Patterns of host use of *Culicoides* spp. in Florida: Implications for pathogen transmission and vector interventions

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BTV Blue-Tongue Virus

EHDV Epizootic Hemorrhagic Disease Virus





EHDV:

Transmitted by no-see-ums.

Affects domestic and wild ruminants, especially deer.

Species of no-see-um that transmit EHDV in Florida are not known.



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How can we protect deer against EHDV & BTV?

Treatments?

No! Specific treatments aren't available.



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How can we protect deer against EHDV & BTV? Treatments? No! Specific treatments aren't available. Vaccinate? No! Current vaccines aren't protective. Vector control? Yes – if we can determine the vector species!



No-see-ums are diverse!

~50 species of *Culicoides* occur in Florida.









No-see-ums are diverse!

~50 species of *Culicoides* occur in Florida.

Each species has particular breeding and feeding habits. Examples of breeding habitats:

> Mud Marsh Pond edge Puddle

Stream edge Tree-holes Seepage Sunny sites & shady sites



Seepage /

Marsh

Tree-holes

Stream edge

Pasture

Pond edge







Larval habitat of *Culicoides* species



~40 *Culicoides* species collected (of ~50 total in FL)





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With all of this diversity, how do we figure out which of these ~50 no-see-um species are important vectors of EHDV in Florida?





Vector "incrimination"

- 1. An association in time and space between the a suspected vector species and cases of disease: Identify the *Culicoides* species that are present, and abundant, during seasons when deer are becoming infected with EHDV.
- 2. Evidence of direct contact between the the suspected vector species and the host animals (deer): Identify the *Culicoides* species that bite deer and other susceptible animals.
- 3. Evidence that the the suspected vector can transmit the virus from an infected host to an uninfected host: Identify which *Culicoides* species harbor the virus & can transmit it in laboratory studies.



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1. Identify blood-fed no-see-ums





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2. Host DNA extraction



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2. Host DNA extraction 3. PCR replication of host DNA



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3. PCR replication of host DNA AAACTGATCTACCAGTACAAAAG CTGGTATACACACATAAGACGAG AAGACCCTGTGGAGCTTAAACCA AAAACTGATCTACCAGTACAAAA GCTGGTATACACACATAAGACGA GAAGACCCTGTGGAGCTTAAACC

4. DNA sequencing



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3. PCR replication of host DNA

HOSTS Lizard Bird Human Dog+Raccoon Squirrels Cow Horse Wild Boar White-tailed deer Other big game animals

POTENTIAL VECTORS



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Study Sites

Panhandle/North Quincy Central Florida Ocala

Southern Florida

Vero Beach Lake Placid (MAERC) LaBelle 🔍 Quincy 🖲

Vero Beach MAERC Labelle

Ocala

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White-tailed deer, Fallow deer Axis deer, Elk, Sika deer, Blackbuck, Scimitar oryx, Gemsbok, Nilgai, Bighorn Sheep, Goat, Water buck



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Quincy

arboricola+haematopotus



Data from B. McGregor

White-tailed deer

Other big game

Dog+Raccoon

Squirrels



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Quincy

arboricola+haematopotus



Data from B. McGregor

White-tailed deer

Other big game animal

□Human

Dog+Raccoon

Squirrels

Lizards

Birds



Quincy

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arboricola+haematopotus



Quincy

arboricola+haematopotus





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Quincy



Data from B. McGregor



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Quincy

pallidicornis (n=14)



Data from B. McGregor

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biguttatus (n=55)



Data from B. McGregor













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Ocala (1 farm)

Hunting preserve Whitetail deer, Axis deer, Elk, Sika deer, Pere-david deer, Big-horned sheep, and Cows



Ocala (1 farm)



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1232

Ocala

Vero Beach 4 locations in southern Indian River County Not deer ranches



Vero Beach

crepuscularis (n=14)



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Deer Other big game

animal





Vero Beach

many.

MAERC: MacArthur Agroecology Research Center Cattle ranch









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C. venustus HOSTS C. stellifer Lizard C. spinosus C. pusillus Bird C. paraensis Human C. pallidicornis C. insignis Dog+Raccoon C. hinmani Squirrels C. haematopotus Cow C. floridensis C. edeni Horse C. debilipalpis Wild Boar C. crepuscularis C. biguttatus White-tailed deer C. baueri Other big game animals C. arboricola

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A management plan for EHDV vectors?

- 1. Determine no-see-um species that transmit the virus
- 2. Identify breeding habitats of the vector species
- 3. Evaluate control strategies for vector species (chemical and physical)
- 4. Provide best management practices for EHDV vector control
- 5. Develop capabilities to predict EHDV transmission in space and time



THANK YOU

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Dr. Samantha Wisely, CHeRI Director Dr. Katherine Sayler Dr. Jason Blackburn Dr. Erik Blosser Bethany McGregor Kristin Sloyer Alfred Runkel Dr. Dinesh Erram John Hill Mandie Carr Carisa Boyce Shannon Moore Hilda Lynn **Glauber Rocha Pereira** SCWDS (S. Vigil, J. Corn) Land owners and ranchers CHeRI, Florida State Legislature

