

Biology, Ecology, and Feeding Behavior of Mosquitoes in Connecticut



John Shepard

***Department of Environmental Sciences
Center for Vector Biology & Zoonotic Diseases
The Connecticut Agricultural Experiment Station
New Haven, CT***



CAES

The Connecticut Agricultural Experiment Station
Putting Science to Work for Society since 1875

Mosquitoes

- True flies (Order Diptera)
- Family Culicidae
 - One pair of wings
 - Forward projecting mouthparts = Proboscis
 - Wings with scales & fringe hairs
- Over 3,500 species worldwide
- Over 150 species in US
- Why Identify?

Evaluate Public Health Risks

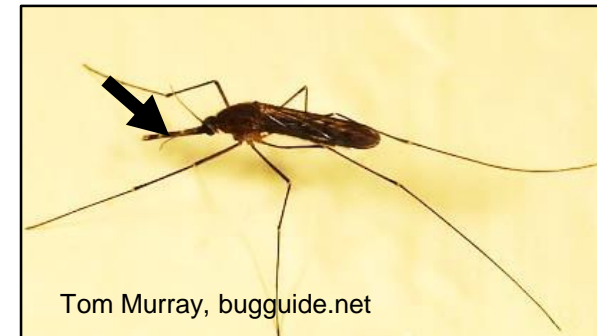
Implement Control Measures



Tom Murray, Bugguide.net

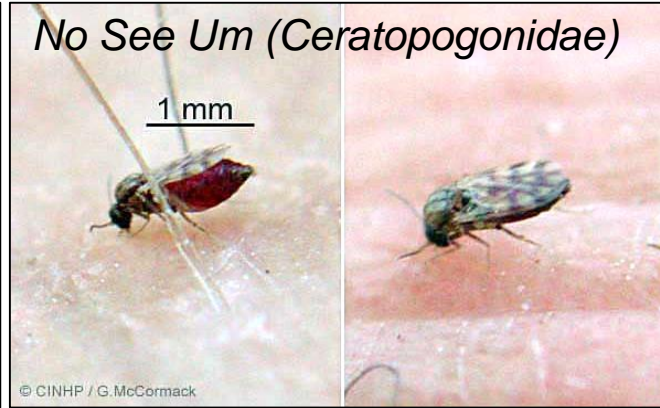
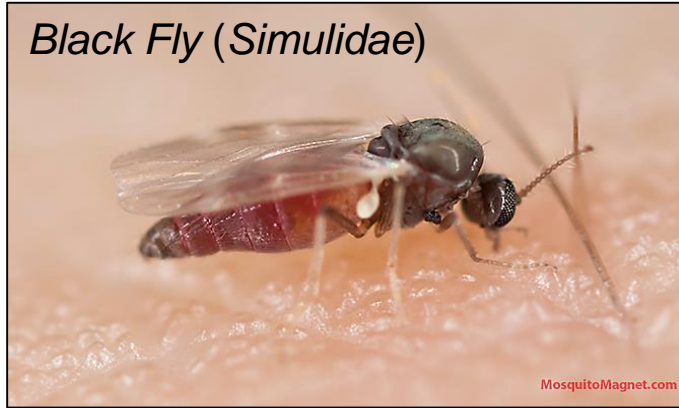


Tracy, bugguide.net



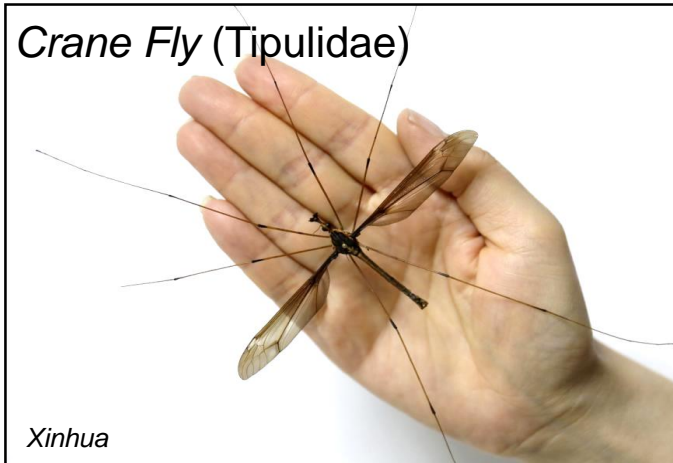
Tom Murray, bugguide.net

Not Mosquitoes



NEED BLOOD
DON'T TRASMIT

EEE
WNV
JC



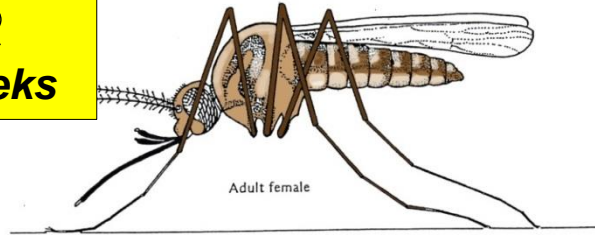
DON'T
NEED BLOOD



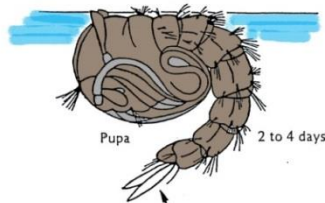
Mosquito Life Cycle

Adult ♀
2 – 8+ weeks

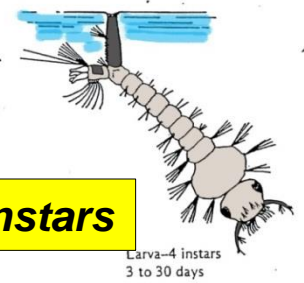
Land



Aquatic



4 Instars



Full Life Cycle can be 7 – 14 DAYS
(Temperature Dependent)

Type of Habitat

- Temporary
 - Pools, depressions, containers
- Permanent
 - Swamps, marshes

Type of Egg

- Single (usually desiccation resistant)
- Raft (laid on water)

Seasonal Abundance (Phenology)

