

Northern Range Expansion of the Asian Tiger Mosquito (*Aedes albopictus*): Analysis of Mosquito Data from Connecticut

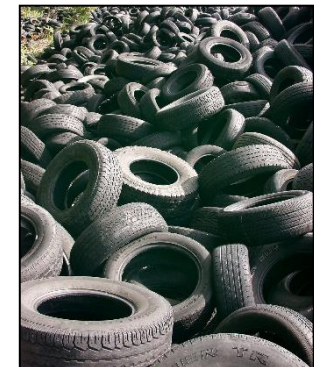
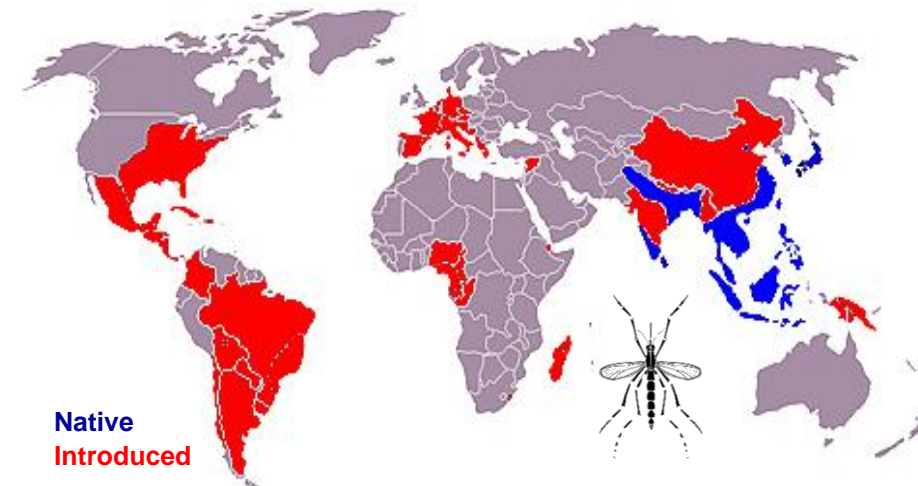
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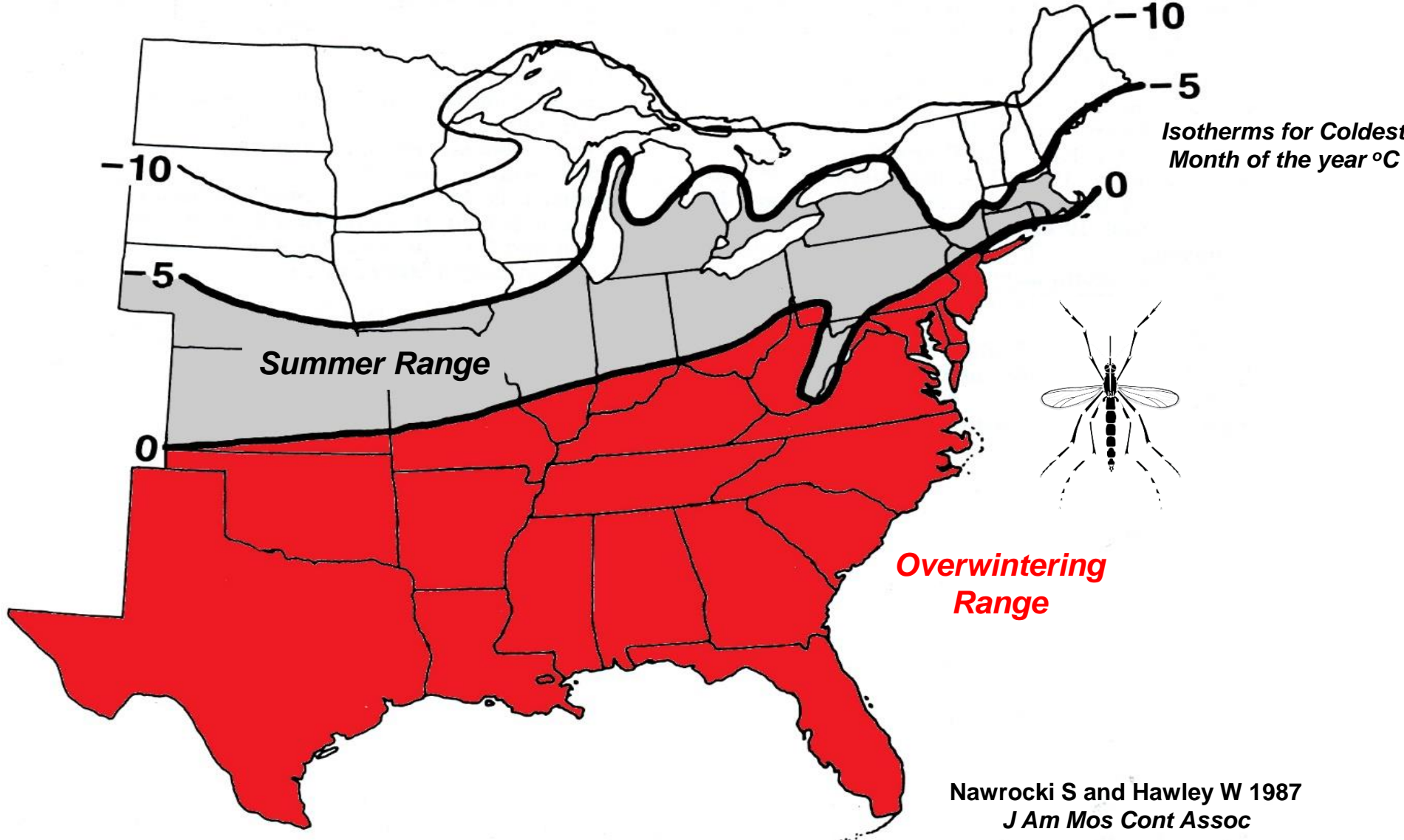


