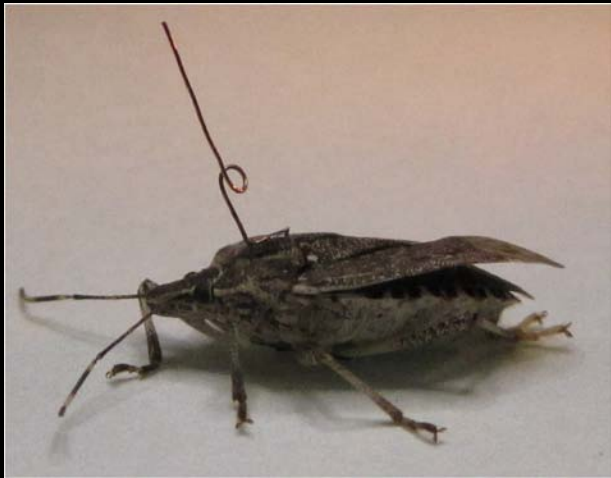
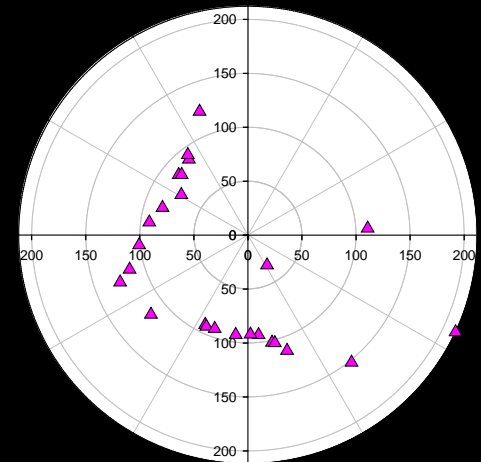
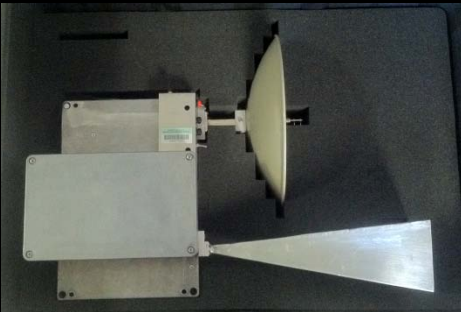


Defining dispersal ecology and behavior of adult *Halyomorpha halys*



Doo-Hyung Lee, Cameron Scorza, Starker Wright, and Tracy Leskey

USDA-ARS, AFRS, Kearneysville, WV



Defining dispersal ecology and behavior of adult *Halyomorpha halys*

- Background: Why dispersal?
- Flight mill
- Harmonic radar
- Free-flight observation

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We found overwintering *H. haly* in **dead trees**.





H. halys positive trees

- 1. Standing**
- 2. Large**
- 3. Oak / Locust**
- 4. Peeling bark**
- 5. Porous**
- 6. Dry**



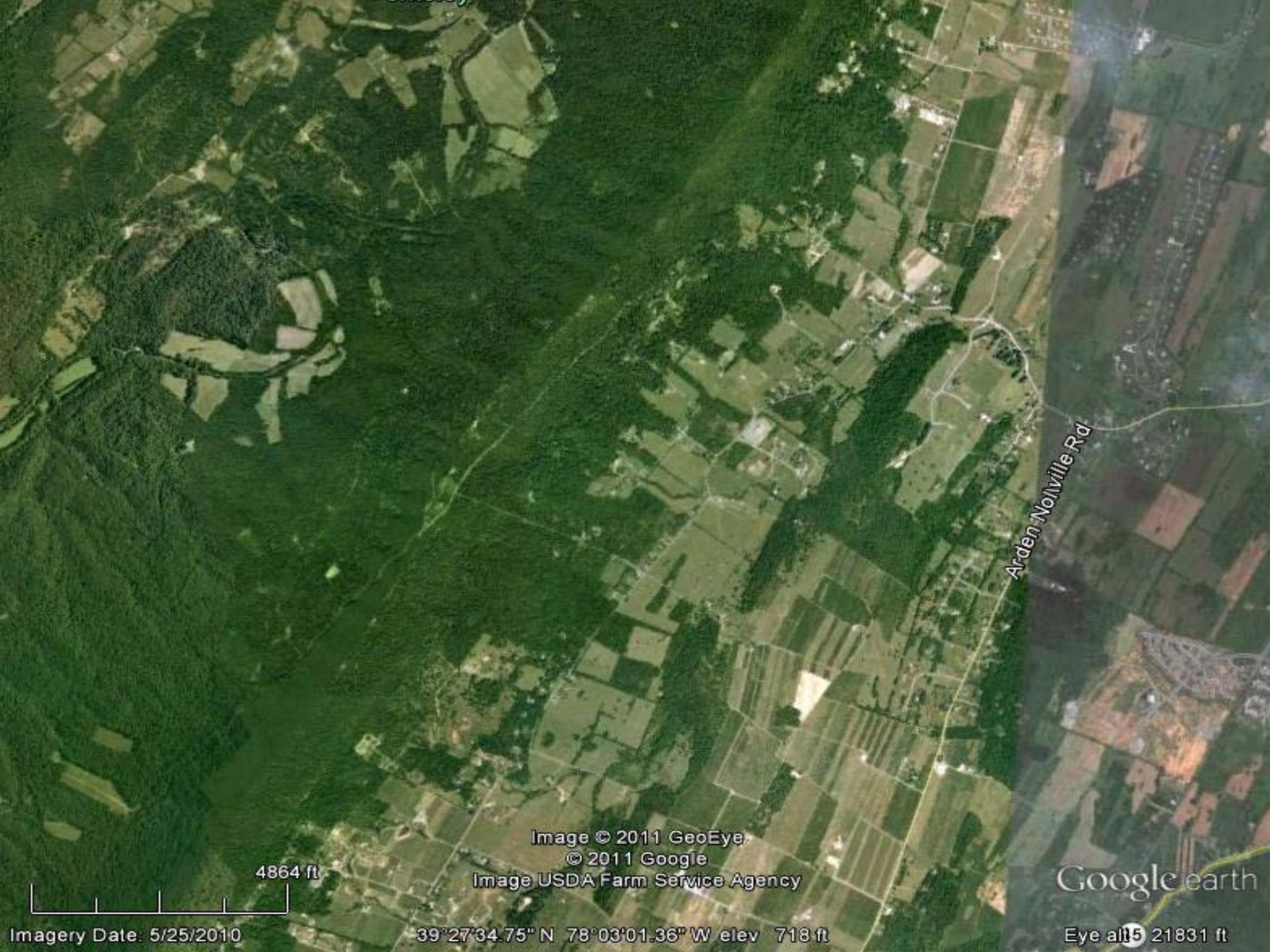


13%

***H. halys* positive trees**

- 1. Standing**
- 2. Large**
- 3. Oak / Locust**
- 4. Peeling bark**
- 5. Porous**
- 6. Dry**





Arden Nolville Rd

Image © 2011 GeoEye
© 2011 Google
Image USDA Farm Service Agency

Google earth

4864 ft

Imagery Date: 5/25/2010

39°27'34.75" N 78°03'01.36" W elev 718 ft

Eye alt 5 21831 ft

13% 



Arden Nolville Rd

Image © 2011 GeoEye
© 2011 Google
Image USDA Farm Service Agency

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13% 



Dispersal?

Dispersal?

Dispersal?

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Defining dispersal ecology and behavior of adult *Halyomorpha halys*

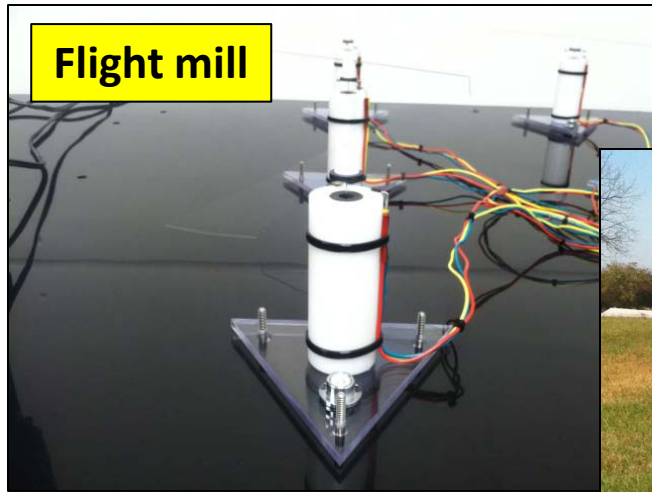
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Defining dispersal ecology and behavior of adult *Halyomorpha halys*