Generations per year

- Single
- Multiple

Feeding Behavior

- Females only

Connecticut Mosquitoes

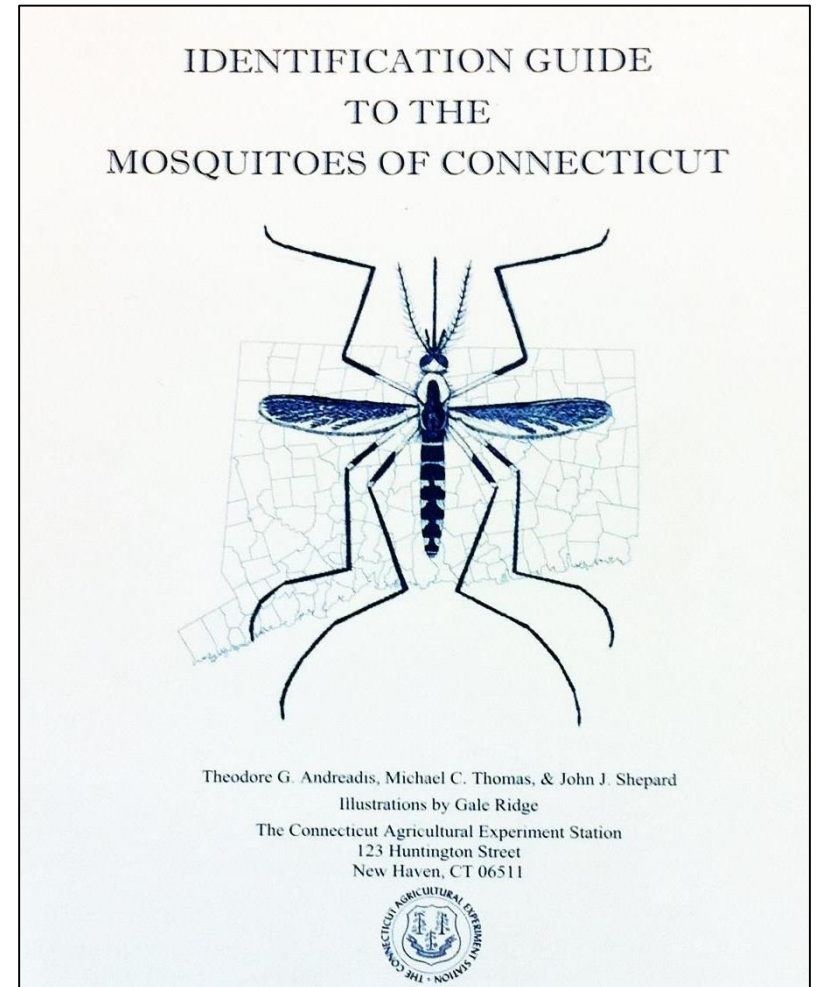
48 species documented in 2005

- Dichotomous Keys
 - 4th instar larvae
 - Adults

Species Descriptions

- Larvae
- Adults
- County Records
- Larval Habitat
- Overwintering Stage
- Host Preference
- Virus Isolates
- Phenology

54 species documented as of 2018



Available as PDF
www.ct.gov/caes
Bulletin 996

“The Usual Suspects”

Vectors

- *Maintenance or Amplifying*
- *“Bridge”* – transmit from vertebrate host to human, horse, etc.

Nuisance

- *Primarily Seek Blood from Mammals*
- *Occasionally Infected with **WNV**, **EEE***
 - *Seasonal Abundance Important*

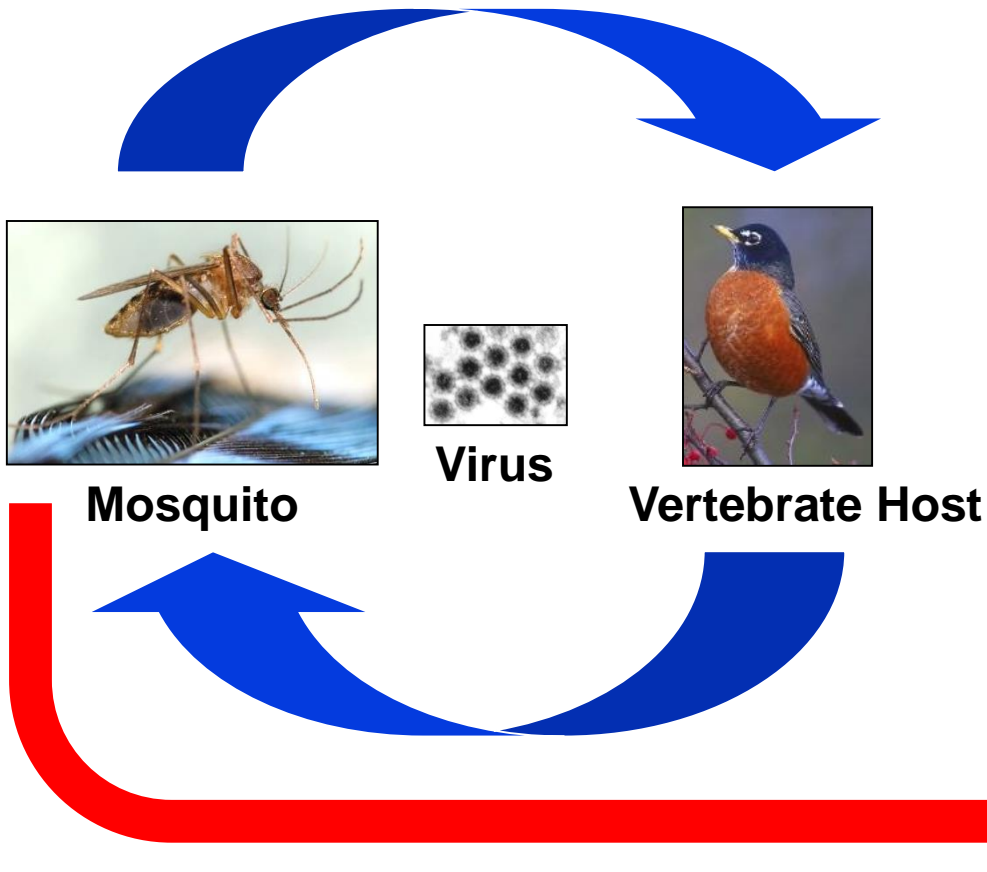


Mosquito-Borne Virus Cycle

**Maintenance Cycle
Amplification Cycle**

Transmission Cycle

Incidental Infection



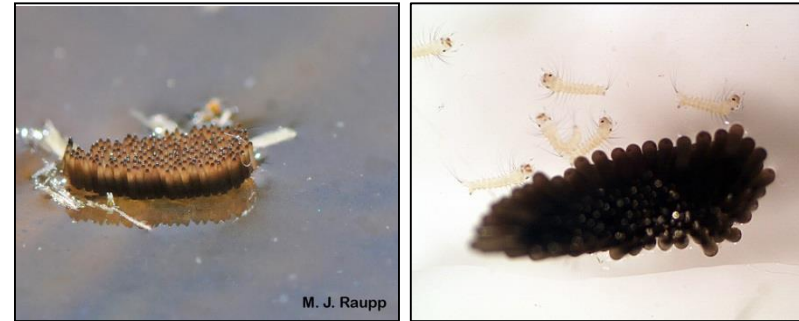
"Bridge"



Culex pipiens and *Culex restuans*

- Main vector of **West Nile virus (WNV)**
Maintenance and Amplification
 - *Cx. pipiens* = Urban and Suburban habitats
 - *Cx. restuans* = Suburban and Rural habitats

