Aedes albopictus in Ontario

and its Significance as a Transmitter of Zika Virus

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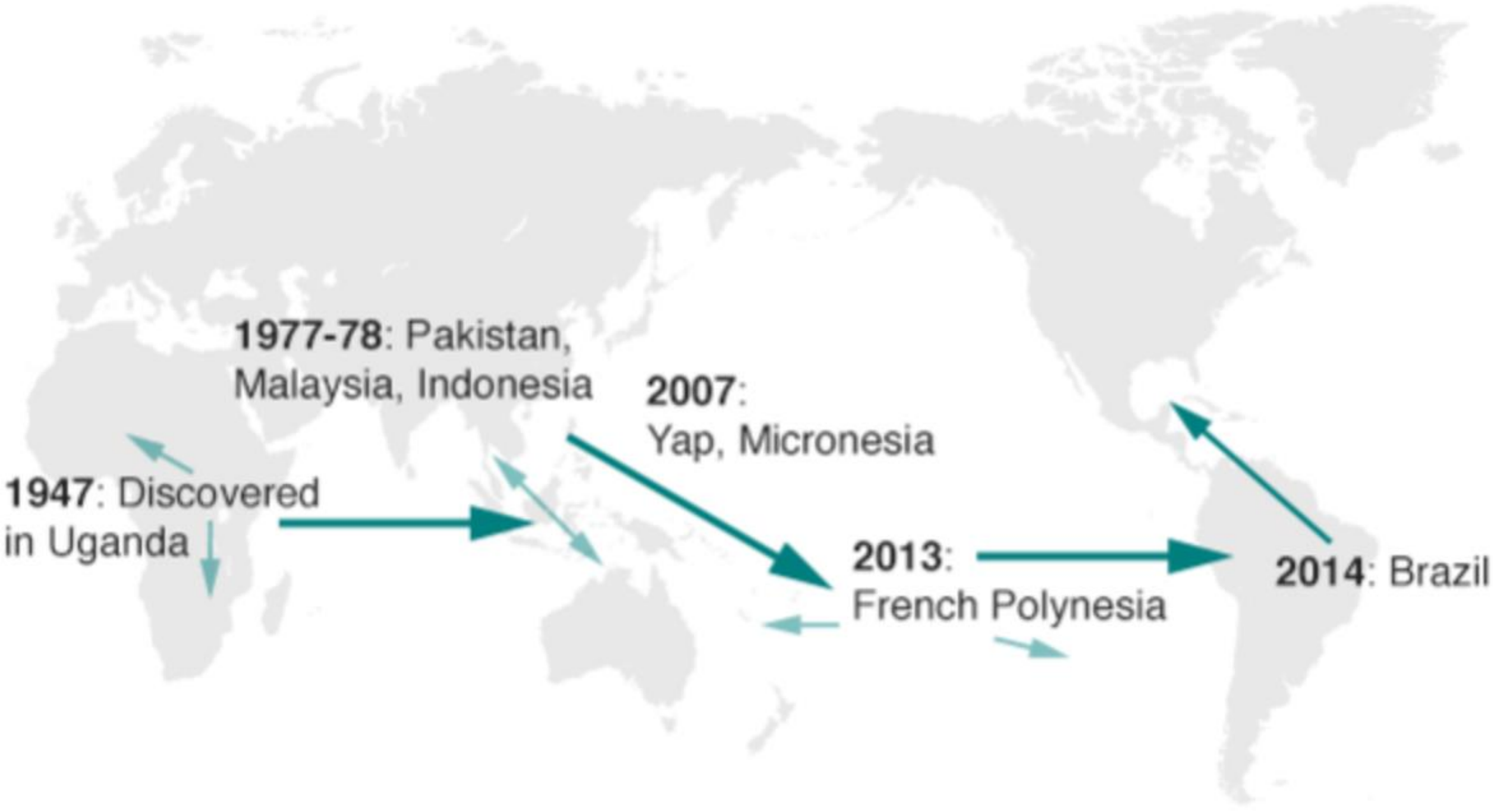
- Feb 1st, 2016
  WHO declared Zika virus a *Public Health Emergency of International Concern*

The Global Spread of Zika virus




Texas
Florida 2016
Thailand
Mexico
Philippines
Venezuela
2016
Colombia
2014
Indonesia
2015
Brazil
Countries where the virus is normally found
Countries where the virus has spread

- Feb 1st, 2016
  WHO declared Zika virus a *Public Health Emergency of International Concern*