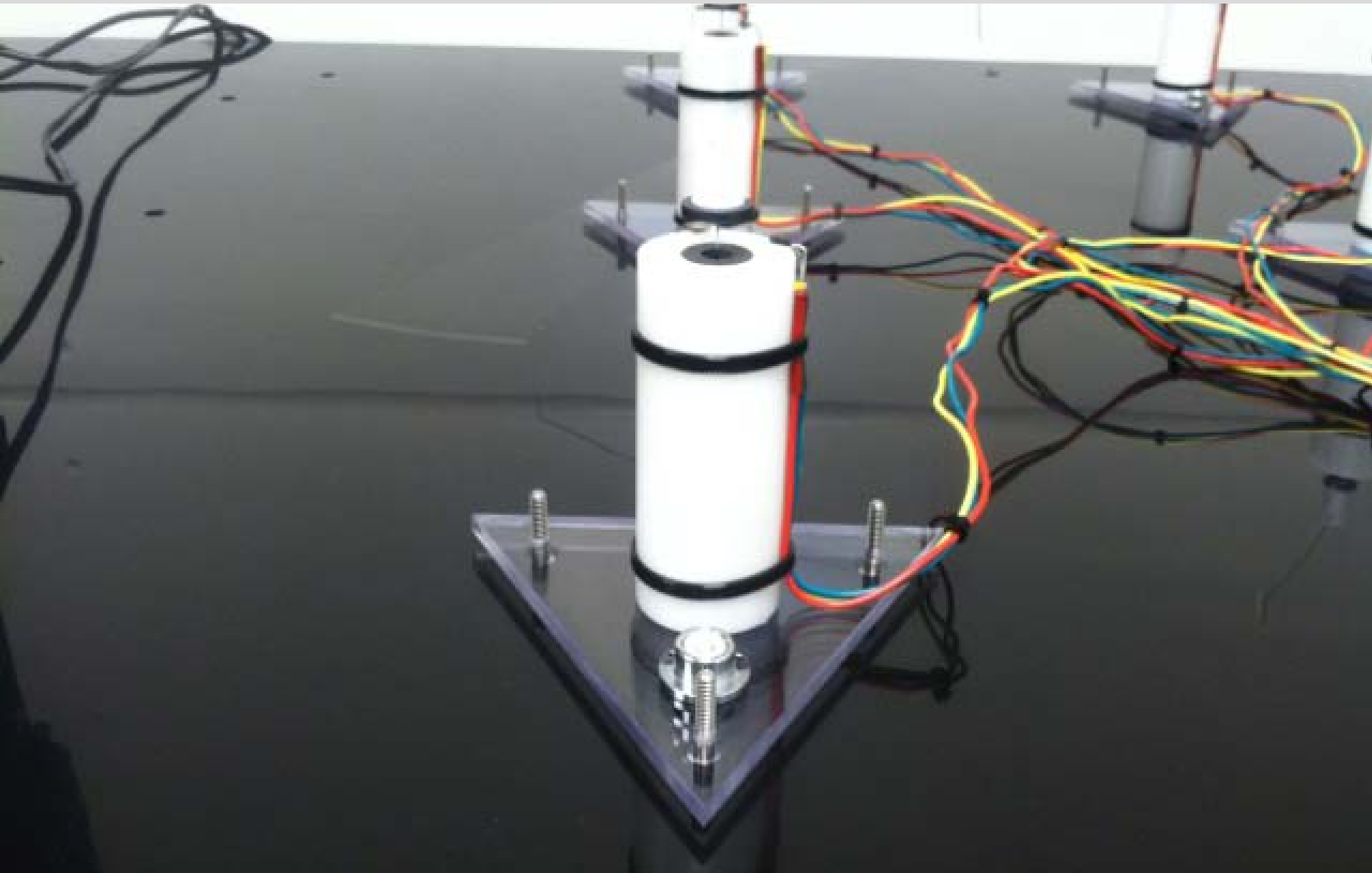
- Background: Why dispersal?

- Flight mill
- Harmonic radar
- Free-flight observation

We have used lab & field trials to better define dispersal ecology of wild *H. halys* populations.

