

An Investigation Into the Distribution of Urban *Aedes* spp. in the Coastal City, Charleston, SC

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BACKGROUND

Aedes spp. mosquitoes vector diseases such as yellow fever, Chikungunya, dengue, and Zika across multiple continents.¹ In the southeastern United States, there has been a considerable increase in the distribution of *Aedes* spp.² Coastal cities like Charleston, SC, are important for domestic and international travel, shipping and receiving ports, cruises, and tourism. Many areas across the world are experiencing an increase in mosquito-borne disease incidence due to environmental changes.³ There is insufficient research on mosquito species distribution and growing concerns of insecticide resistance. Recognizing the lack of literature, the potentials for disease transmission in coastal cities, and the critical role vector control plays in preventing disease outbreaks¹, it is imperative to understand mosquito distribution and present *Aedes* species. Further research would allow public health experts to understand future mosquito-borne disease epidemiology and apply mosquito control efforts more effectively.

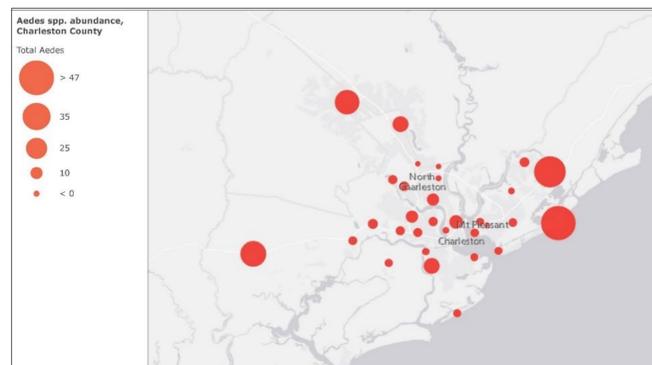


Figure 1: *Aedes* mosquitos vary in geography and abundance across our study area, 2018 collection data.

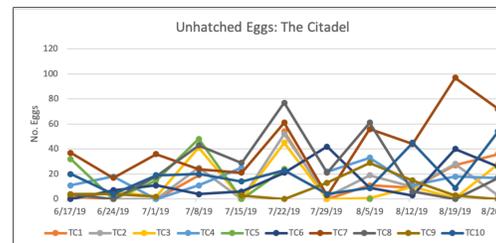
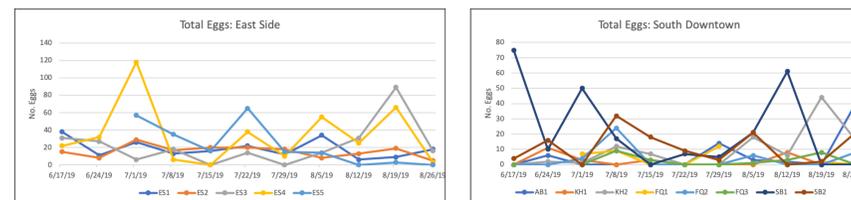
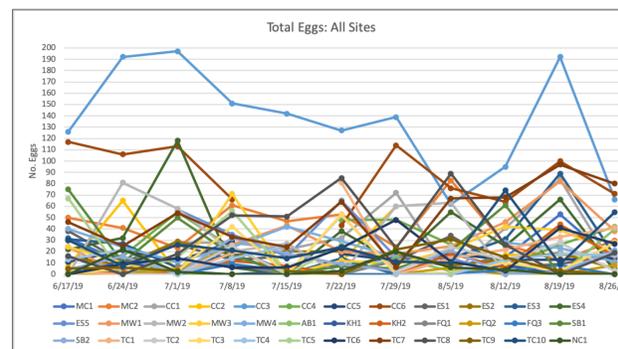
MATERIALS AND METHODS

Between June and August 2019, mosquito ovicups were placed in 35 sites in and around Charleston's peninsula. Ovicups were set once a week and collected after four days. The mosquito eggs were counted as hatched and unhatched before being mailed to our collaborators at Florida International University, who reared unhatched eggs for species and sex determination.

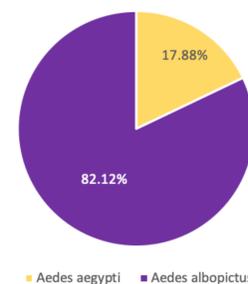


RESULTS AND DISCUSSION

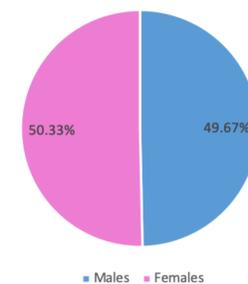
All eggs have been counted and mailed, but results for species distribution, abundance, and insecticide resistances for all sites and dates are not yet complete.



Percent of Hatched Eggs by Species



Percent of Hatched Eggs by Sex



Figures 2 and 3: Percent of hatched eggs by sex and species as of September 11th, 2019.

Genetic testing to understand mosquito population and insecticide resistance dynamics is currently being conducted by our collaborators at Florida International University. Understanding these dynamics is important for coastal mosquito control efforts to hinder their ability to vector arboviruses.

MAJOR FINDINGS

- Aedes aegypti* and *Aedes albopictus* vector distribution will be better understood and documented in Charleston, previously unpublished.
- In total, the traps set on 8/19/19, 7/22/19, and 7/8/19 had the highest number of eggs, respectively.
- The highest numbers of unhatched (viable) eggs were laid at sites CC3, CC6, and TC7, respectively.
 - The cemetery cluster showed comparatively higher numbers of total and unhatched eggs.

CROWDFUNDING

Funding for the project was secured through crowdfunding platform Experiment.com. \$1,003 was raised from 14 unique backers and \$998 was matched by the University of South Carolina's Office of the Vice President for Research. The average pledge was \$154.

REFERENCES

- Organization WH. Vector ecology and management: Mosquito-borne diseases [online]. Available at: https://www.who.int/neglected_diseases/vector_ecology/mosquito-borne-diseases/en/. Accessed 6 September 2019.
- Hahn MB, Eisen L, McAllister J, Savage HM, Mutebi JP, Eisen RJ. Updated Reported Distribution of *Aedes* (*Stegomyia*) *aegypti* and *Aedes* (*Stegomyia*) *albopictus* (Diptera: Culicidae) in the United States, 1995- 2016. *J Med Entomol* 2017;54:1420-1424.
- Reinhold JM, Lazzari CR, Lahondere C. Effects of the Environmental Temperature on *Aedes aegypti* and *Aedes albopictus* Mosquitoes: A Review. *Insects* 2018;9.