- **First arbovirus known to be sexually transmitted**

- **Suspected link to microcephaly and birth defects**

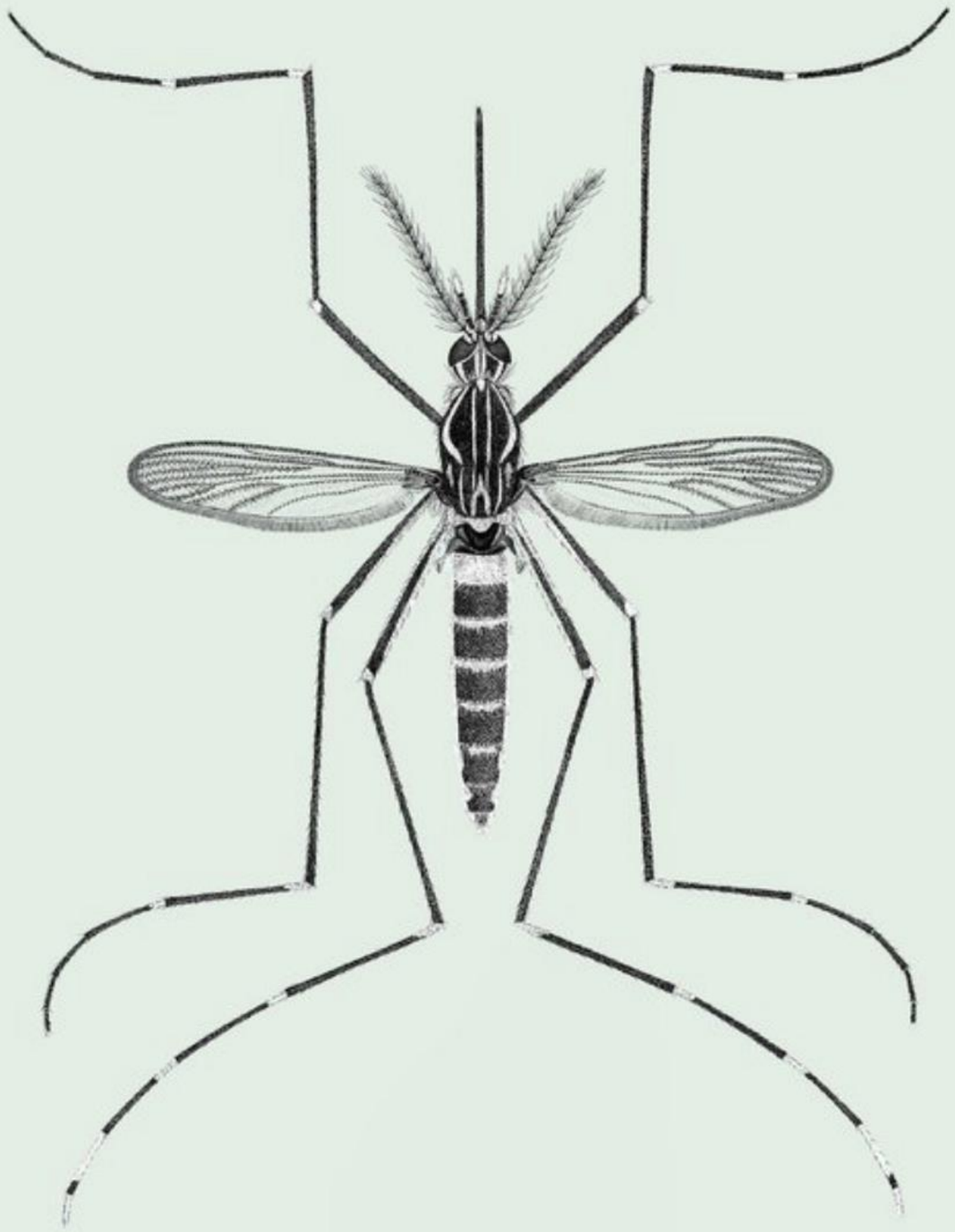
- **Over 100,000** *confirmed* **cases in 2016 in Brazil**