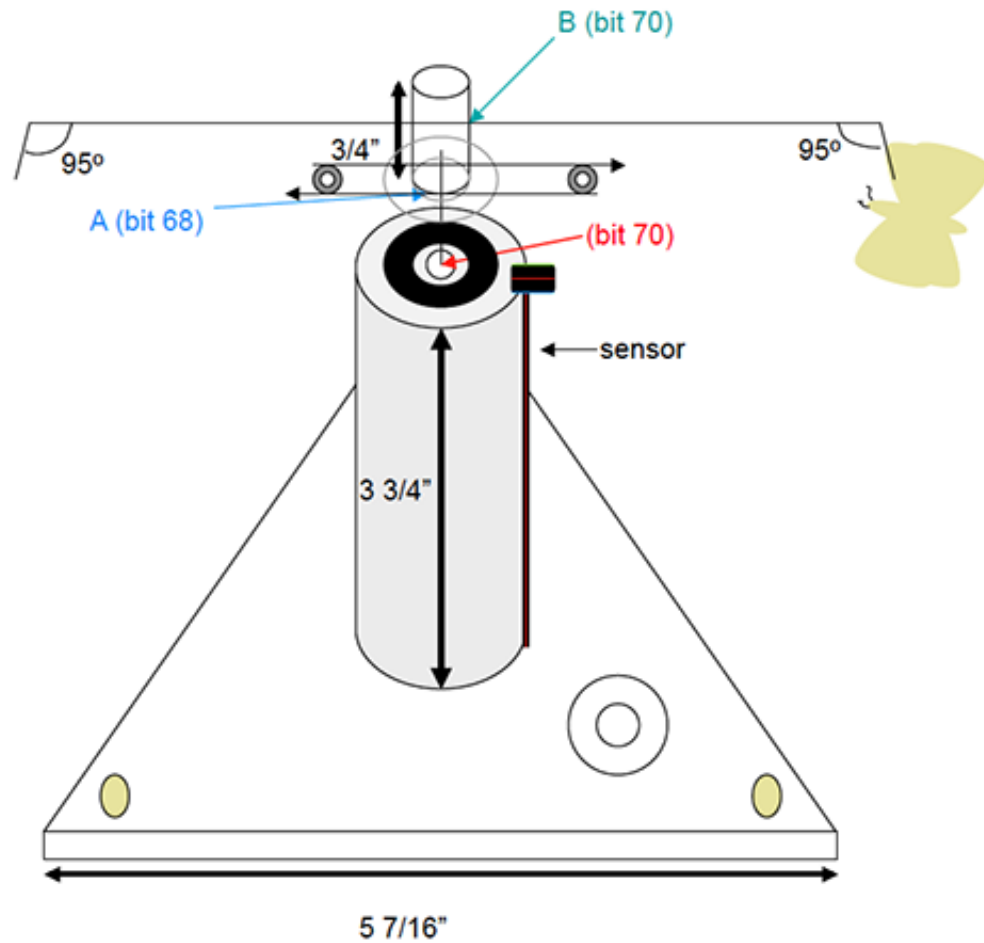


1. Flight mill: What is the potential flight capacity of *H. halys*?

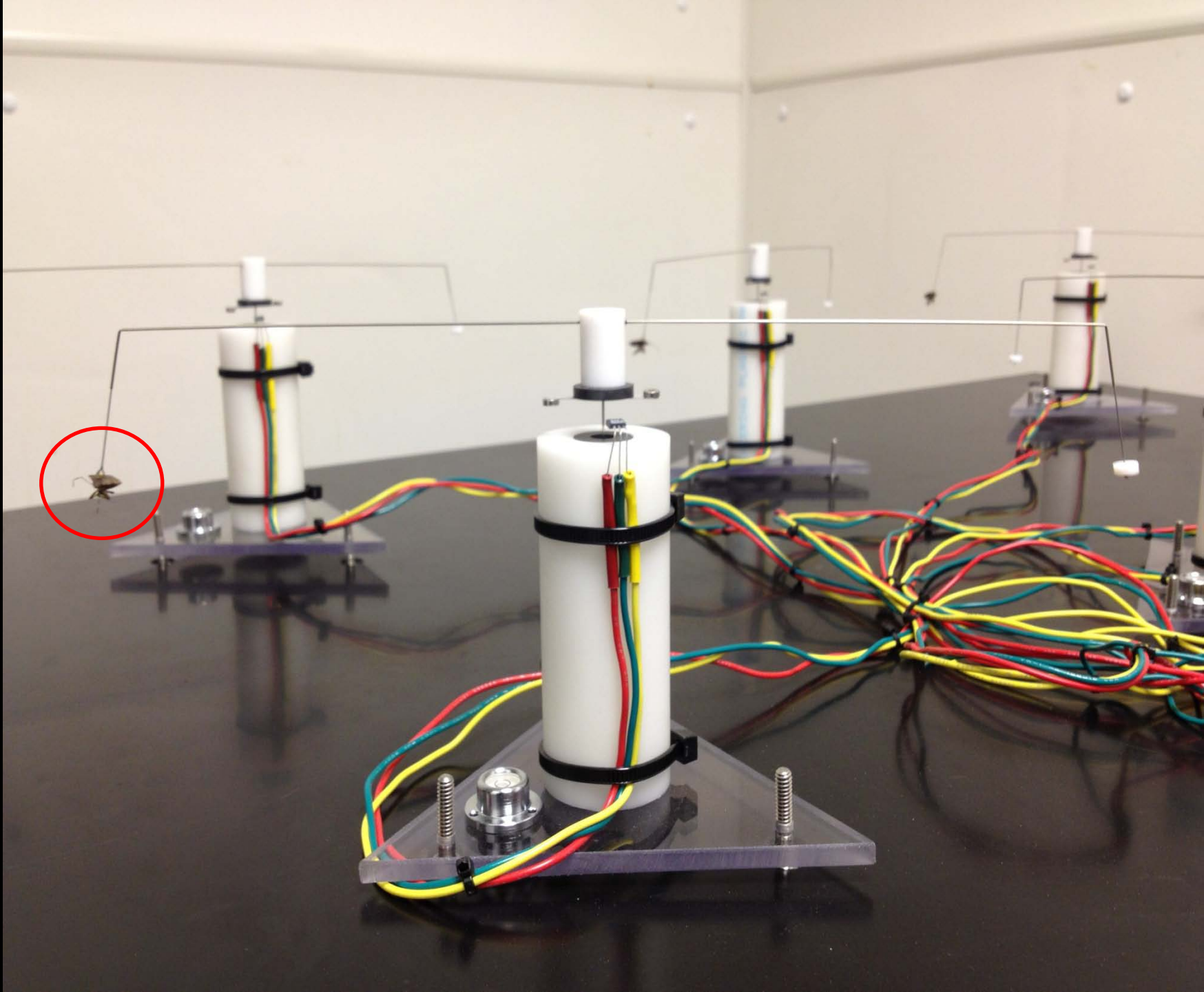


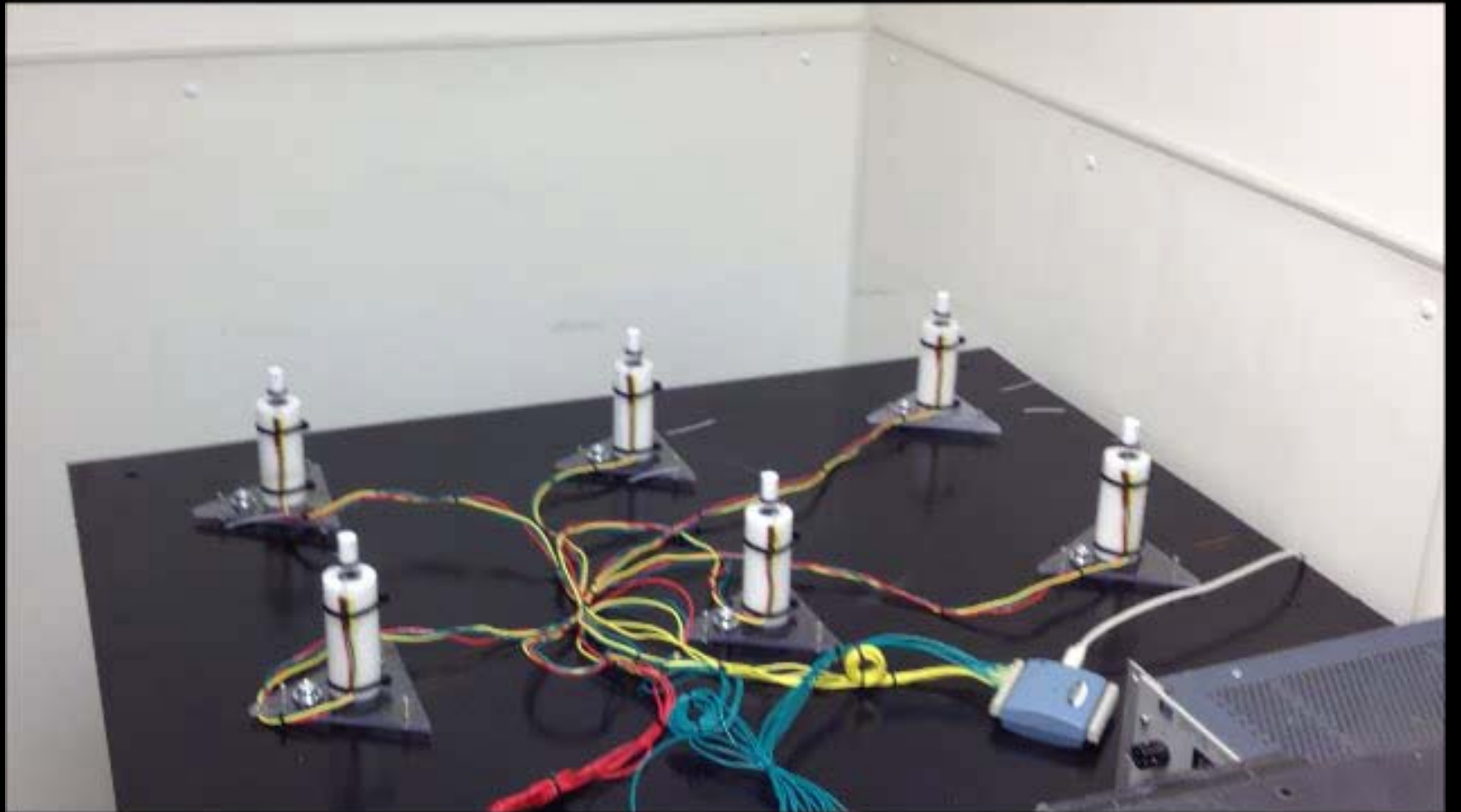


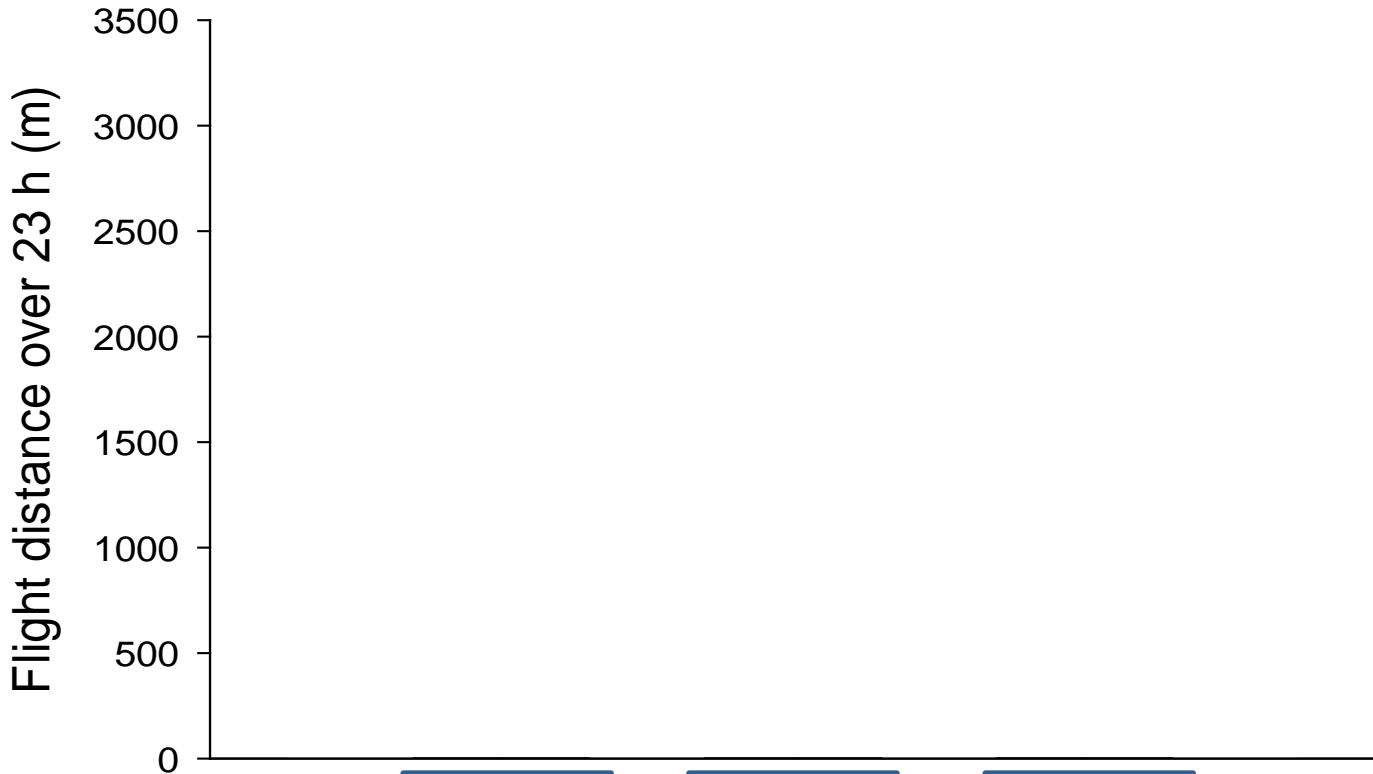
