroid exposure
- Focused on the 1016 and 1534 mutations of the voltage-gated sodium channel

2017-2018 *kdr* Results by County

Frequency of Susceptible and Resistant Alleles
1016 (2017-2018)



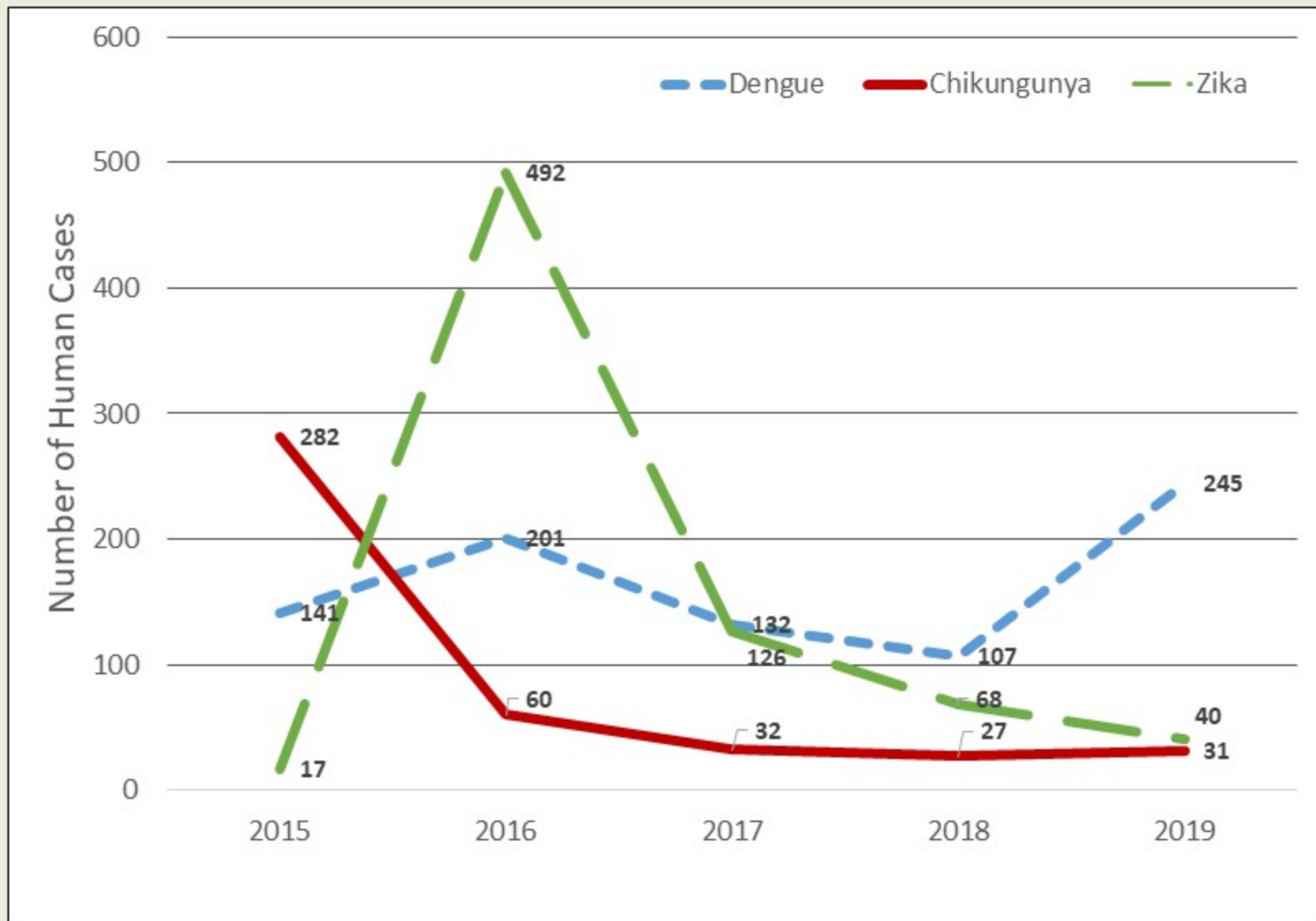
Frequency of Susceptible and Resistant Alleles
1534 (2017-2018)