  - **~11,000 of which were pregnant women**

- **Primary Mosquito Vectors:**
  Aedes aegypti **and** *Aedes albopictus*

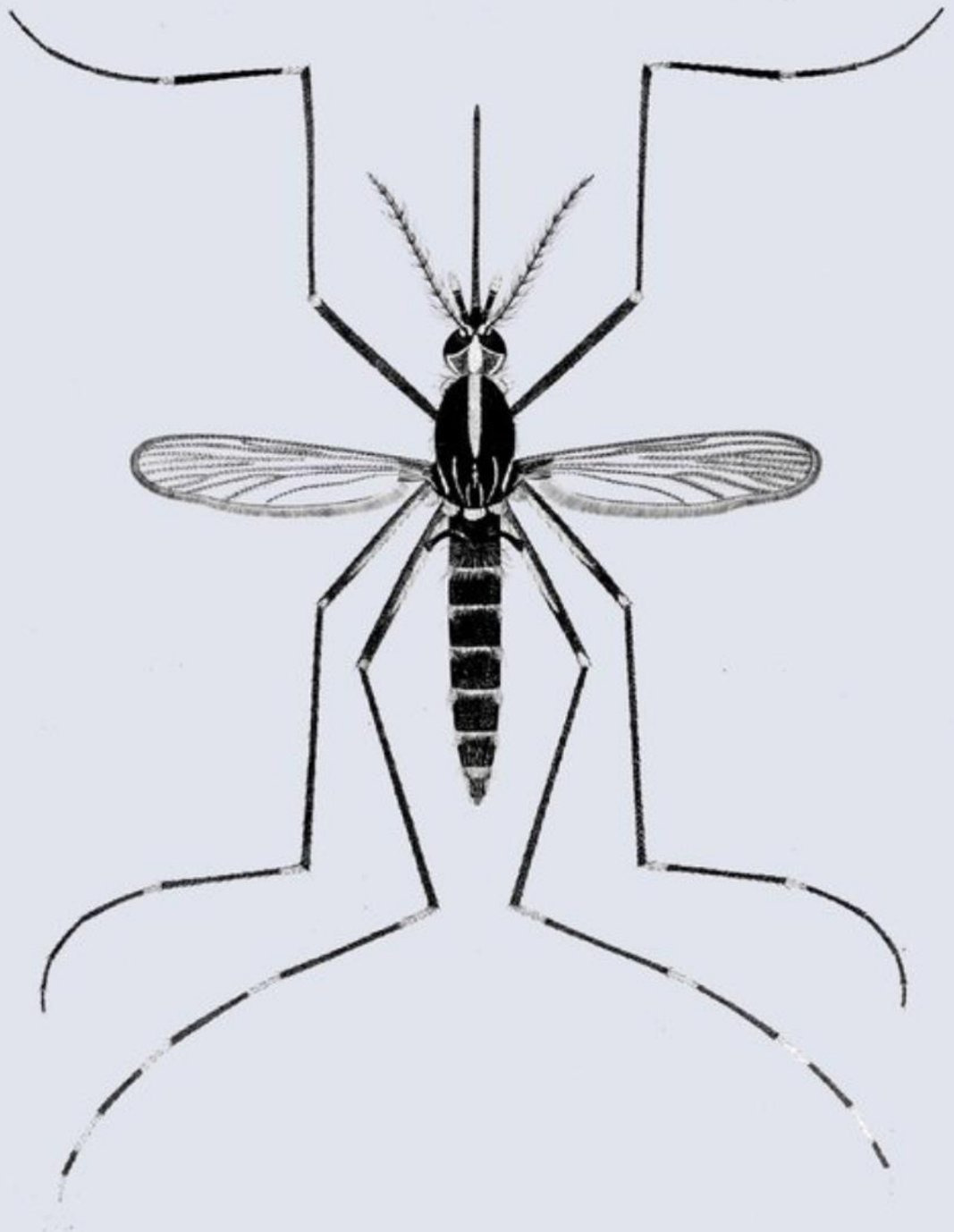
Aedes aegypti

Lyre shaped pattern
2 central dorsal strips

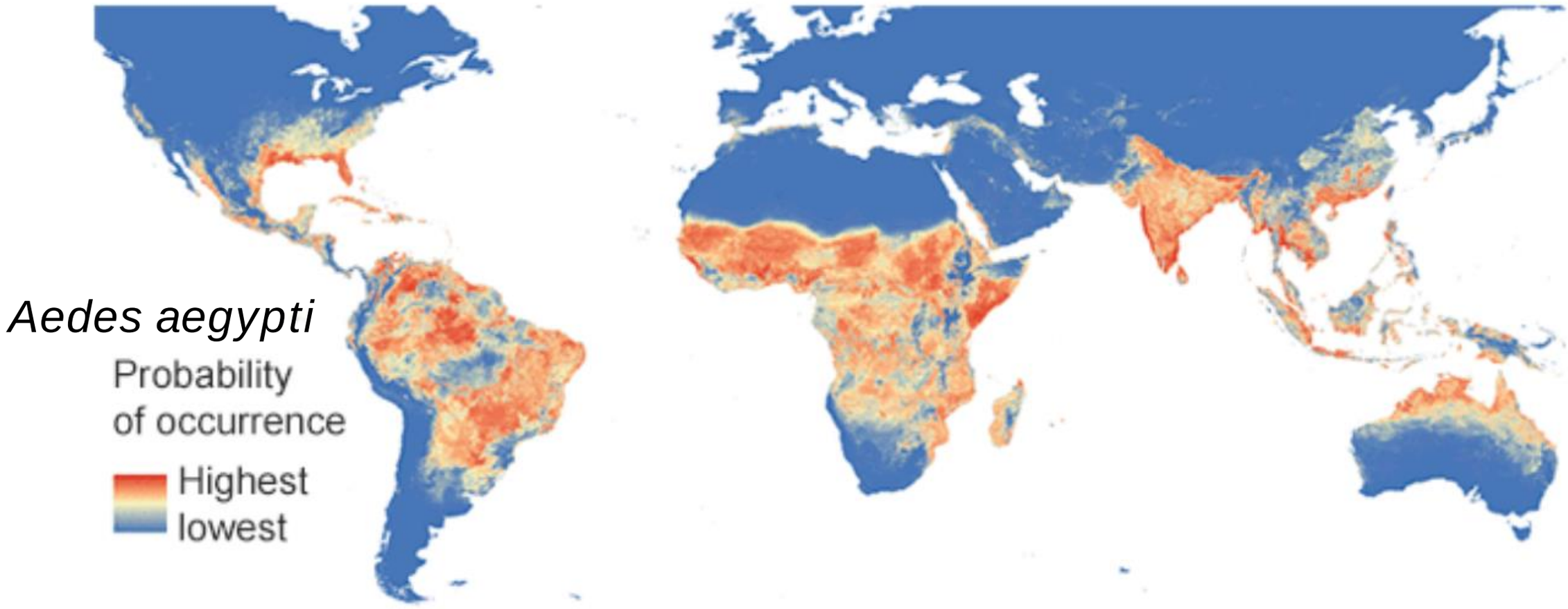