Dr. Vincent Jones



By Teah Smith at WSU TFREC







*Late Aug –
Early Sep*



Foraging

*Late Sep –
Early Oct*

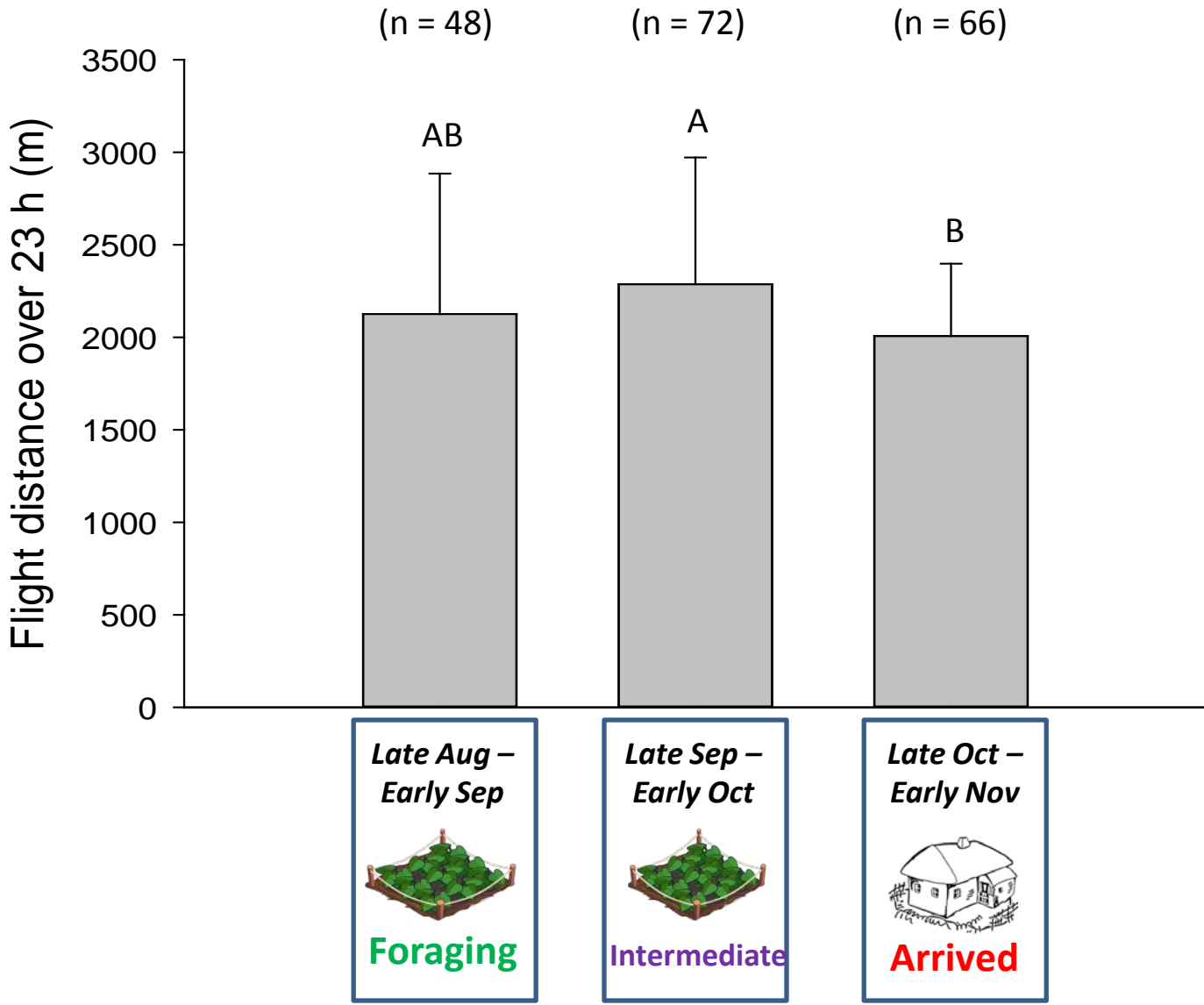


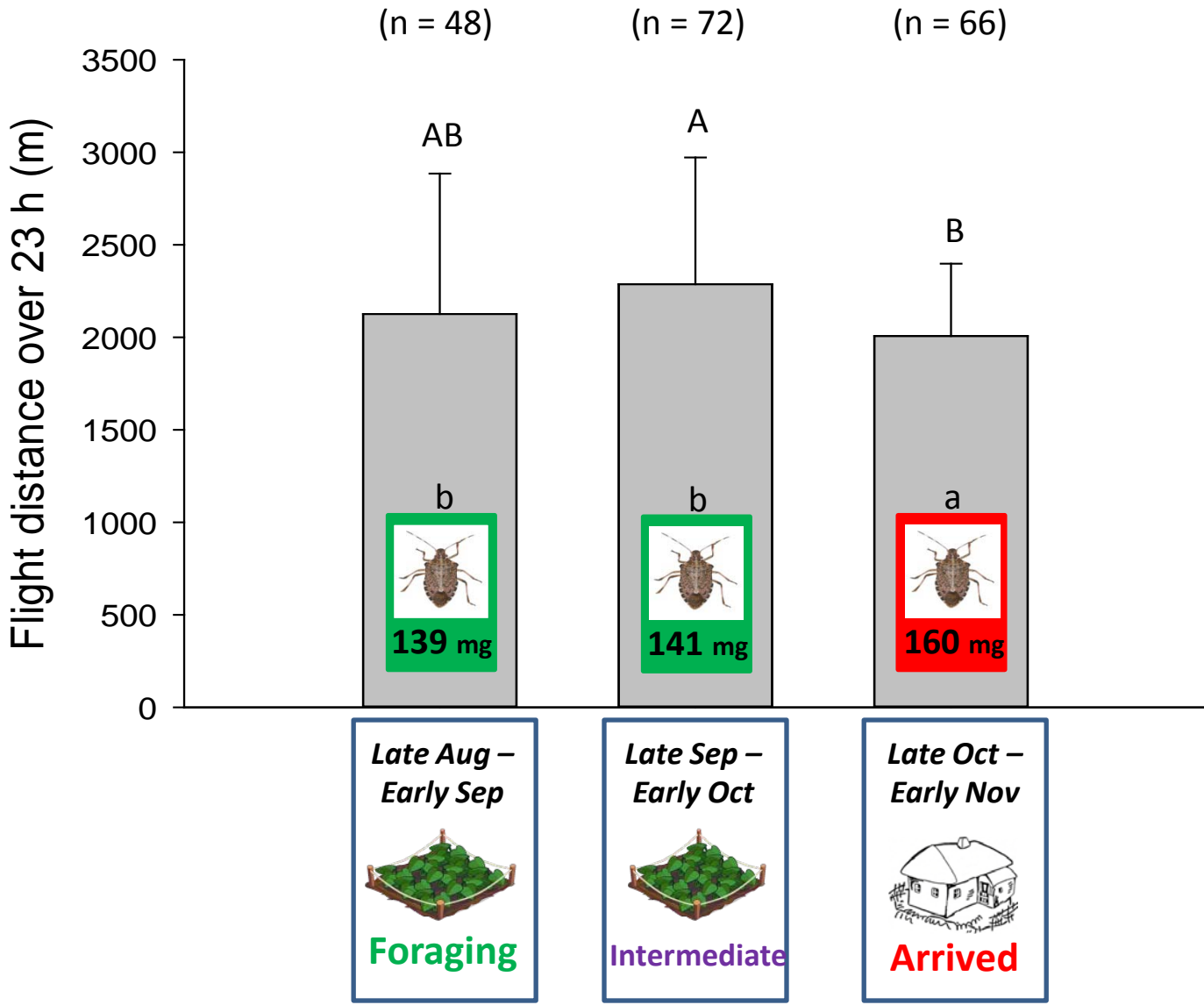
Intermediate

*Late Oct –
Early Nov*