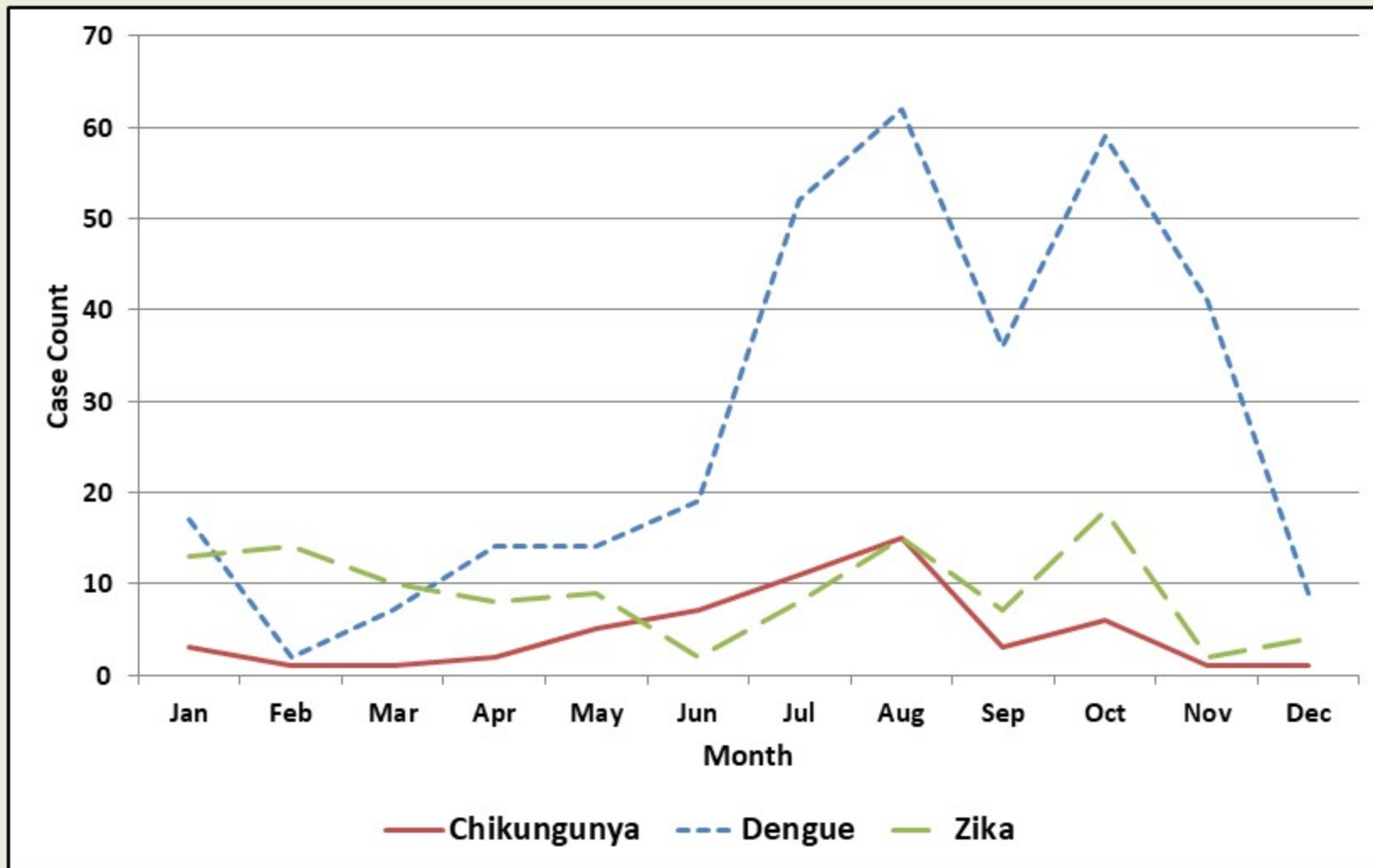
Public Health Concerns

- Vectors of dengue, chikungunya, Zika, and several other encephalitis viruses
- Aggressive day-biting mosquitoes that prefer mammals, especially humans
- Establishment increases the risk of local disease transmission and creates a severe public health nuisance
- Responsible for outbreaks of dengue (FL, TX, HI), chikungunya, and Zika (Caribbean and FL, TX)

Travel-Associated Dengue, Chikungunya, and Zika Cases in CA, 2015 - 2019



Chikungunya, Dengue, and Zika Cases by Month of Onset, 2018 - 2019



Key Messages

- Invasive *Aedes* have the potential to spread throughout state
- Chemical resistance should be considered prior to applications
- Local, state, and federal public health agencies must continue to work closely to ensure rapid and effective response in the event of local disease transmission
- Explore novel application methods and treatments to slow the spread of invasive *Aedes*

Acknowledgements

Partners:

- Mosquito and Vector Control Association of California
- UC Davis Arbovirus Research and Training Laboratory
- Local health departments
- Local public health laboratories

California Department of Public Health:

- Vector-Borne Disease Section
- Viral and Rickettsial Disease Laboratory
- Infectious Diseases Branch



Questions

Bryan T. Jackson, Ph.D.
Vector-Borne Disease Section
California Department of Public Health
(916) 686-8421
Bryan.Jackson@cdph.ca.gov

Marco E. Metzger, Ph.D.
Vector-Borne Disease Section
California Department of Public Health
(909) 937-3448
Marco.Metzger@cdph.ca.gov

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New! *Bridgport* SLUG-A-BUG®
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New, improved formula provides longer lasting power of control pests. Pleasantly scented.

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Kills and repels fleas, flea ticks, other insects on dogs and cats. Refreshing, too.

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For your personal use. Sprays on shoes, bags, clothing, keeps insects away from hands, hair, skin and grooming.

AER-A-GOL®
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ANTI-MOIST
KILLER
Narrow on household under sink, larvae breeding fly which lays for months. Kills insects on contact.

Rose Spray
Delicious bouquet, aphids, other insects, all insects, disinfectant, mints, many Indian and Arabian plants.

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Aedes notoscriptus

Public & Veterinary Health Concerns

- Extreme daytime biting nuisance
- Main vector of dog heartworm (*Dirofilaria immitis*)
- Role as vector of arboviruses to humans remains undetermined
 - Experimental vector of Ross River and Barmah Forest viruses. Viruses isolated from field collected adults
 - Infected with Murray Valley encephalitis in lab studies
 - Limited susceptibility to dengue virus