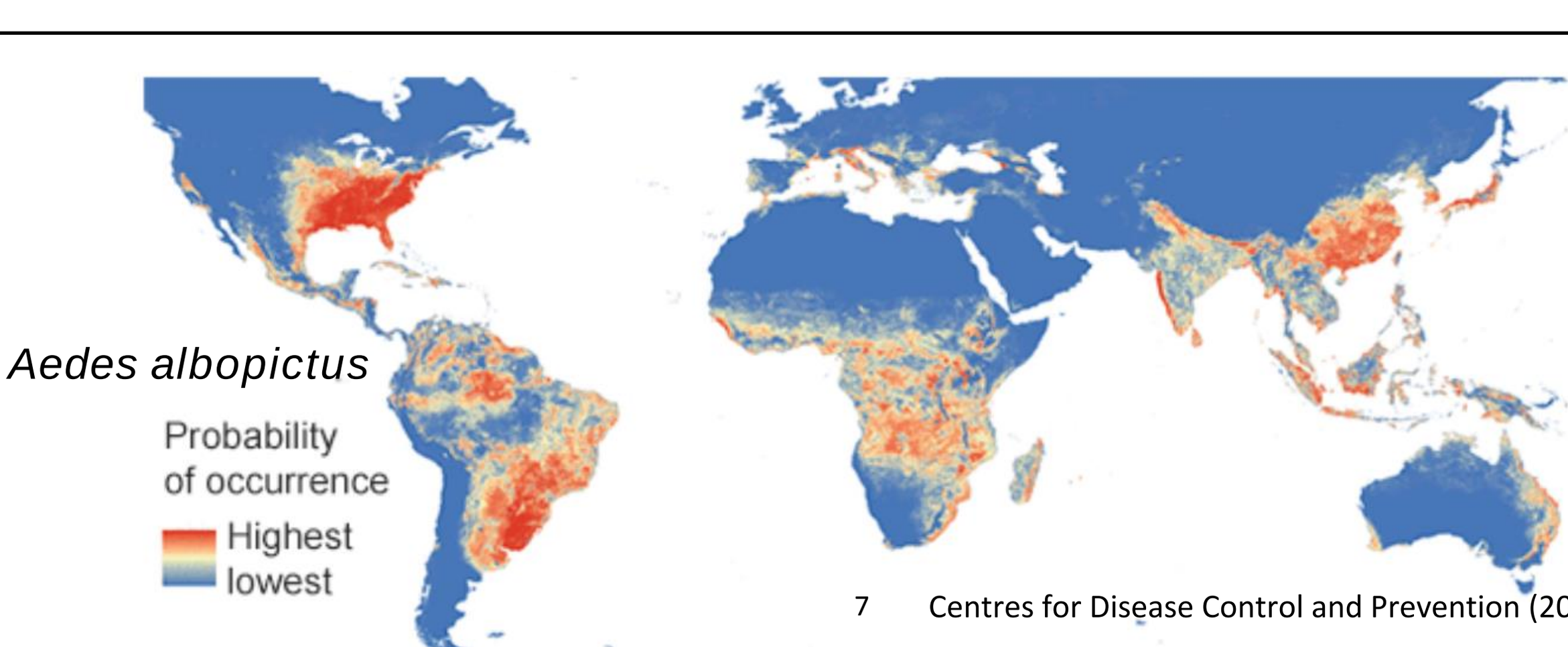
Aedes albopictus

1 central dorsal strip



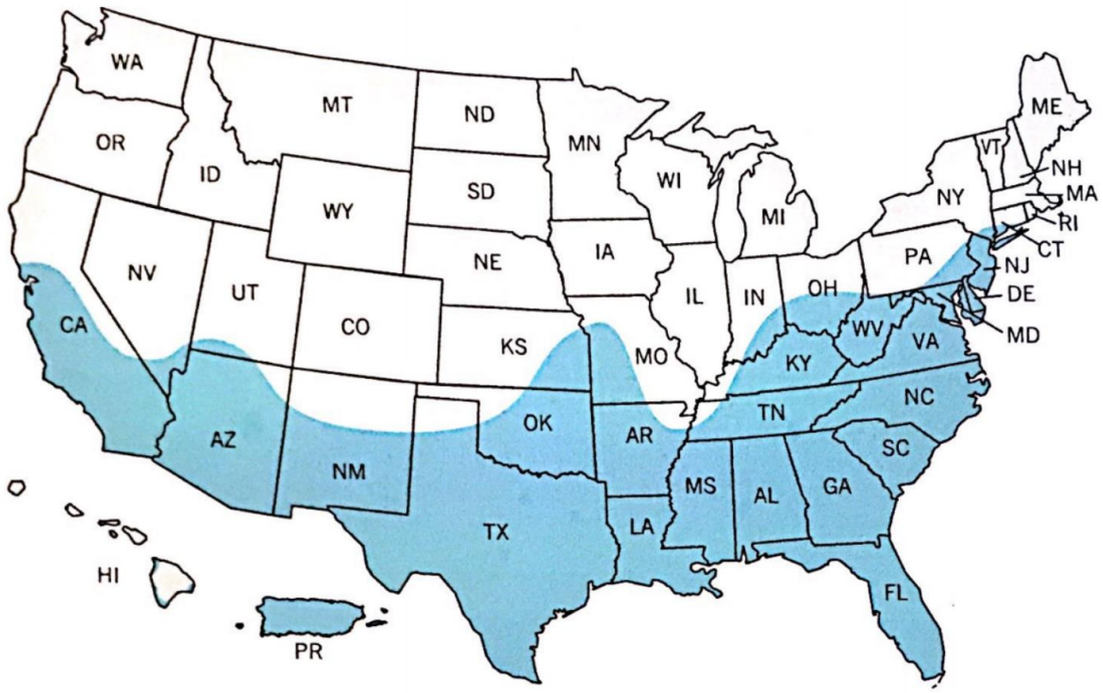
Smithsonian Insider (2016)



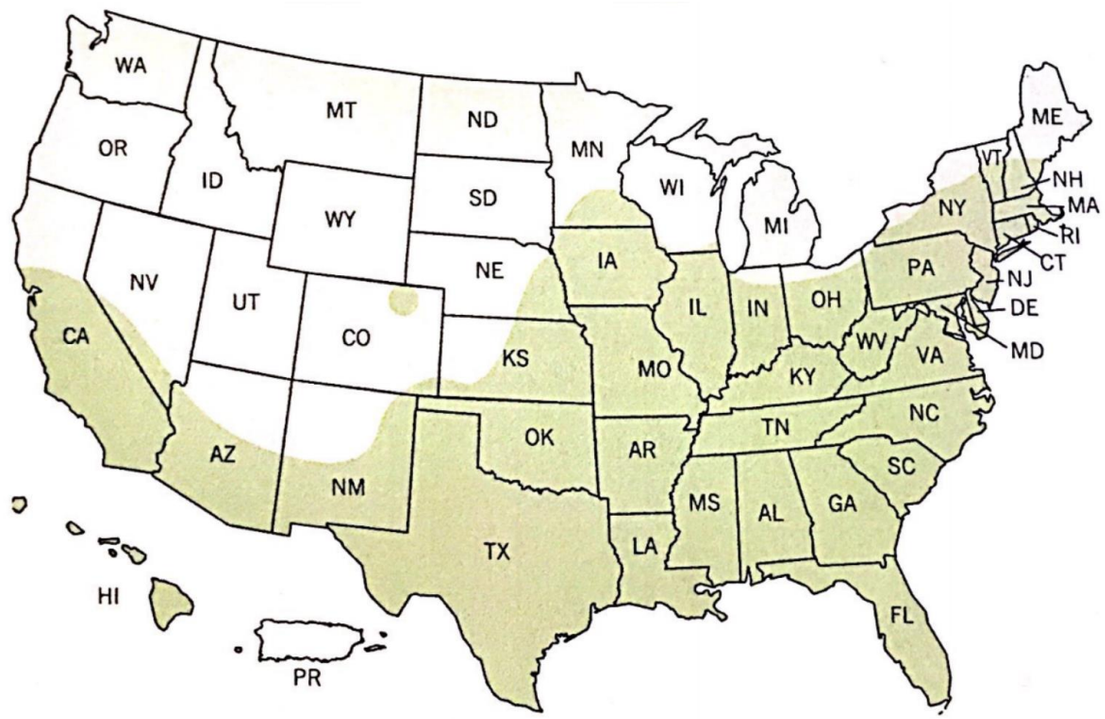


 Centres for Disease Control and Prevention (2016)