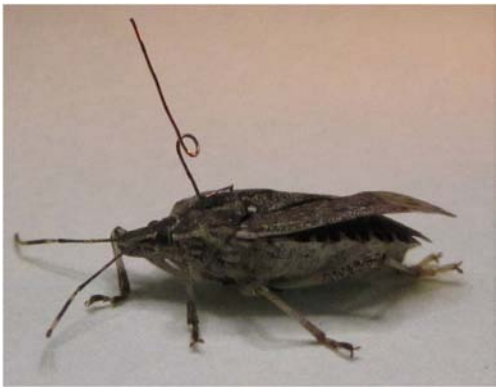
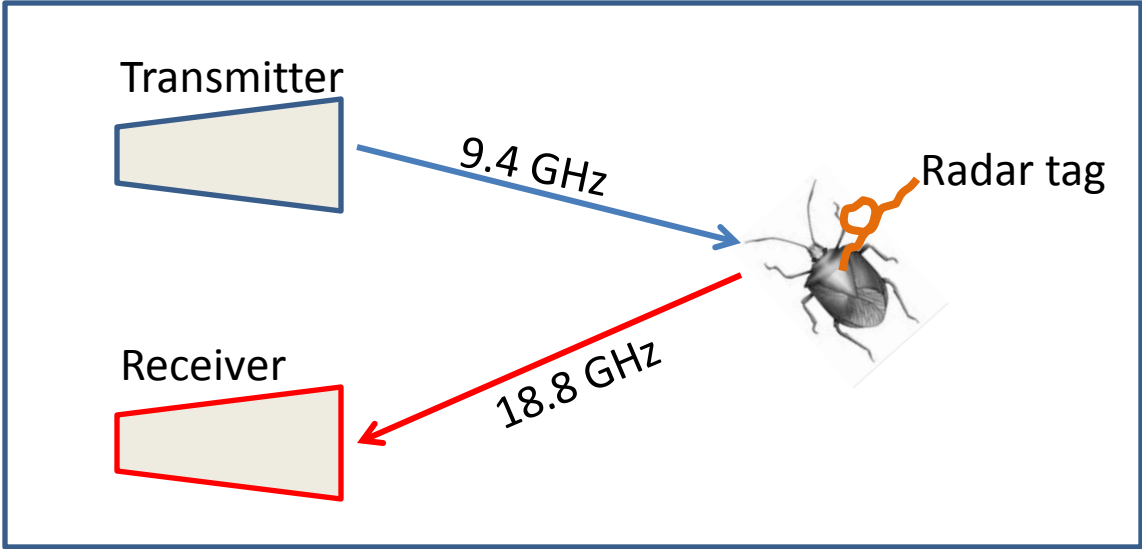


Arrived



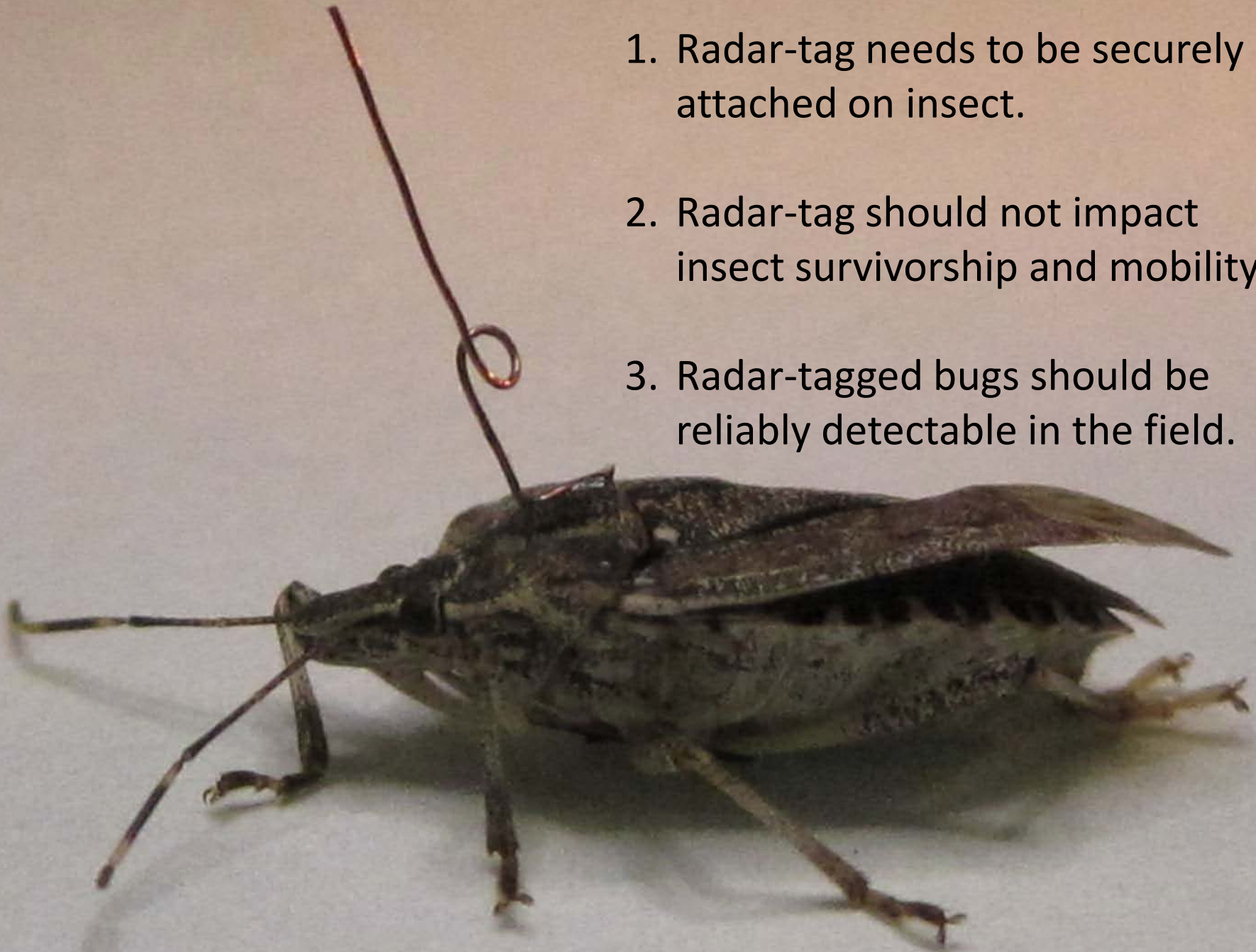


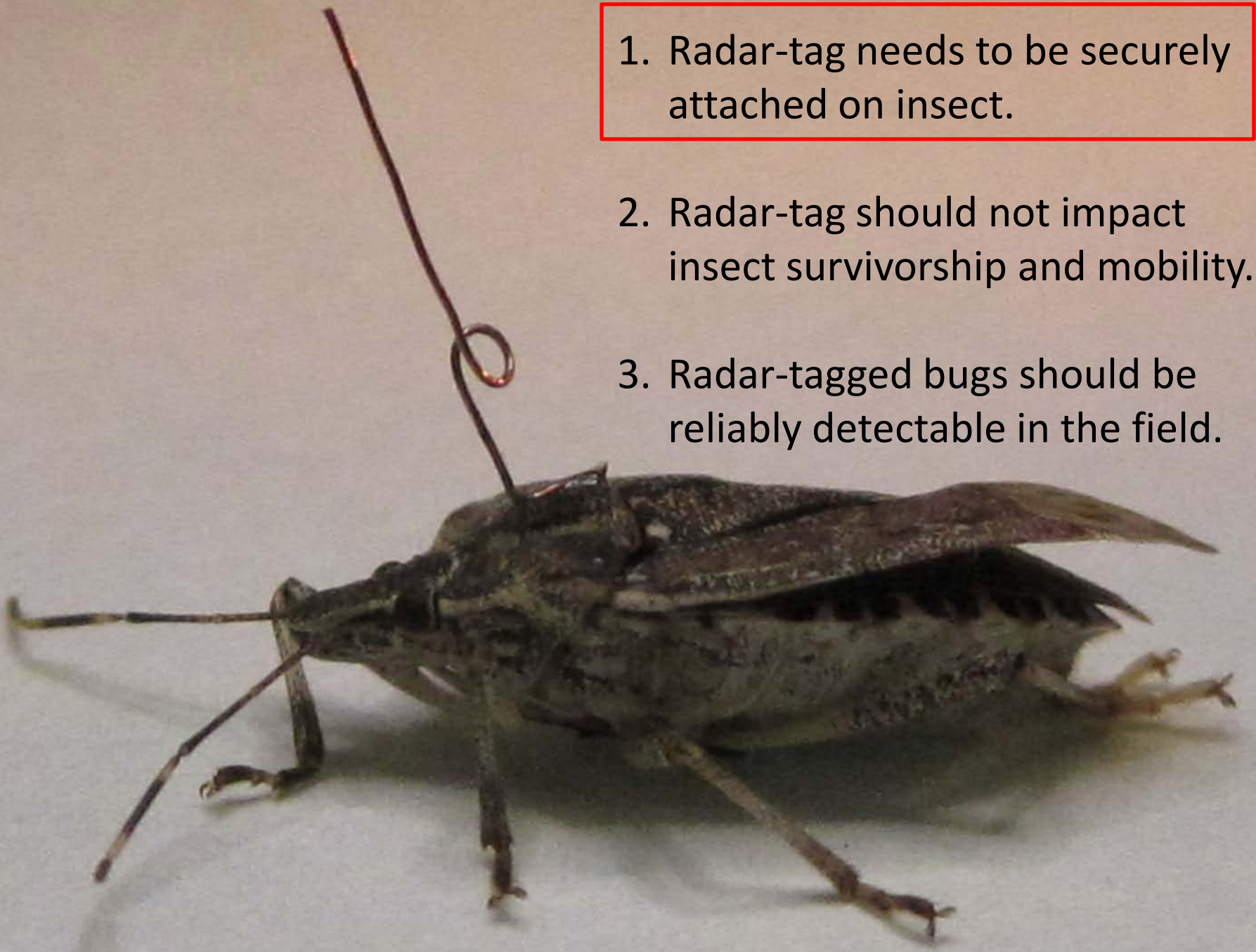
2. Harmonic radar: How does *H. halys* disperse at farm and landscape scales?