Aedes albopictus

- Most invasive mosquito species in the world
- Native to East Asia, has spread to > 50 countries over last 4 decades
- Spread primarily through world-wide trade in used tires
- First established U.S. population discovered in Houston, TX during 1985
- Aggressive human-biter
- Vector of dengue, chikungunya, and Zika virus
- Competent vector for 23 different arboviruses including West Nile, eastern equine encephalitis, and La Crosse virus



Estimated Range of *Aedes albopictus* in the U.S.

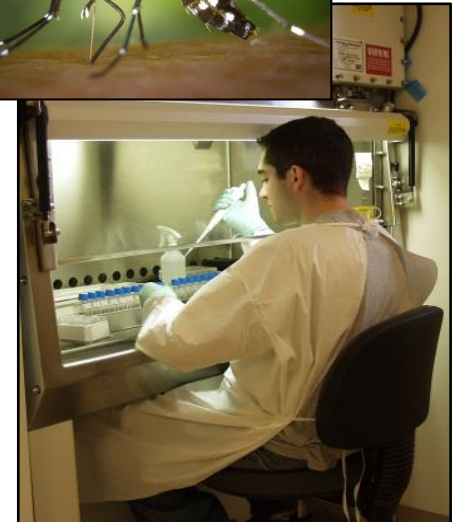


OBJECTIVES

- Track establishment and northern range expansion of *Ae. albopictus* in Connecticut
- Assess population changes in relationship to winter temperatures
- Evaluate overwintering success of local *Ae. albopictus* populations
- Survey northern populations for the presence of arboviruses

STUDY DESIGN

- Mosquito trapping statewide June-October
- 91 trapping stations
 - 36 sites sampled since 1997
 - Remaining sites since 2000
 - Each site sampled weekly
- Mosquitoes sorted and identified to species level
- Mosquitoes screened for virus infection by cell culture and PCR assays
- Retrieve and flood tires in spring to evaluate overwinter success of winter populations



MOSQUITO TRAPS

- CDC light traps
 - All species
 - Baited with CO₂
- Gravid traps
 - Primarily *Culex* species
 - Baited with hay-infusion water
- BG-Sentinel Traps
 - Primarily *Ae. albopictus*
 - Baited with Human Scent Lure
 - Added to sites after detection *Ae. albopictus*