Aedes aegypti

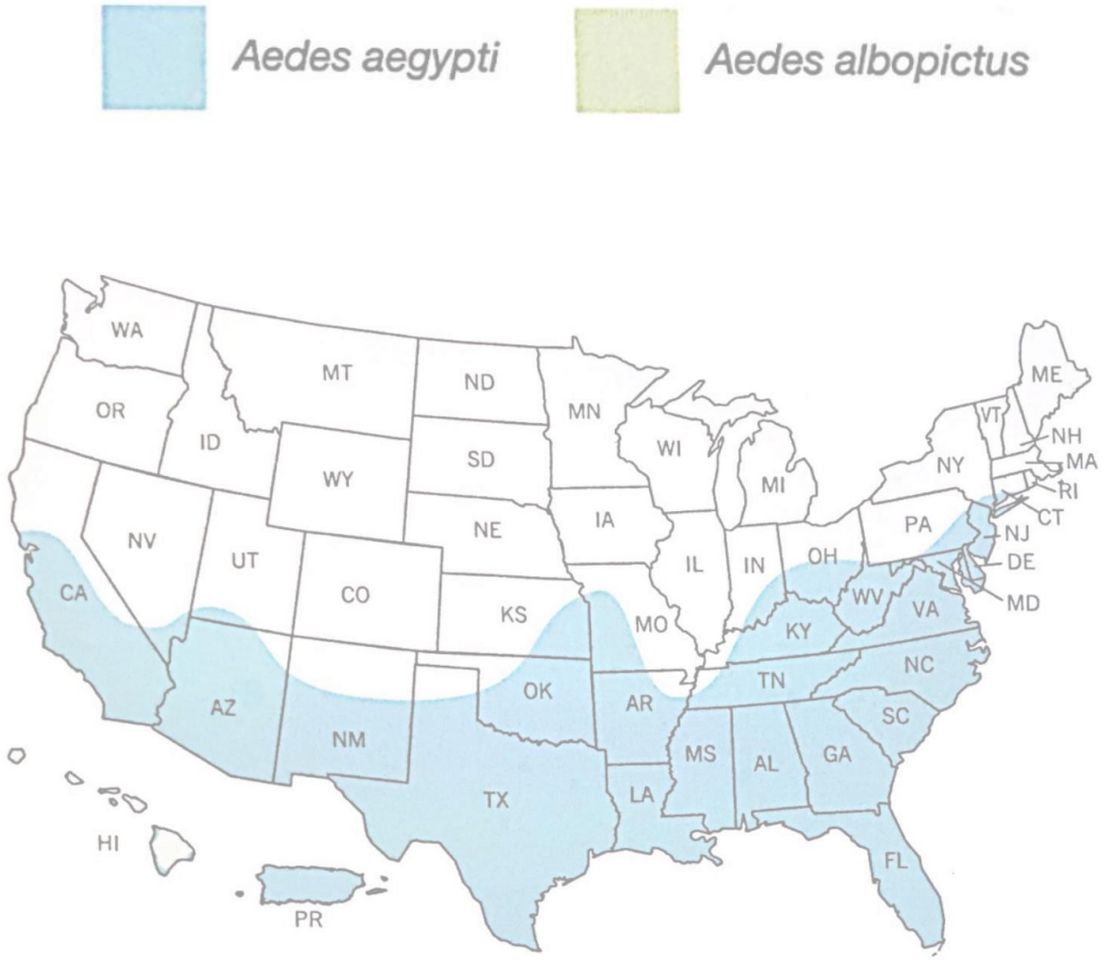


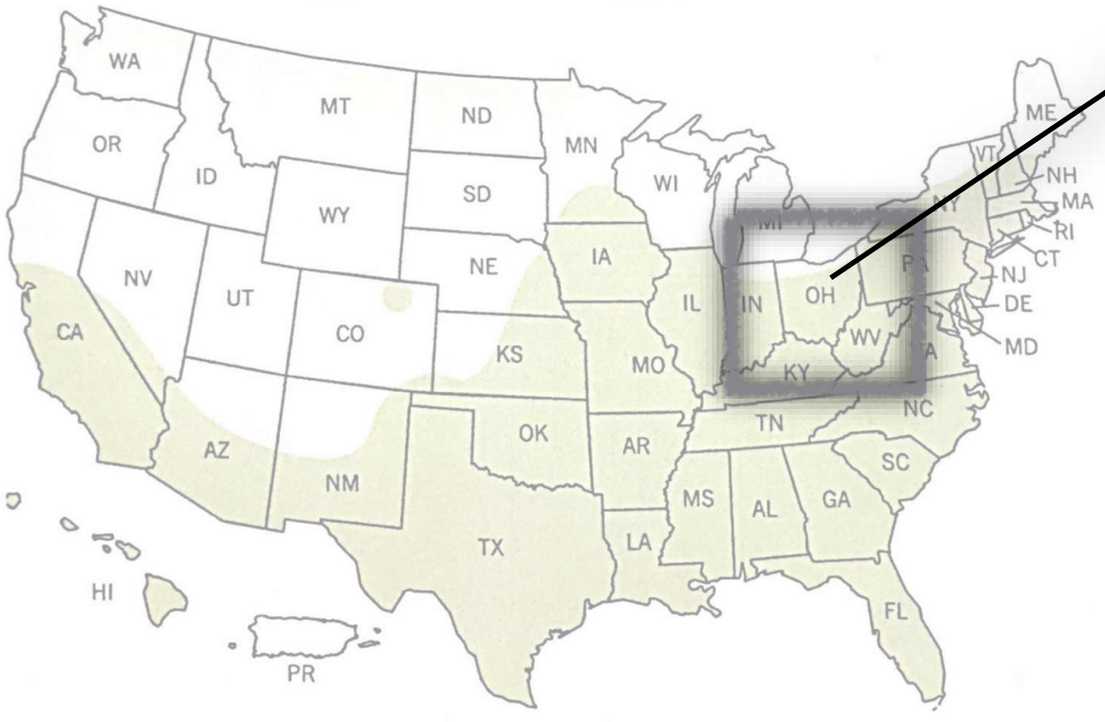
Aedes albopictus

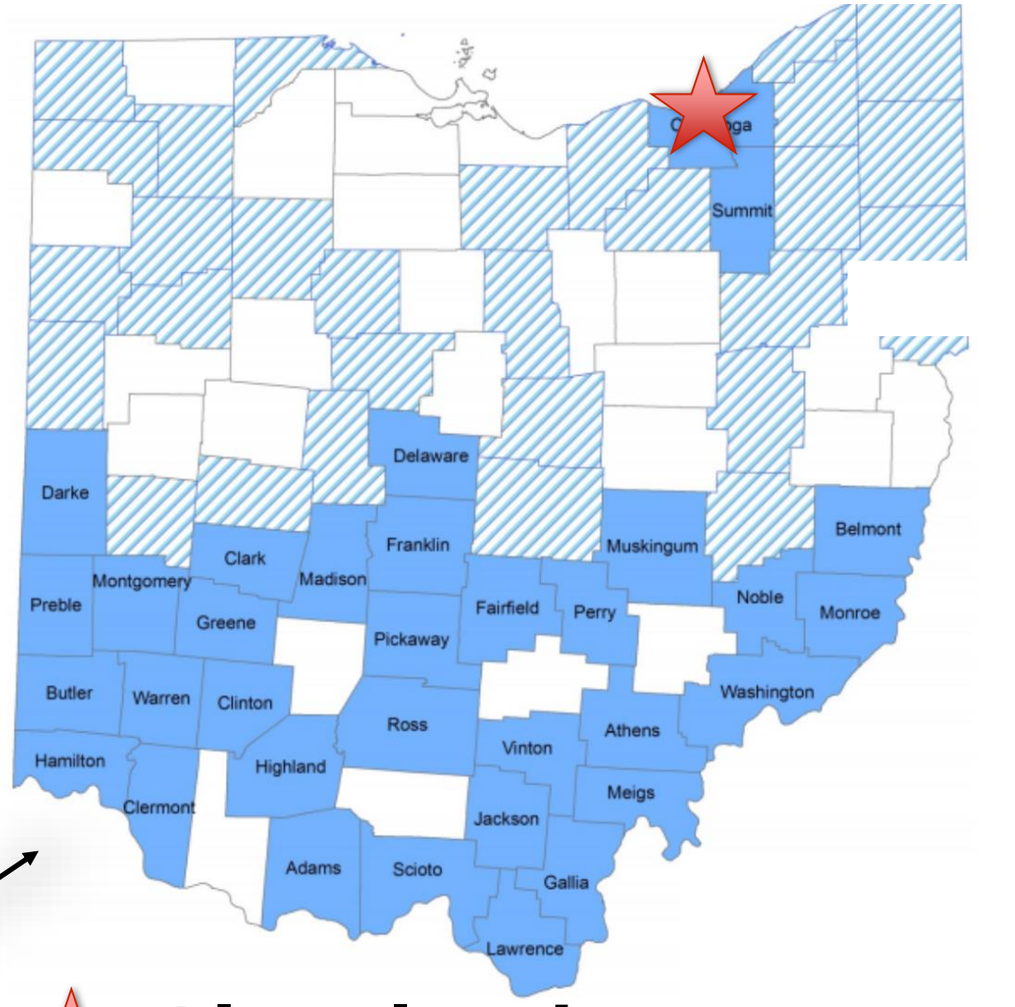


Centres for Disease Control and Prevention (2016)

Aedes albopictus Surveillance, Ohio 2016







Cleveland

2016 Mosquito Surveillance

- No Mosquito Surveillance
- Mosquito Surveillance
- *Aedes albopictus*

Ohio Public Health Department (2016)

Aedes albopictus
Windsor, Ontario September 2016

- An isolated population of *Aedes albopictus* was discovered in Windsor, Ontario in September 2016.

- September 14th, September 21st, October 5th

- Repeated collections (6 specimens total) led to an expedition

Aedes albopictus Collections

- Centres for Disease Control and Prevention (CDC) Light Traps
- BioGents Sentinel (BGS) Traps
- Baited with a BG lure (ammonia, lactic acid, caproic acid)
- BGS collects significantly more *Aedes albopictus* compared to CDC light traps

(Farajollahi *et al.* 2009)