1. Radar-tag needs to be securely attached on insect.
2. Radar-tag should not impact insect survivorship and mobility.
3. Radar-tagged bugs should be reliably detectable in the field.





1. Radar-tag needs to be securely attached on insect.

2. Radar-tag should not impact insect survivorship and mobility.

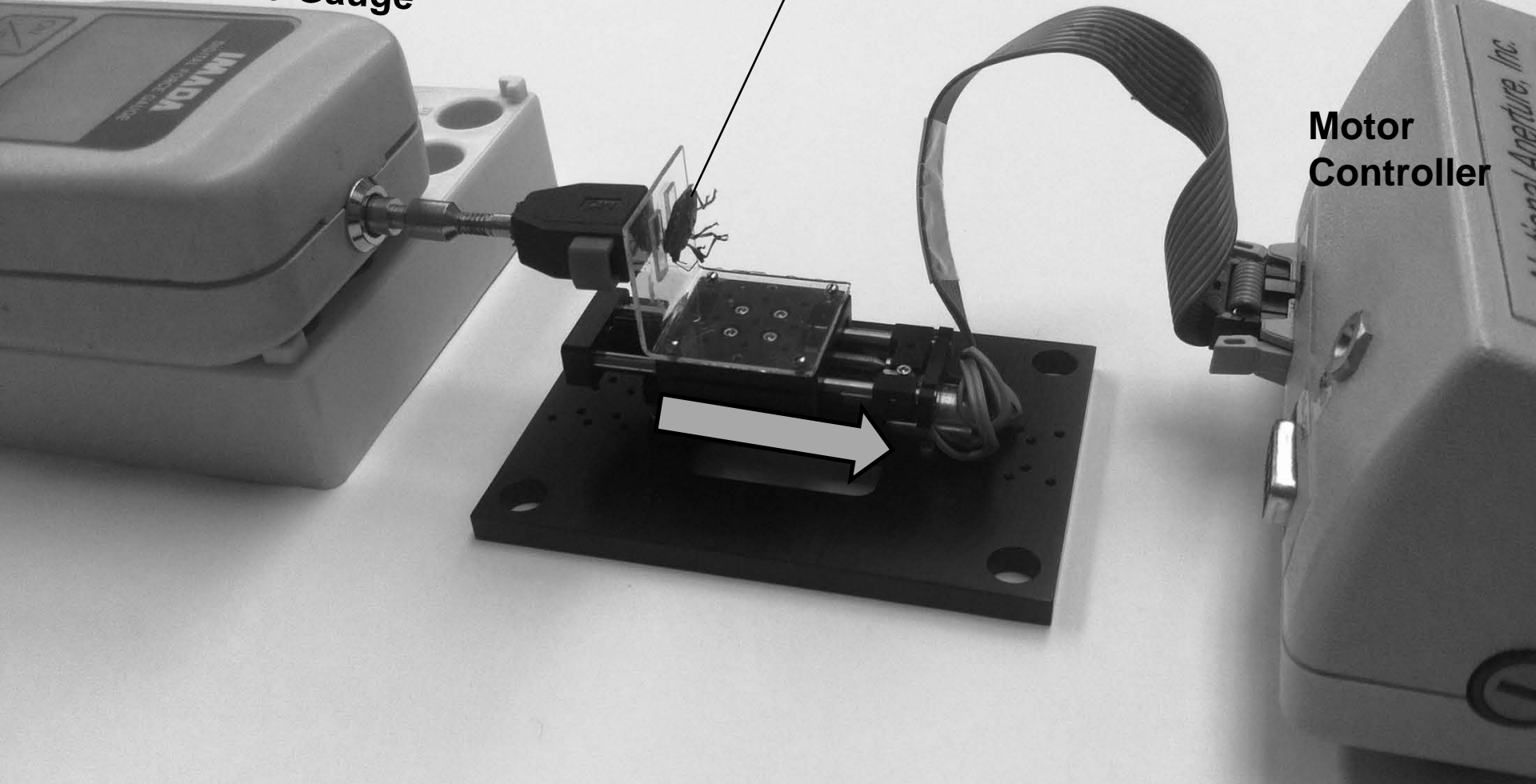
3. Radar-tagged bugs should be reliably detectable in the field.