- Egg Rafts
 - High organic content
 - “Containers”, Temporary pools



- Multiple generations per year
- Peak numbers in early-mid summer

- Primarily feed on **BIRDS**
 - Occasionally on mammals



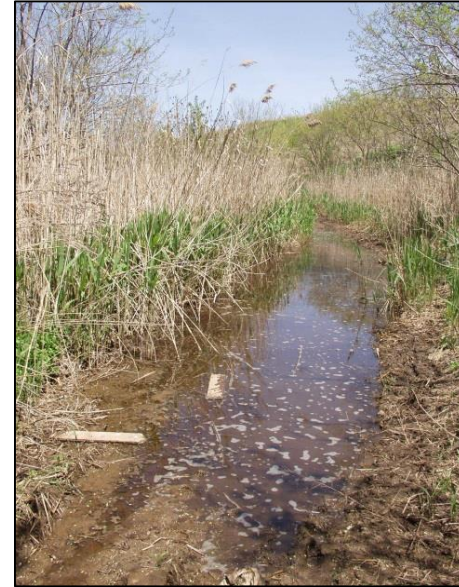
Arbovirus Isolates

Culex pipiens: **WN (1,695)**, **EEE (11)**

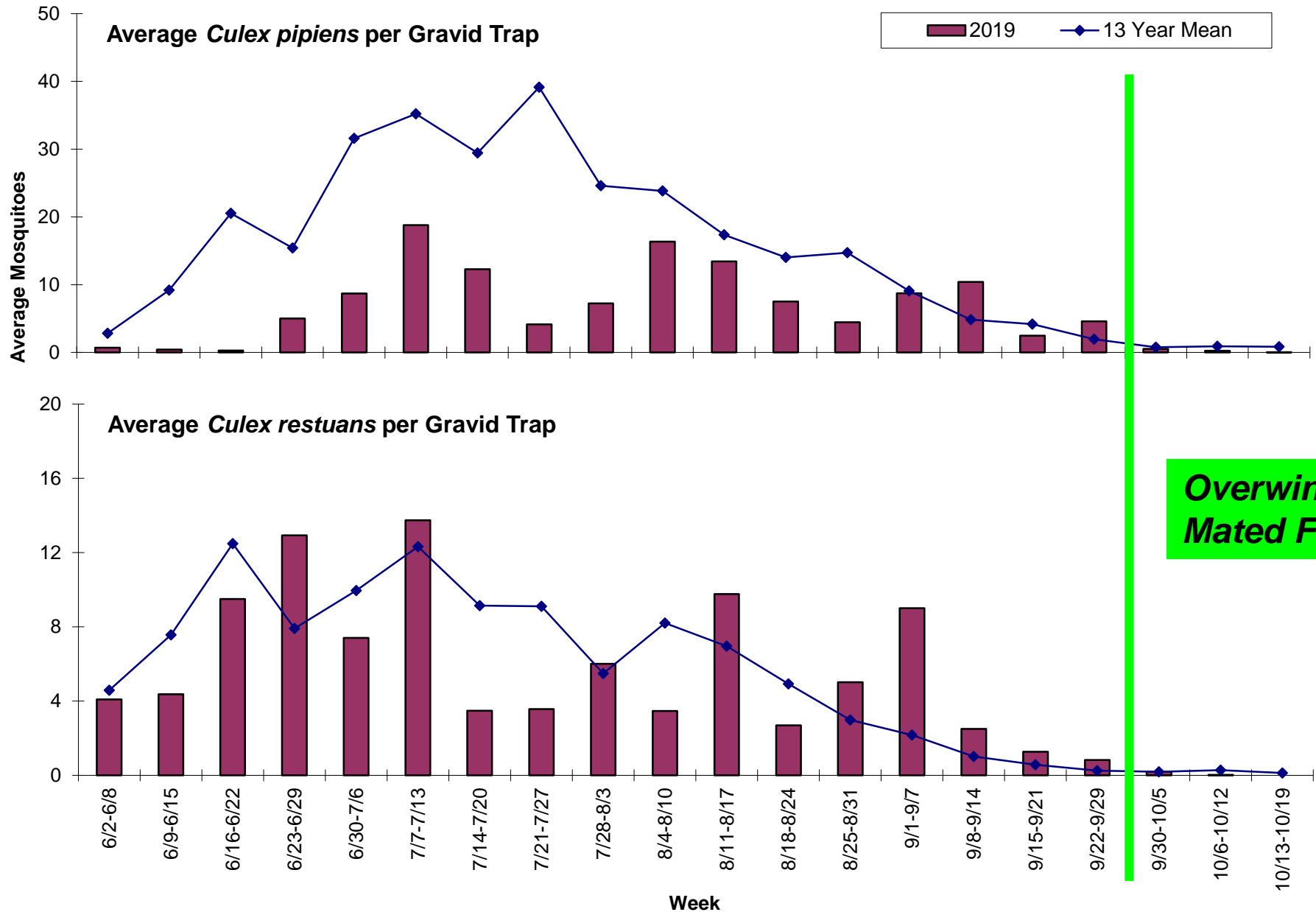
Culex restuans: **WN (330)**, **EEE (5)**, **JC (1)**

Culex pipiens and *Culex restuans*

- Larvae and pupae are found in a variety of habitats



Culex pipiens and *Culex restuans*



Culiseta melanura

- Main vector of **Eastern Equine Encephalitis (EEE)**
 - **Maintenance and Amplification**
 - Atlantic white cedar, red maple swamps
- Egg Rafts
 - Underground “crypt” habitat, formed by tree roots
 - Sphagnum moss mats
- 2 -3 generations per year
- Peak numbers in mid summer
- Primarily feed on **BIRDS**
 - Occasionally on mammals



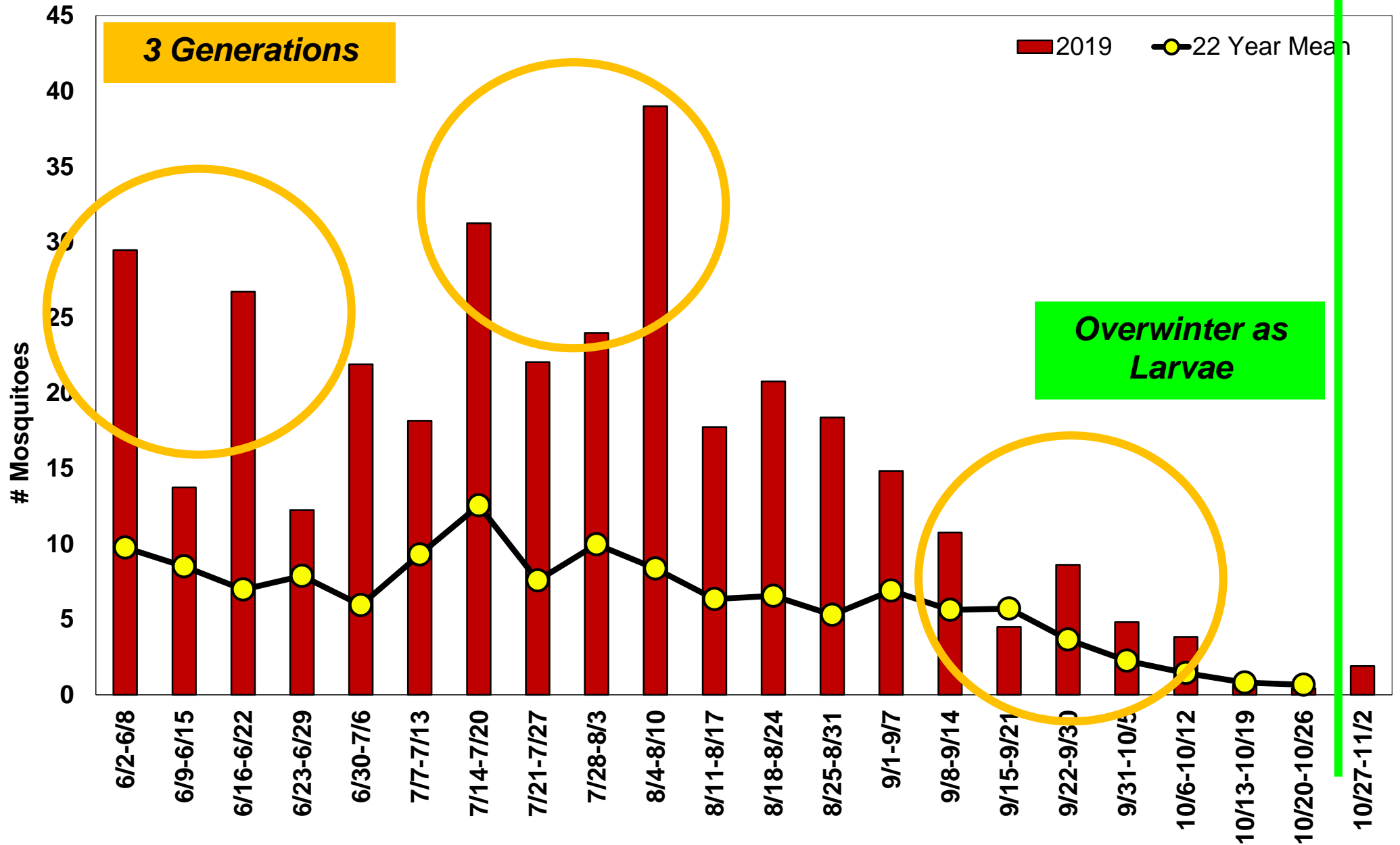
Arbovirus Isolates

EEE (344), WN (117), JC (2)