CDC Light Trap

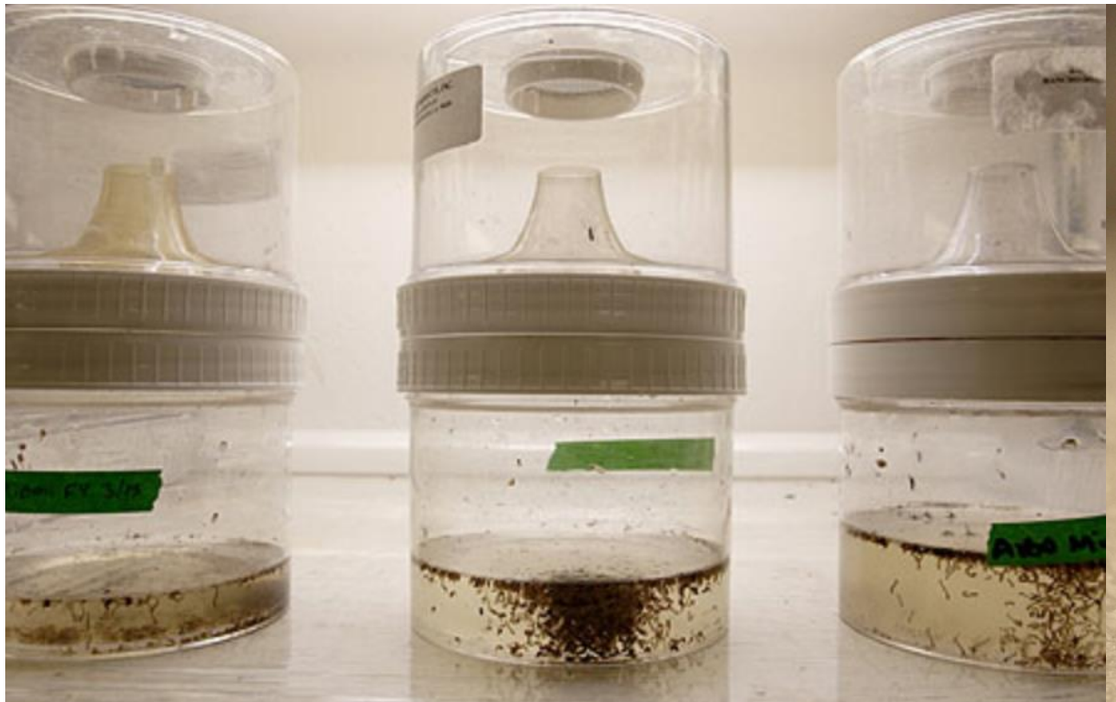
BGS Trap

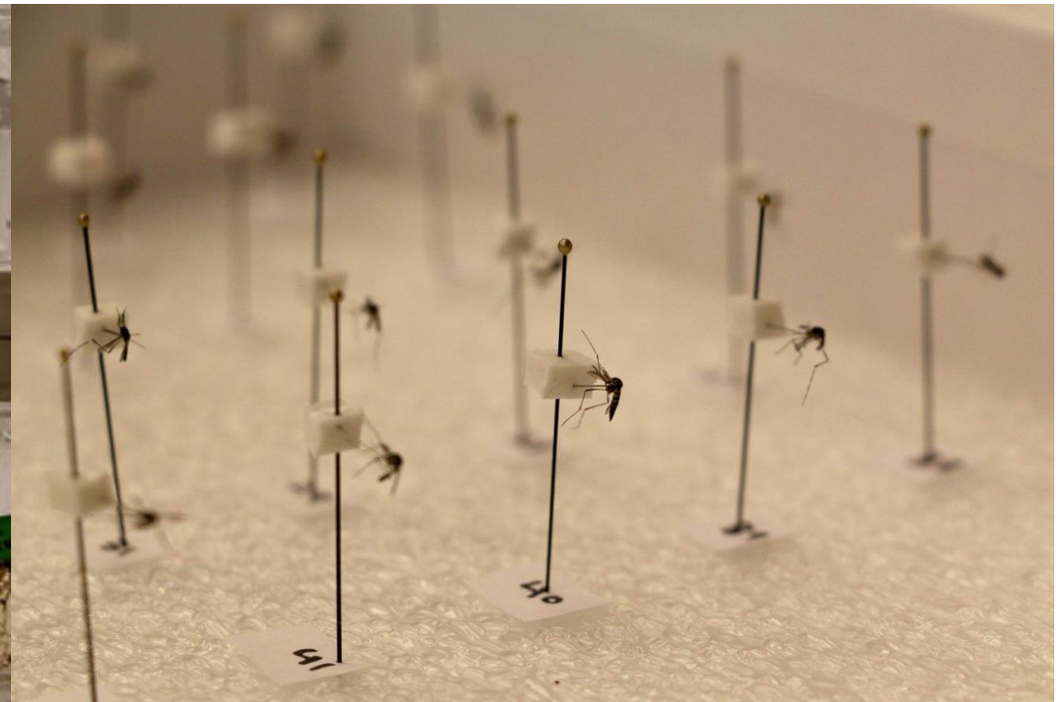
Aedes albopictus Collections

- Larvae collected from:
  discarded tires
  recycle bins
  plastic cups
  Styrofoam containers

Mosquito Rearing and DNA Extraction

- Collected larvae and eggs transported back to **Brock University** and reared to adulthood for identification
- Adults were killed in freezer
  - 3 legs removed for DNA extraction
- Select adult male and female specimens to be submitted to the Canadian National Collection, Ottawa





Mitochondrial CO1 Barcoding

- Sequenced an approx. 650 bp region of the Mitochondrial cytochrome oxidase subunit 1 (CO1)

- PCR products were visualized on 1.5% agarose gel followed by PCR purification and sent to Sick Kids Toronto for sequencing

- Sequenced PCR amplicons were BLAST searched using the NCBI database for comparison of sequences

Collection Summary *Aedes albopictus*

- Adults collected from both CDC light traps and BGS traps
- Few specimens collected as larvae reared to adults
    - Multiple stagnant water sites
- Verified morphologically and by CO1 barcoding

Giordano *et al.*, unpublished data

Collection Summary *Aedes aegypti*

c**First Canadian Record**c

- Few specimens collected as larvae reared to adults
    - Single stagnant water site
- Verified morphologically and by CO1 barcoding

Giordano *et al.*, unpublished data

Next Steps

- Examine haplotype variation
- Compare sequences in GenBank from other populations worldwide:
    - California, New Jersey, Texas, Costa Rica, Panama City, Singapore, China
    - *Estimated date of completion: Spring 2017*
- Goal:
  Attempt to describe where this population derived from Northern range expansion **OR** human intervention