Gravid Trap

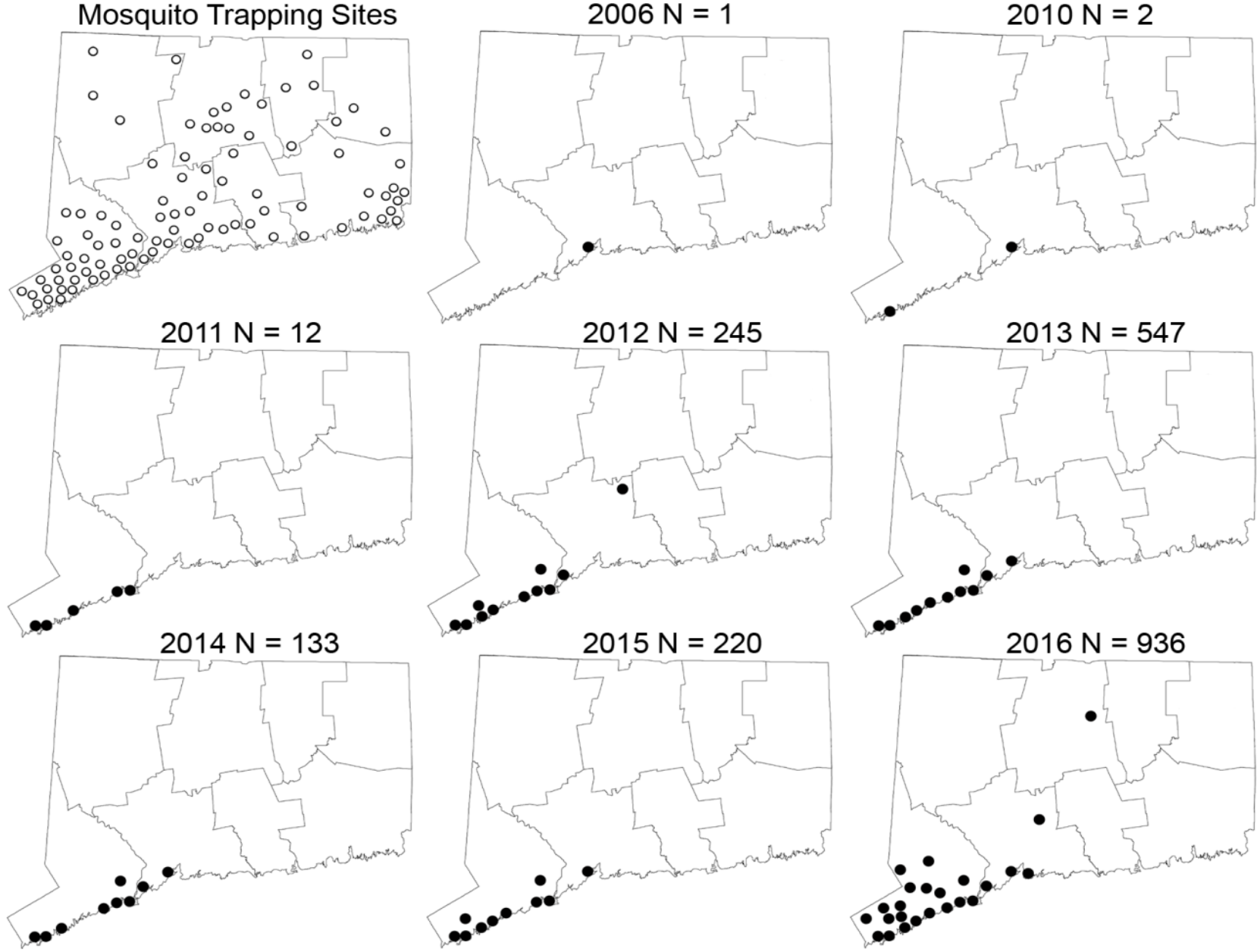


BG-Sentinel Trap