Culiseta melanura



Average Light Trap Collections – *Cs. melanura*, 2019



Culex salinarius

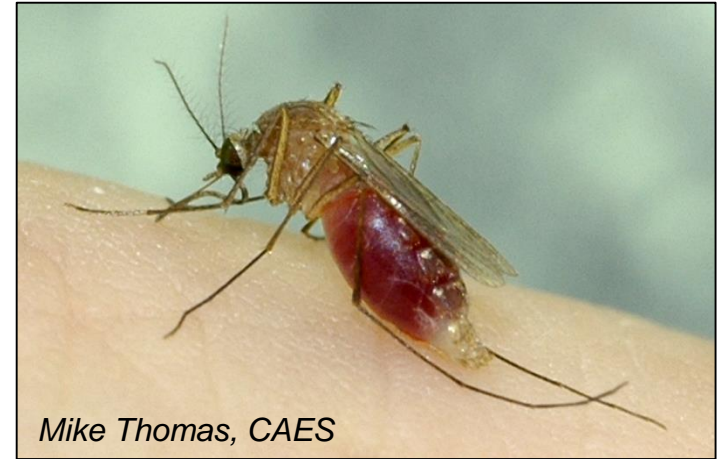
- Bridge Vector of **West Nile virus (WNV)**
Transmission to Humans and Horses
- Egg rafts laid on water in brackish and freshwater habitats
 - Shallow pools associated with *Phragmites sp.*
- Multiple generations per year
- **Generalist Feeder**
 - Obtains blood from many bird and mammal species



Arbovirus Isolates

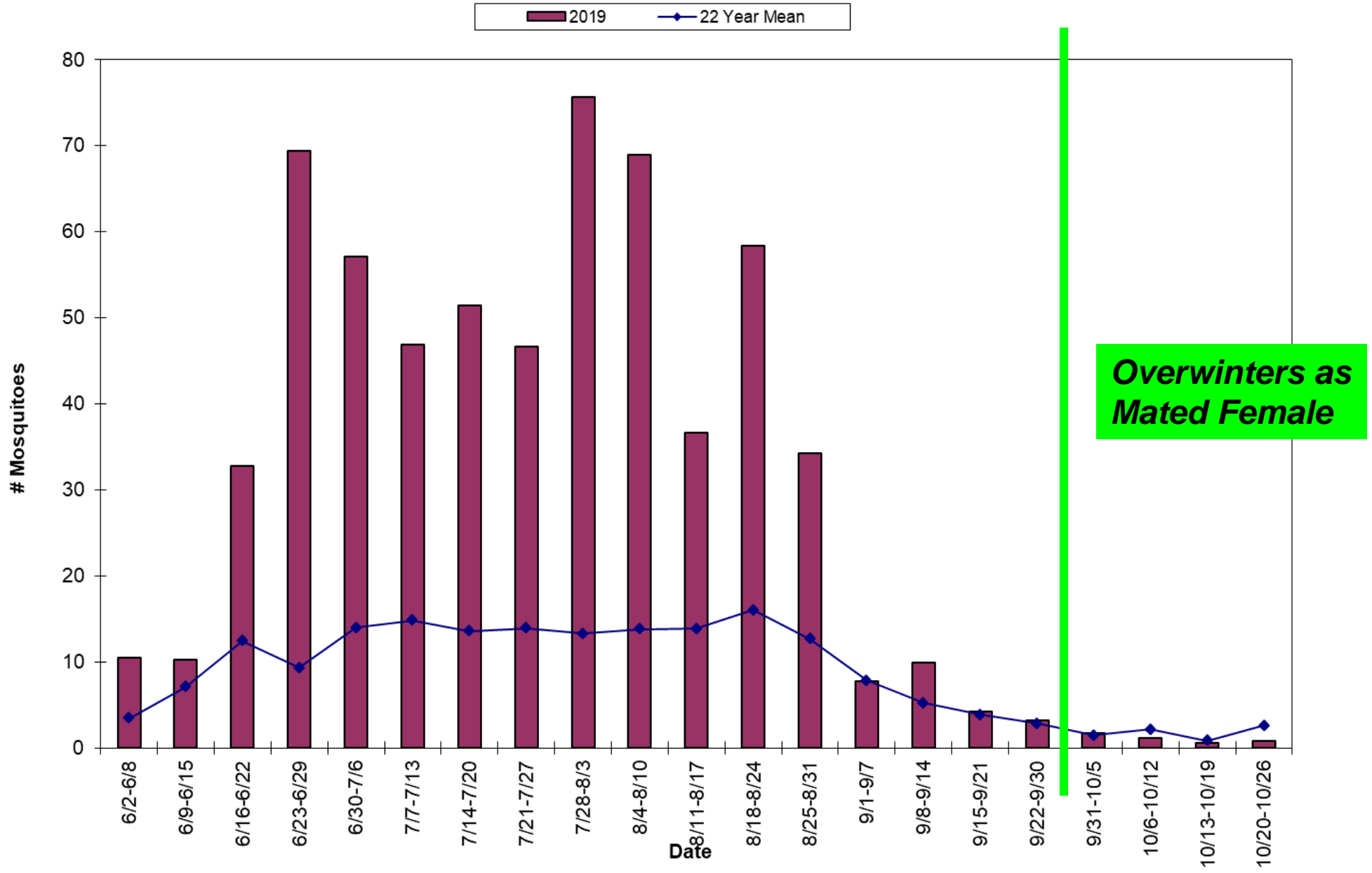
EEE (16), WNV (171), JCV (3)

Culex salinarius



Culex salinarius

Culex salinarius per Light Trap



Coquillettidia perturbans

- **Bridge Vector of Eastern Equine Encephalitis (EEE)**

Transmission to Humans and Horses

- Single eggs laid directly on water
- Larvae attach to aquatic vegetation in freshwater habitats
- One extended generation per year
- **Generalist Feeder**
 - Obtains blood from many bird and mammal species



Arbovirus Isolates

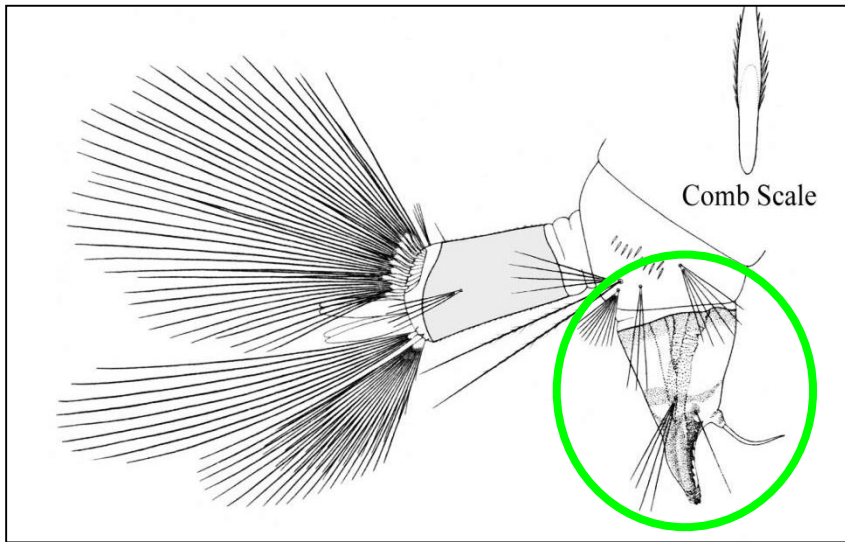
EEE (10), WN (14), JC (31)