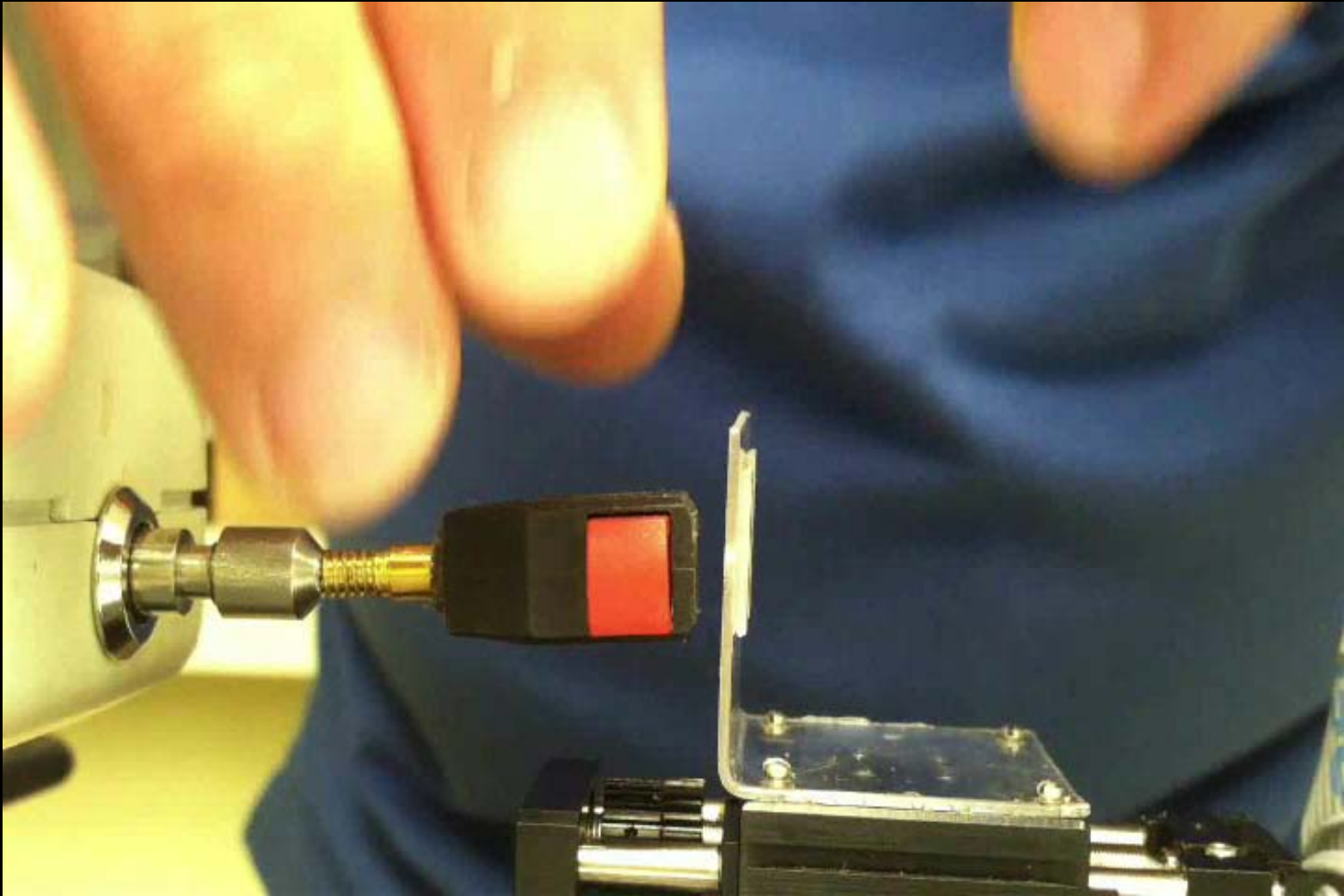
Digital Force Gauge

Radar-tagged *H. halys*

Motor Controller



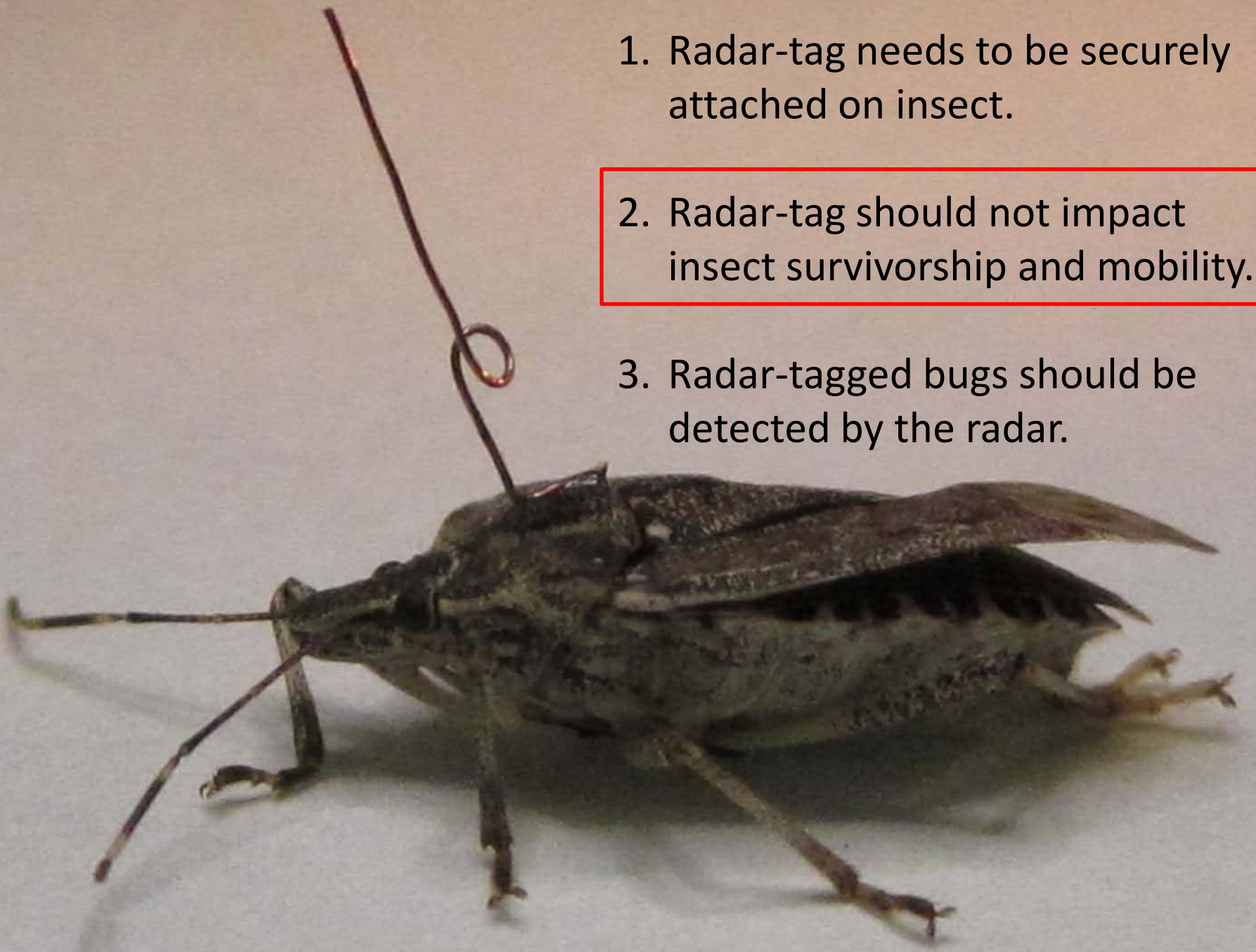
The strength of bond between radar tag and insect



The adhesive strength of glue bond
between radar tag and insect:

ca. 170-g force





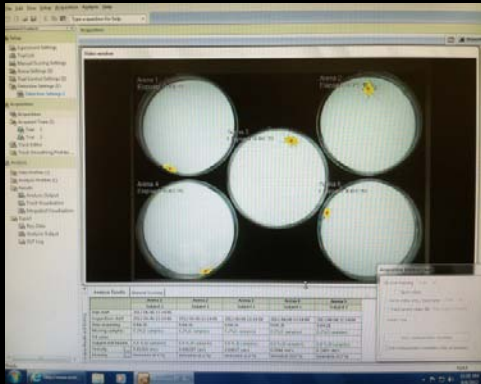
1. Radar-tag needs to be securely attached on insect.

2. Radar-tag should not impact insect survivorship and mobility.

3. Radar-tagged bugs should be detected by the radar.



Radar-tag did not impact *H. halys*

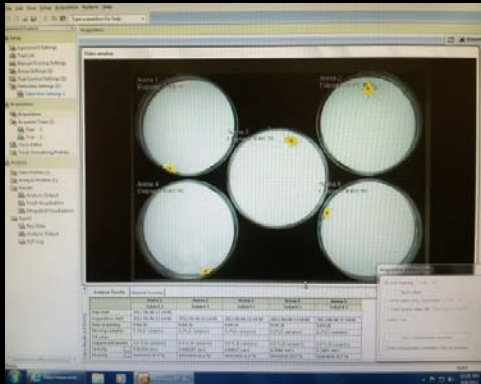


- Survivorship. (lab)
- Horizontal & vertical walking ability. (lab)
- Flight capacity. (field)





Radar-tag did not impact *H. halys*

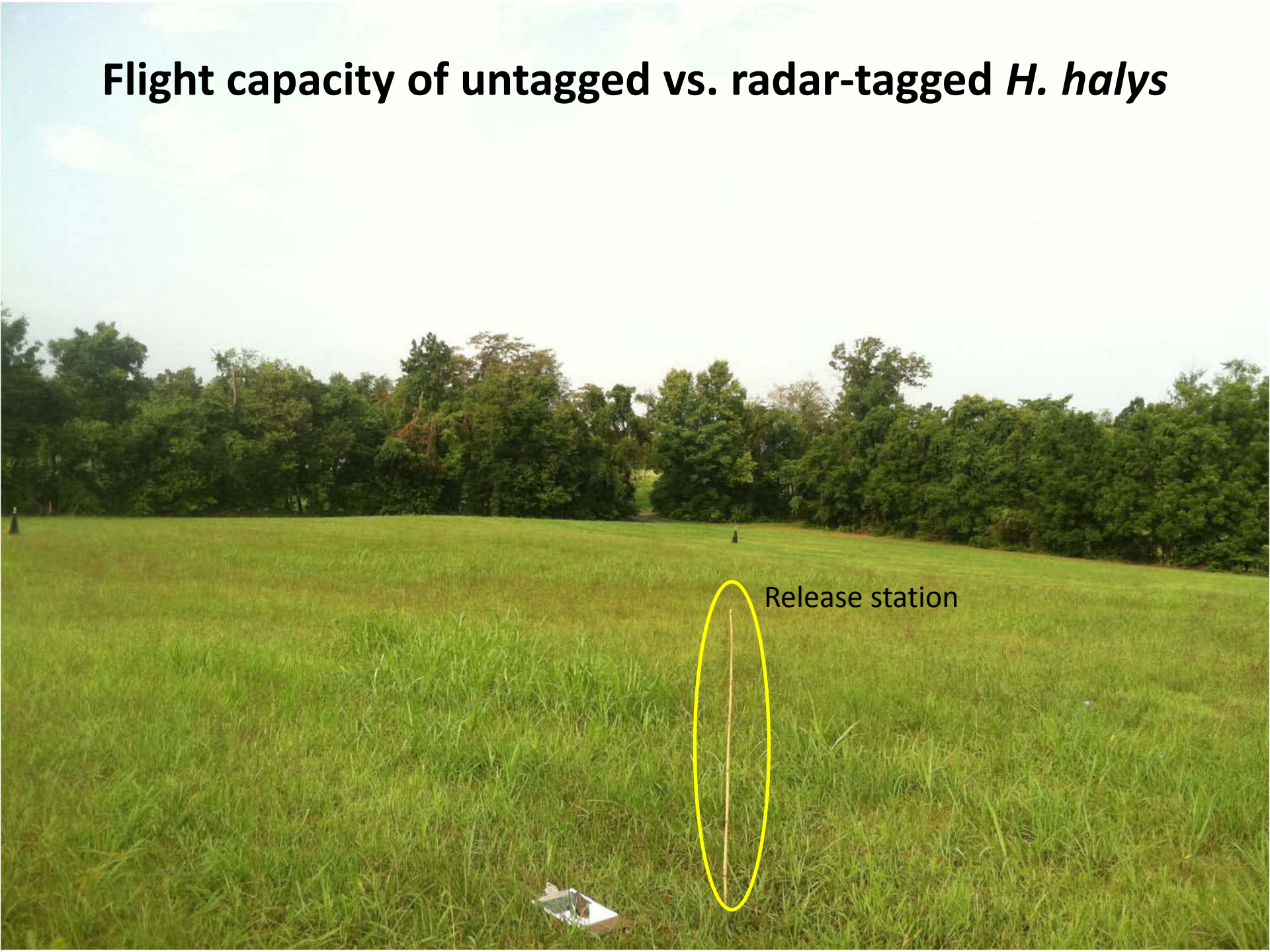


- Survivorship. (lab)
- Horizontal & vertical walking ability. (lab)