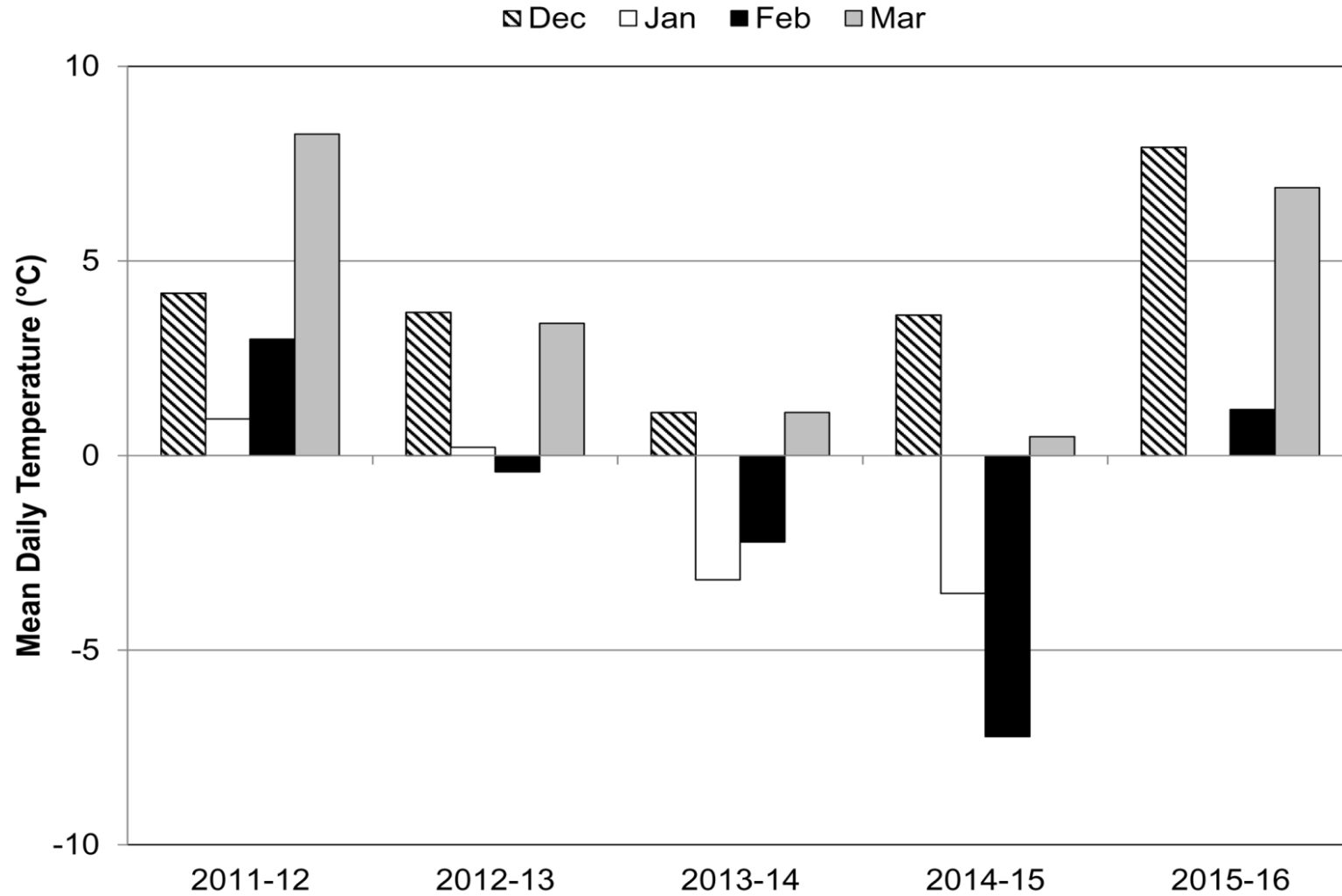


CDC Light Trap

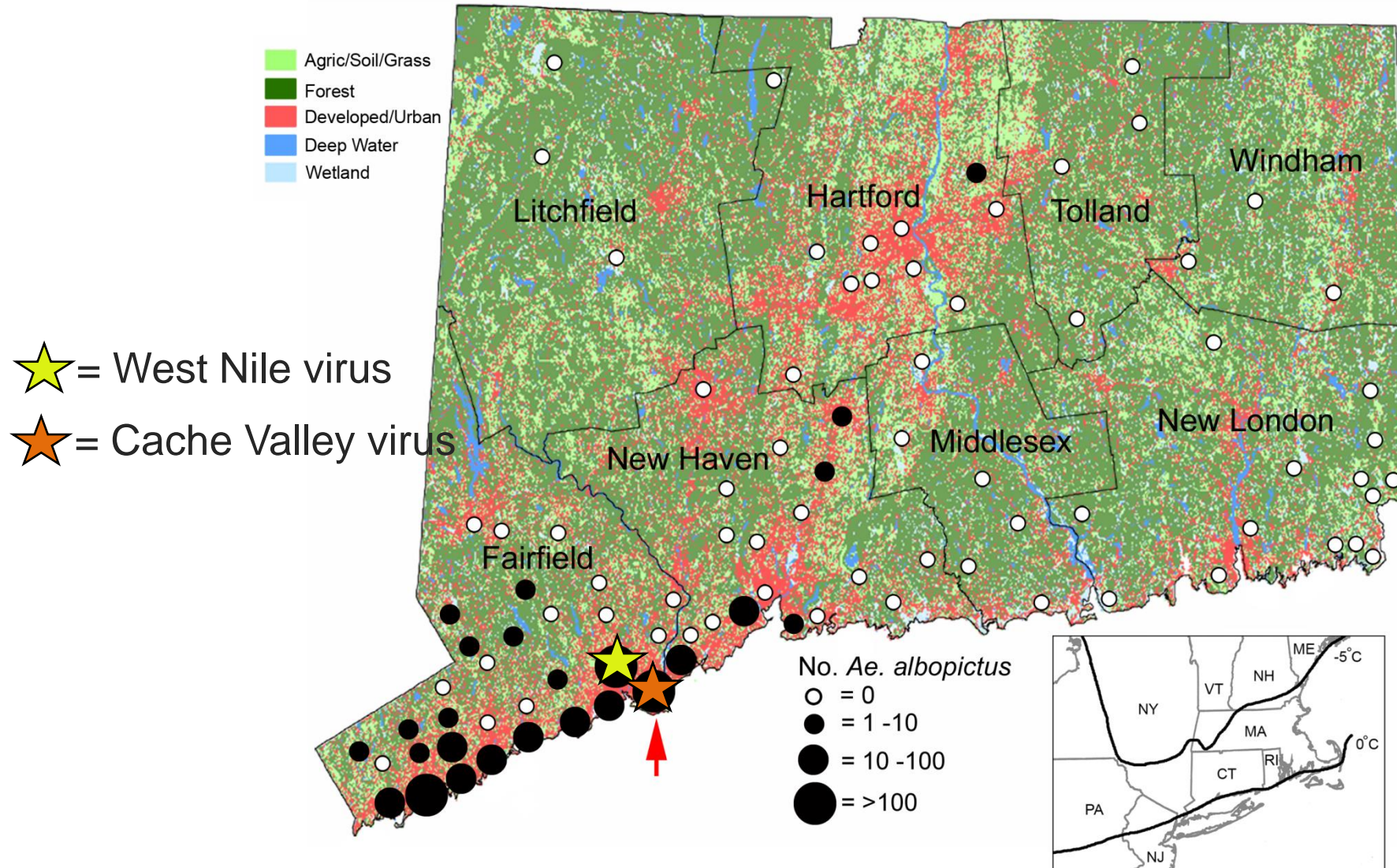
Distribution of the Asian Tiger Mosquito *Aedes albopictus* in Connecticut