2019 MA

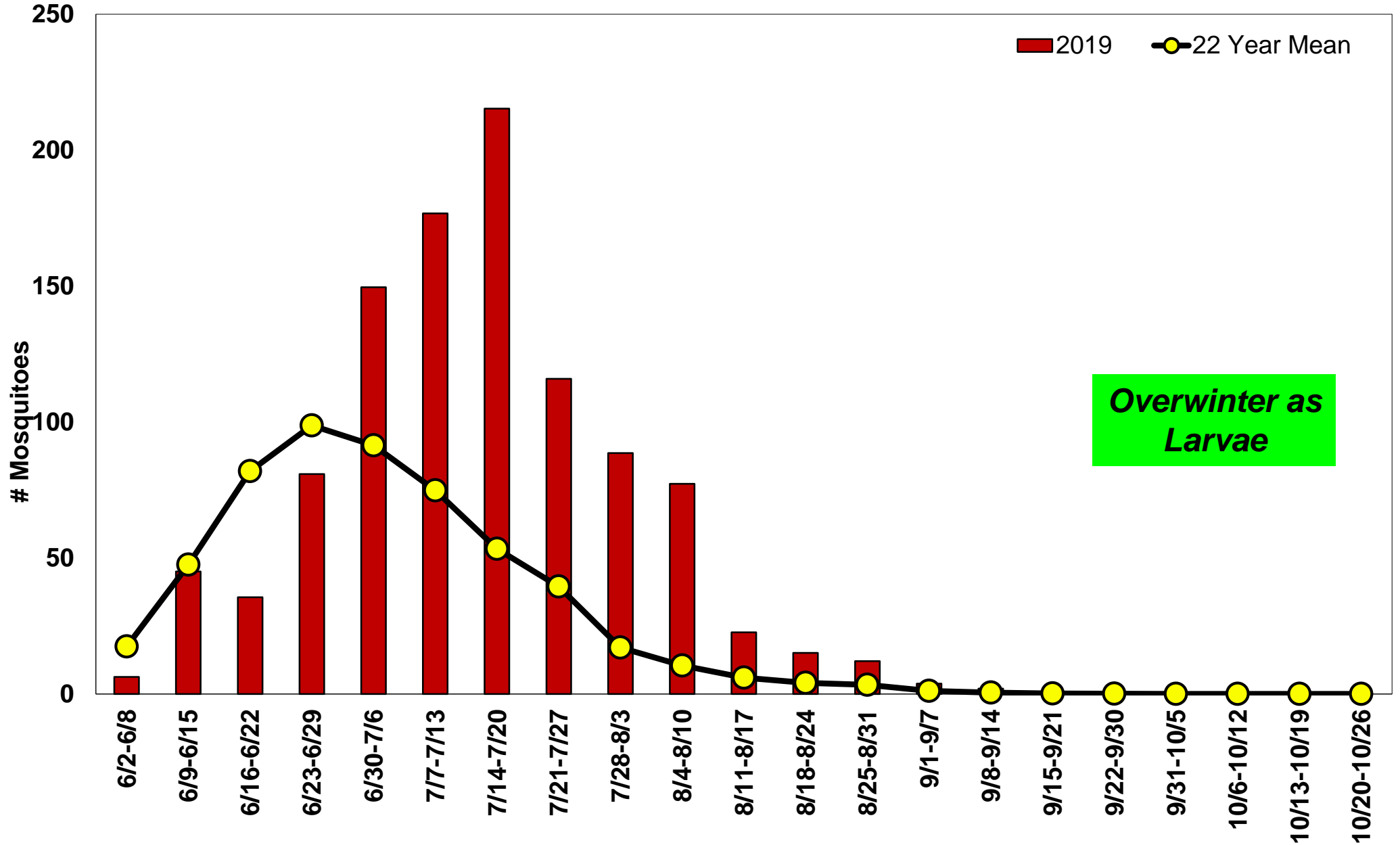
12 human EEE cases

142 (+) pools from *Cq. perturbans*

Coquillettidia perturbans



Average Light Trap Collections – *Cq. perturbans*, 2019



“Floodwater” Species

- Primarily Nuisance mosquitoes
- Desiccation-resistant eggs
- Larvae develop in a variety of transient water habitats
- Multiple generations per year; RAINFALL dependent
- Primarily Feed on Mammals
 - Occasionally on Birds



