Microclimate affects mosquito body size

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Introduction

The Asian Tiger mosquito**,** *Aedes albopictus*, is an invasive mosquito vector that can transmit up to 27 different arboviruses. Since mosquitoes are small ectotherms, variations in temperature largely impact their physiology and potential to transmit human pathogens.[1] Small changes due to microclimate impact mosquito life history traits relevant for transmission (i.e. body size). Body size is an indicator of fecundity and population growth; therefore understanding the effect of microclimate can inform small-scale variation in disease transmission**.**

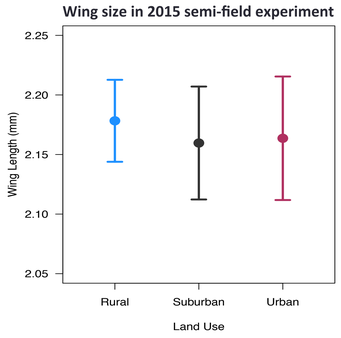

Fig 1. Urban sites have smaller *Ae. albopictus* mosquitoes than rural and suburban sites (p<0.001). (Murdock et al. *in prep*)

Last summer, a study was conducted to test the relationship between microclimate and body size in a semi-field system. They found that mosquitoes in urban sites were significantly smaller than those in rural sites; most likely due to warmer temperatures in urban sites.[2] To validate these findings in the field, we conducted field mosquito surveys and quantified *Ae. albopictus* wing length across land use.

Question

How does variation in microclimate across land use affect body size in wild caught *Aedes albopictus*?

Hypothesis: temperatures in urban sites are warmer, leading to smaller bodied wild caught mosquitoes from urban sites than wild caught mosquitoes from rural and suburban sites

Methods

9 sites

- Rural, urban, and suburban sites were chosen based on percentage of impervious surface
- Placed one BG-Sentinel trap per site
- Trapped mosquitoes weekly for two trap nights for a total of 90 trap nights
- Froze mosquitoes and identified them. If female *Ae. albopictus*, wing was mounted and measured
- Collected temperature and relative humidity data of each site's microclimate

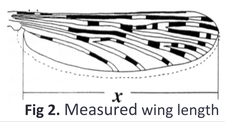

Fig 2. Measured wing length

Results

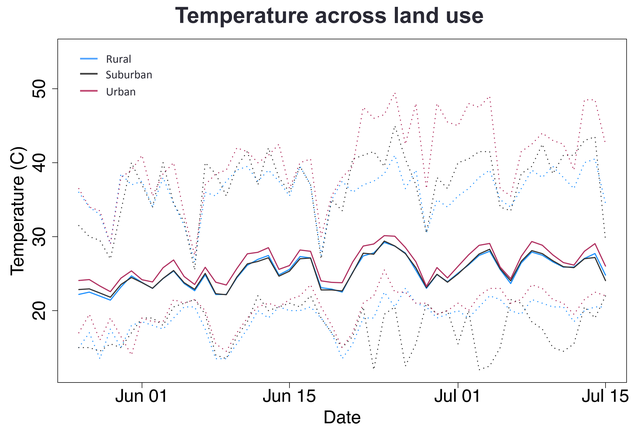

Fig 3. Rural sites are significantly cooler than suburban and urban sites. We tested for significant differences in mean temperature across land use using a mixed effects model with site as a random effect (p <0.001).

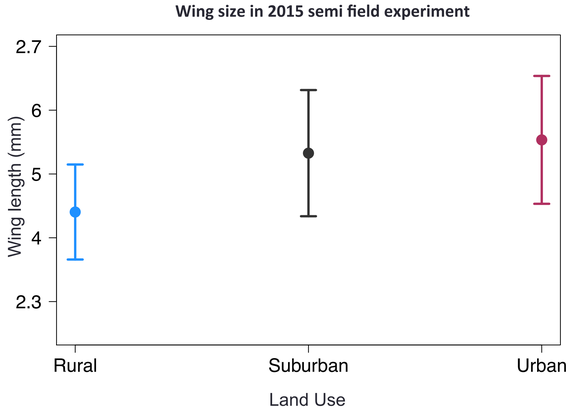

Fig 4. Rural sites have smaller *Ae. albopictus* mosquitoes than suburban and urban sites. We tested for significant differences in mean wing length across land use using a mixed effects model with site as a random effect (p <0.001).

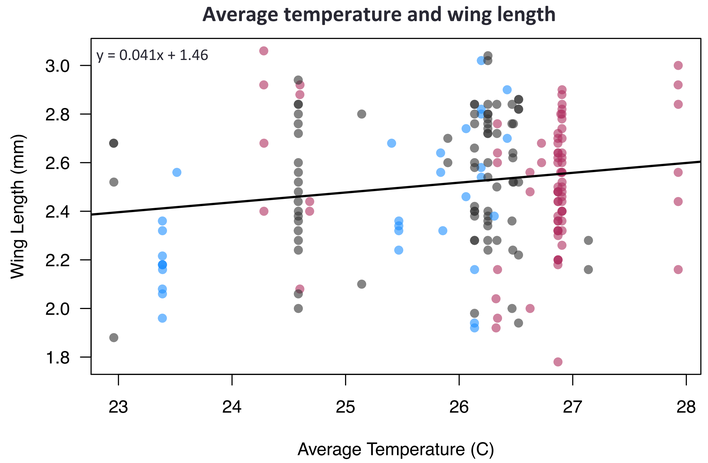

Fig 5. Urban sites are significantly warmer than rural and suburban sites. We tested for a relationship between wing length and temperature using a mixed effects model with site as a random effect (p<0.001). Solid black line Linear relationship found by the mixed effects model.

Conclusion

- Microclimate differs across land use with urban sites being warmer
- Wing length differs across land use with rural sites being smaller
- Contrary to the semi-field study from 2015, we found that wing length increases with temperature
- Suggests other factors (e.g. larval habitat quality, larval competition) may have a stronger effect on body size

Future Work

- Pair adult survey data with larval survey data to test for a relationship between habitat availability and adult abundance
- Explore effects of land use and microclimate on *Aedes albopictus* abundance and community dominance
- Test water samples from larval habitat

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References

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