Significance

- Data suggests multiple females are feeding, breeding, and ovipositing

- Vector for Zika virus

Vector competence studies at Brock University

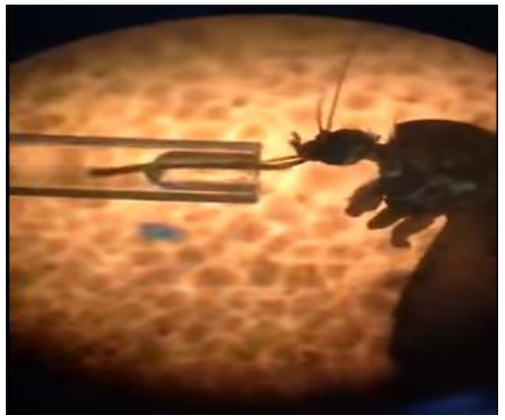


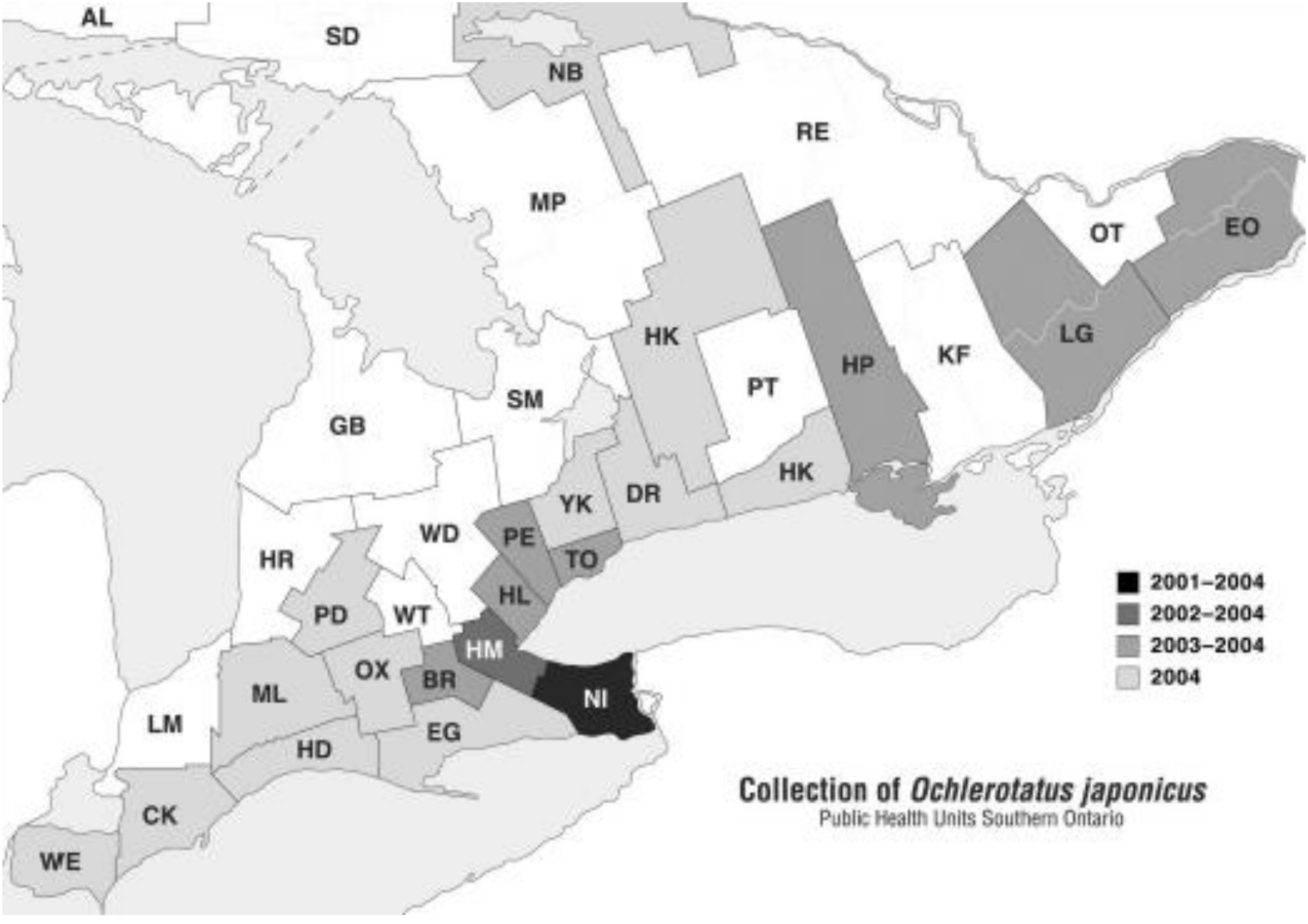
Table 2: ZIKV vector competence rate comparisons. A comparison of the infection, dissemination, and transmission rates for ZIKV associated with *Ae. vexans*, *Ae. albopictus*, and *Ae. aegypti* samples following either 10 or 14 d.p.i. at 28˚C and 75-80% RH.

	Ae. vexans (10 d.p.i.)	*Ae. albopictus* (10 d.p.i.)	*Ae. aegypti* (10 d.p.i.)	*Ae. aegypti* (14 d.p.i.)
infection rate (IR)	9.7% (3/31)	36.4% (4/11)	12.7% (7/55)	6.7% (2/30)
disseminated infection rate (DIR)	0% (0/3)	50% (2/4)	14.3% (1/7)	100% (2/2)
transmission rate (TR)	0% (0)	100% (2/2)	100% (1/1)	100% (2/2)
transmission efficiency (TE)	0% (0/31)	18.2% (2/11)	1.8% (1/55)	6.7% (2/30)

Shivifard S. BSc Thesis. Unpublished data

Significance

- Data suggests multiple females are feeding, breeding, and ovipositing
- Vector for Zika virus
- Aggressive and persistent biters with wide host range
- Known to outcompete native species as larvae
- Well adapted to survive in both urban and rural municipalities



Thielman and Hunter (2007)

Questions ?

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4. Shivafard S. An Analysis of Vector Competence for Zika Virus. BSc Thesis. 2016. Brock University.
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NSERC CRSNG

Brock University