Bugguide.net

Arbovirus Isolates

Aedes vexans = **WN (19)**, **EEE (19)**, **JC (16)**

Ochlerotatus trivittatus = **WN (4)**, **EEE (9)**, **JC (19)**

Psorophora ferox = **WN (5)**, **EEE (5)**, **JC (1)**

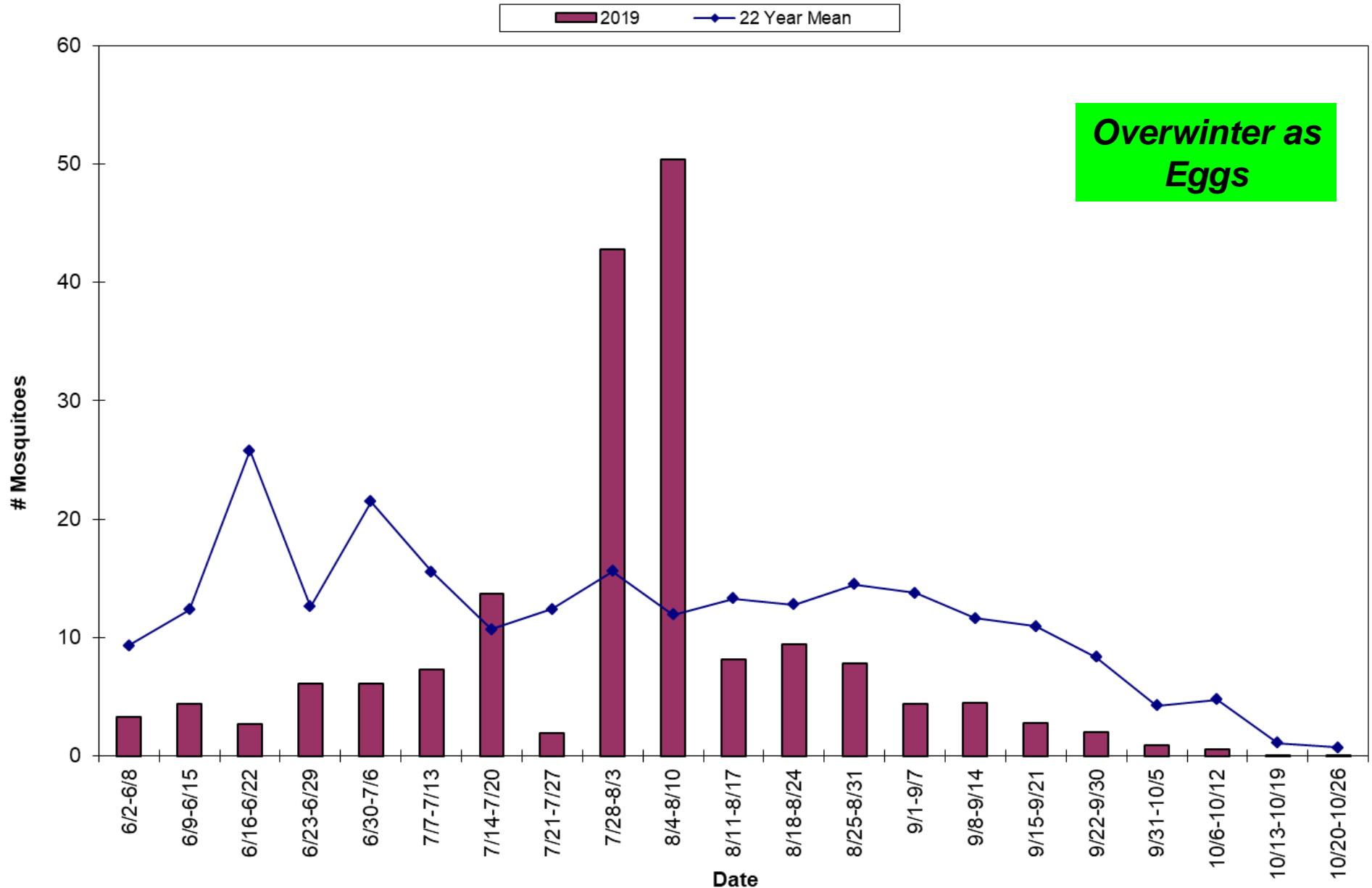
“Floodwater” Species



Over 11,000 *Ps. ferox* & *Ae. vexans*
Sept. 22, 2011

“Floodwater” Species

Aedes vexans per Light Trap



“Vernal Pool” and “Snow-pool” Species

- Nuisance mosquitoes
 - Most diverse group of mosquitoes in CT
 - Some potential to transmit **WNV** and **EEE**
 - **Jamestown Canyon** isolated frequently
- Eggs are desiccation resistant
- Larvae develop in a wide variety of seasonal freshwater habitats
- Major generation in spring
 - Peak abundance in early summer
 - Some species with 2-3 generations
- Strong Mammalian Association
 - Occasionally on Birds



“Vernal Pool” and “Snow-pool” Species

Arbovirus Isolates

2-3
Generations

Oc. canadensis = WN(12), EEE(37), JC(120)

Ae. cinereus = WN(13), EEE(20), JC(12), LAC (2)

Oc. sticticus = WN(2), EEE(1), JC(25),

1 Generation

Oc. abserratus = JC (52)

Oc. aurifer = JC (51)

Oc. excrucians = JC (15)

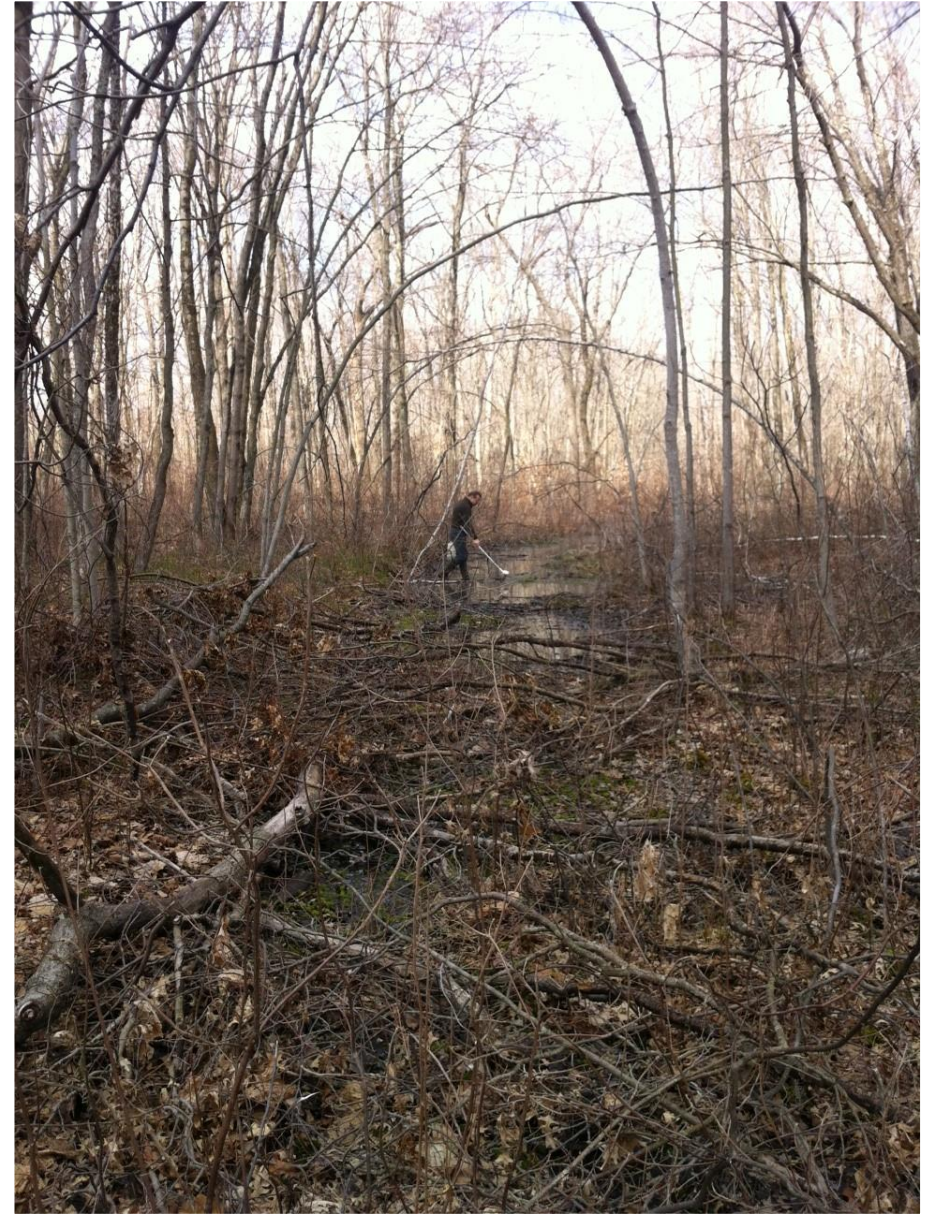
Oc. provocans = JC (21)

Oc. stimulans = WNV (2), JC (23),

Oc. thibaulti = JC(4)