Mean monthly temperatures



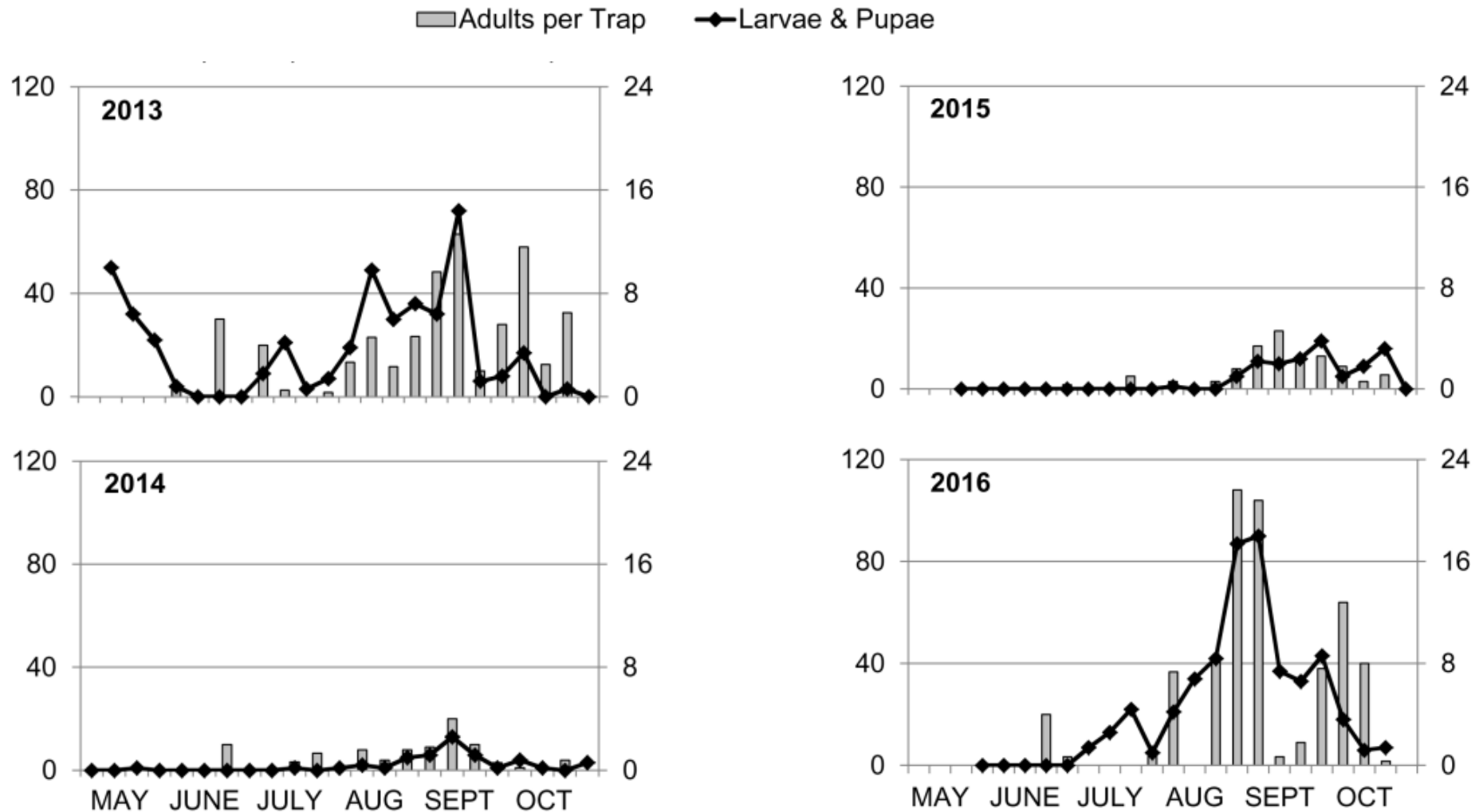
Aedes albopictus collections in Connecticut 2006-2016



Performance of mosquito traps

- Compared number of female mosquitoes collected from 2010-2016
 - 474 trap nights
 - Mean number of *Ae. albopictus* collected per trap night:
 - BG Sentinel trap=1.6
 - CDC Light trap=1.1
 - Gravid trap=0.4
- Statistical significance markers:
- N.S. (Not Significant) between BG Sentinel and CDC Light traps
 - $P < 0.0001$ between BG Sentinel and Gravid traps
 - $P < 0.01$ between CDC Light and Gravid traps

Weekly collection of *Ae. albopictus* in Stratford, CT



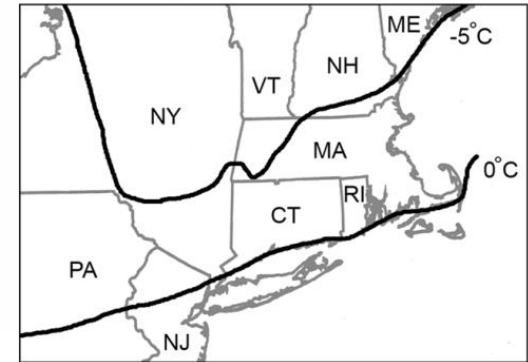
Overwintering of *Aedes albopictus*

- Four tires retrieved from Stratford, CT in late April
- Placed in a greenhouse and flooded twice to recover hatching larvae
- *A. albopictus* larvae recovered:
 - 2013 N=51
 - None during 2014, 2015, or 2016
- Other species collected included *Ae. triseriatus* and *Ae. japonicus*



Conclusions

- *Ae. albopictus* is expanding northward with breeding populations in the southwestern CT
- The distribution limit most closely matches the location of the 0° C cold-month isotherm
- This study documents the northernmost location of *Ae. albopictus* overwintering in North America
- The seasonal abundance and overwintering success of *Ae. albopictus* appears to be impacted by winter temperatures
- West Nile virus and Cache Valley virus were isolated from *Ae. albopictus*, further indicating the public health threat posed by this species





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Questions?

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