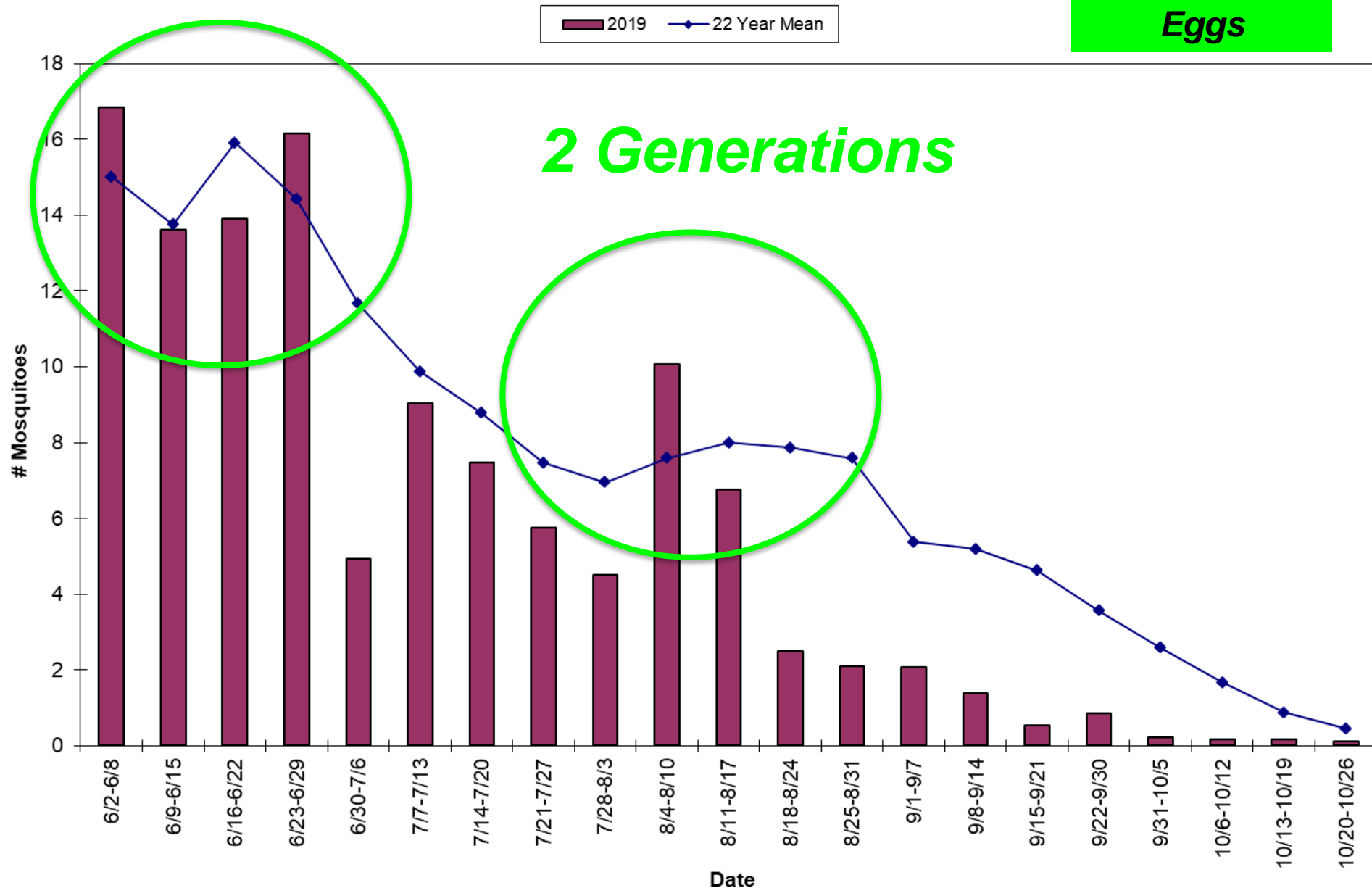
“Vernal Pool” and “Snow-pool” Species



“Vernal Pool” and “Snow-pool” Species

Aedes cinereus per Light Trap

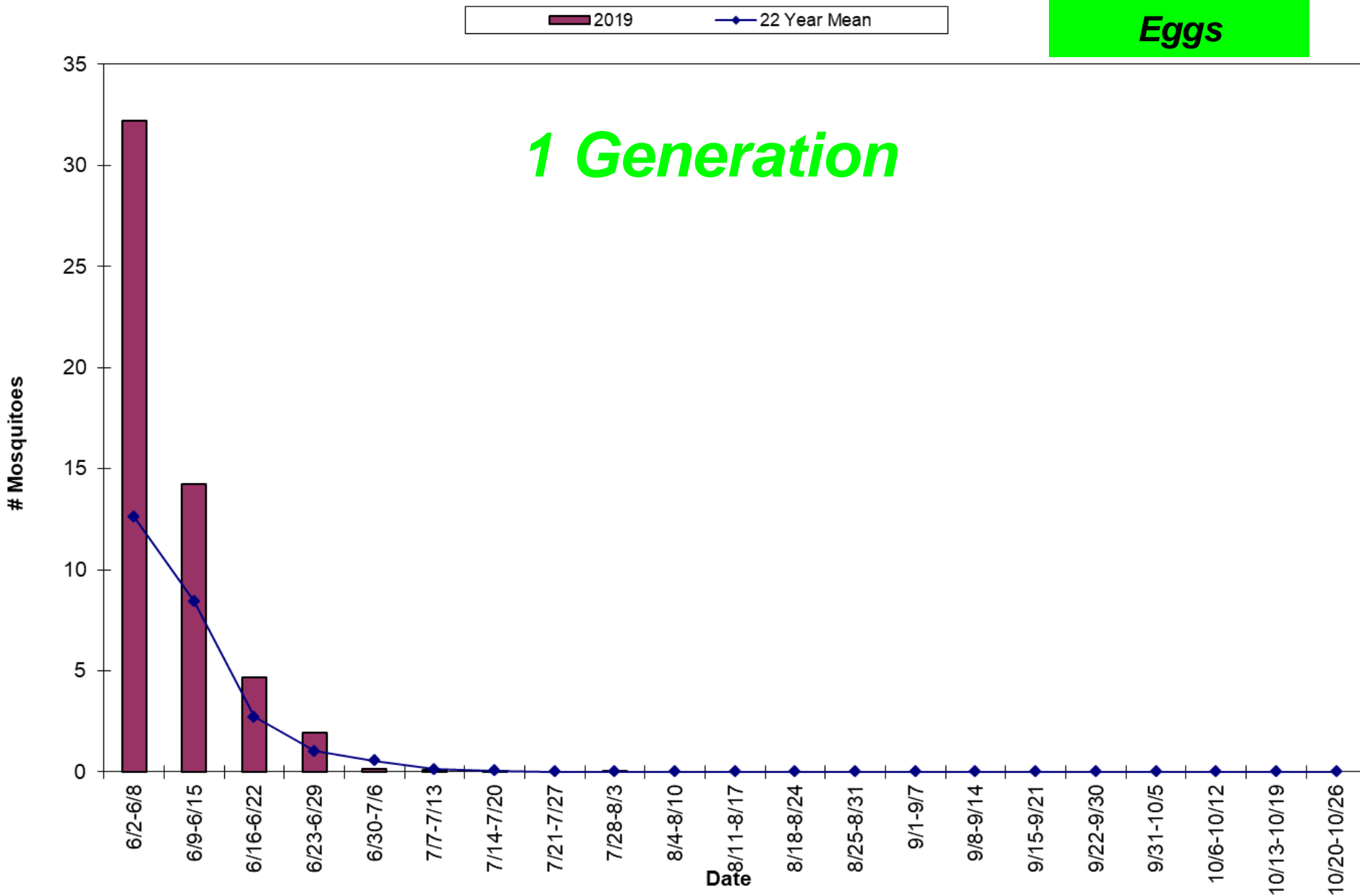
Overwinter as Eggs



“Vernal Pool” and “Snow-pool” Species

Ochlerotatus abserratus per Light Trap

Overwinter as Eggs



“Container” Species

- Primarily Nuisance Mosquitoes
- Desiccation-resistant eggs laid above waterline in containers
- Larvae develop in an wide range of natural and artificial containers
- Multiple generations per year
- Strong Mammalian Association
- Occasionally on Birds



Arbovirus Isolates

Oc. triseriatus = WN(5), EEE (4), JC (2), LAC (3)

Oc. japonicus = WN(10), EEE (1),

Ae. albopictus = WN(2)

“Container” Species

Ochlerotatus triseriatus



Ochlerotatus japonicus



Aedes albopictus



Artificial Containers

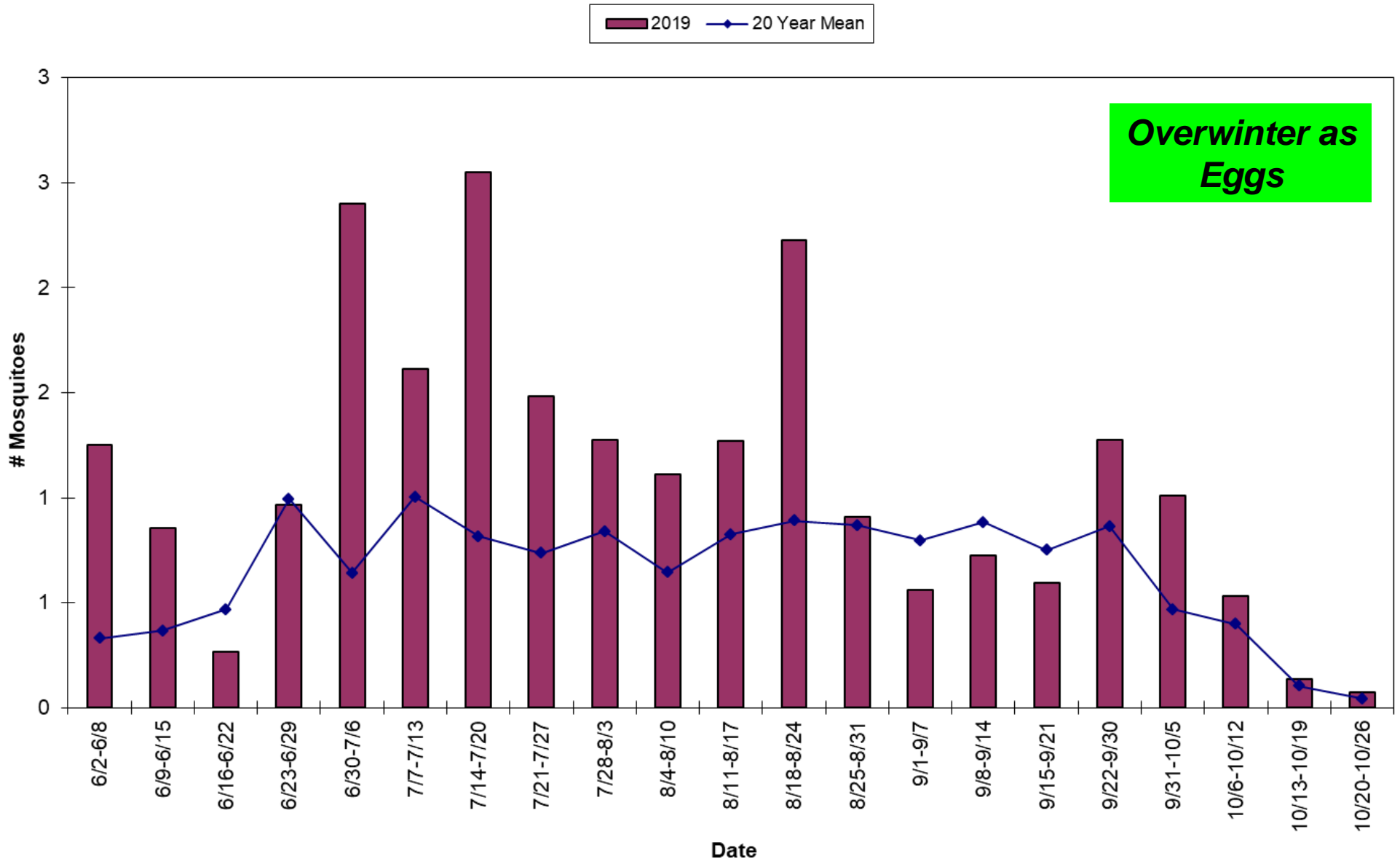


Natural Containers



“Container” Species

Ochlerotatus japonicus per Light Trap



“Salt Marsh” Species

- Nuisance Mosquitoes
- Larvae develop in salt marsh pools
- Desiccation-resistant eggs laid in areas flooded by lunar tides
- Multiple generations per year
- Strong Mammalian Association



Tom Murray, Bugguide.net



Roger Wolfe, CT DEEP



Arbovirus Isolates

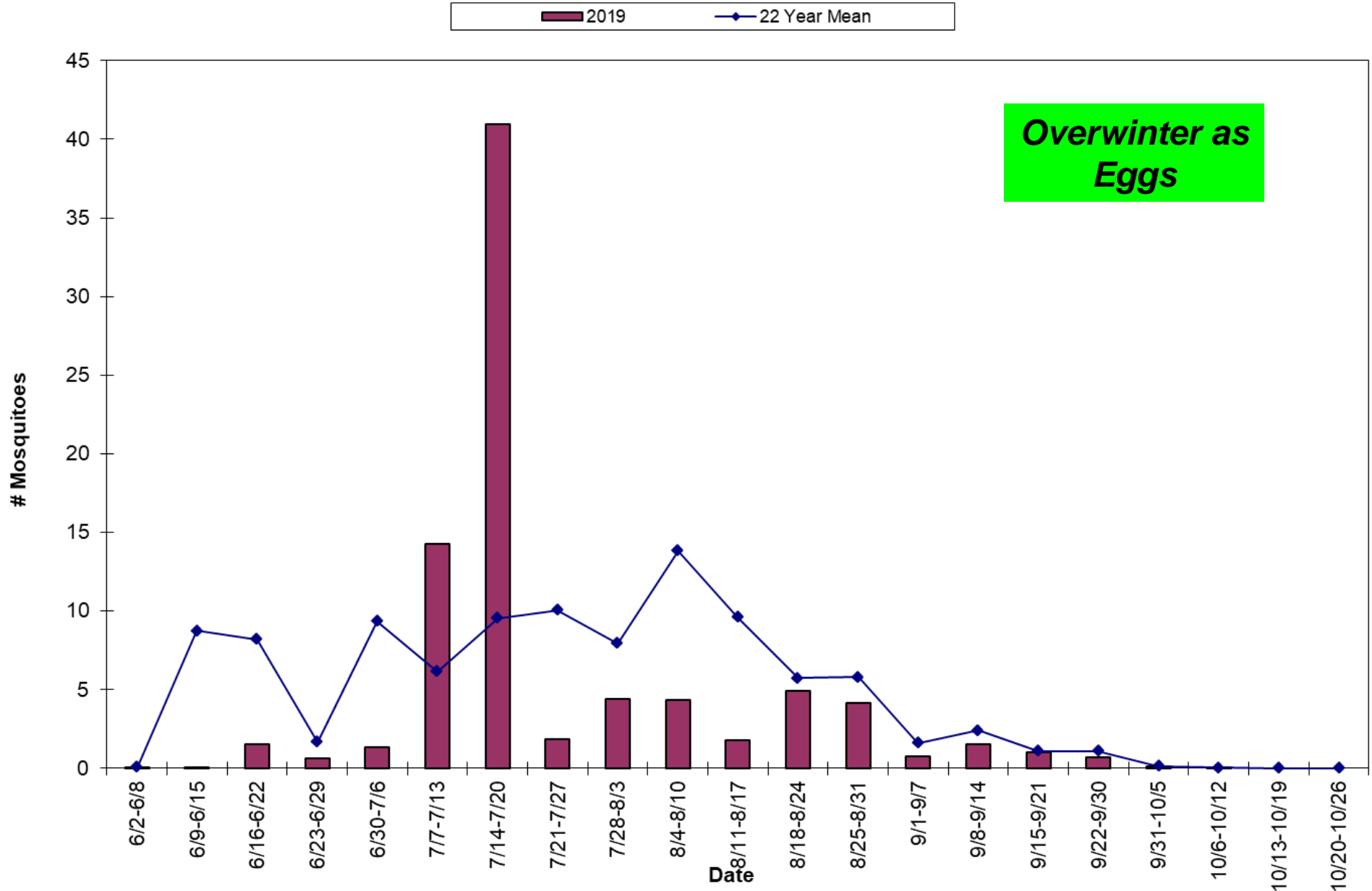
Oc. sollicitans = **WN (1)**, **EEE (3)**, **JC (6)**,

Oc. cantator = **EEE (5)**, **JC (81)**

Oc. taeniorhynchus = **WN (6)**, **JC (17)**

“Salt Marsh” Species

Ochlerotatus taeniorhynchus per Light Trap



Questions?

John.Shepard@ct.gov
203-974-8517