- Flight capacity. (field)

Flight capacity of untagged vs. radar-tagged *H. halys*



Release station













Green pin: Untagged bug
Pink pin: Radar-tagged bug



© 2012 Google

Image © 2012 GeoEye

39°21'28.11" N 77°53'23.17" W elev 624 ft

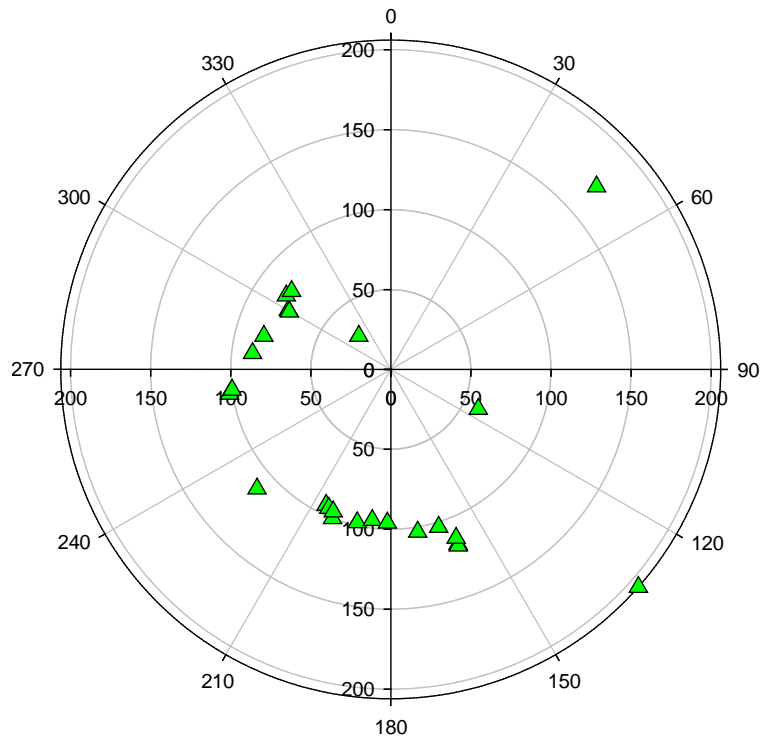
Google earth

Imagery Date: 5/25/2010

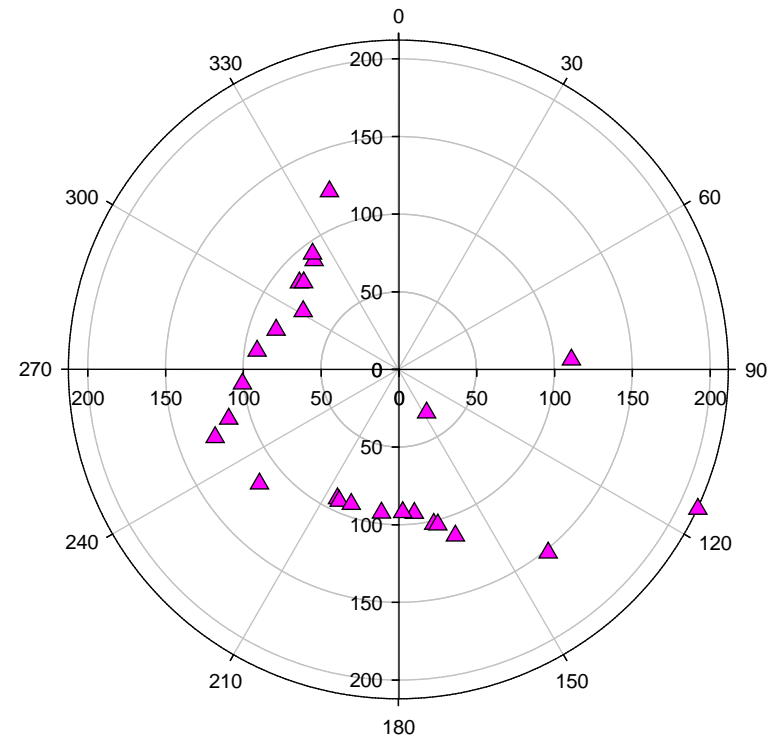
Eye alt 2799 ft

Flight capacity of untagged vs. radar-tagged *H. halys*

[Untagged]



[Radar-tagged]





*Made in
Canada*



Radar-tagged bugs were reliably detectable from ca. 15 m.



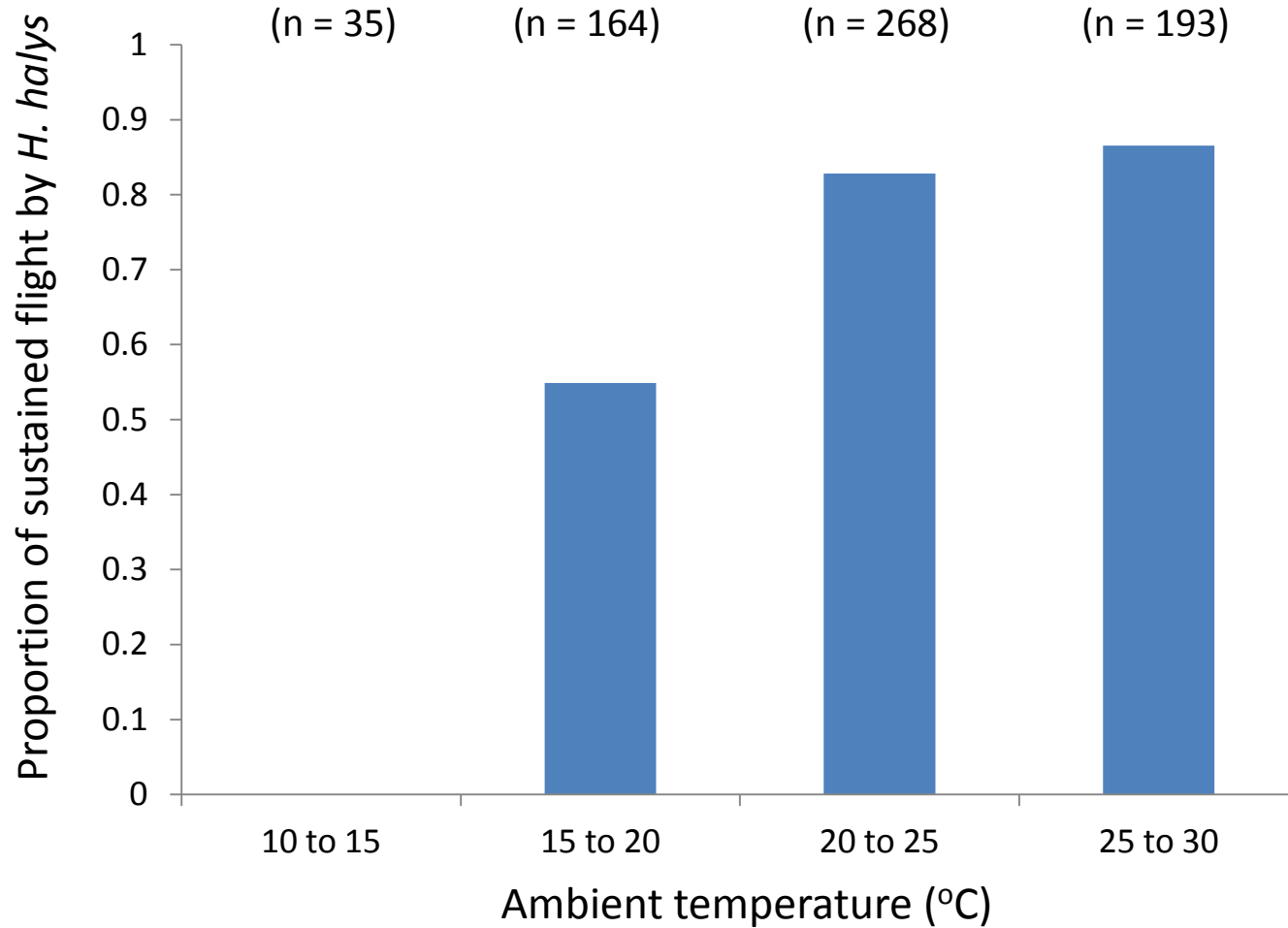
3. Free-flight observation: What is the diurnal flight behavior and pattern of *H. halys*?



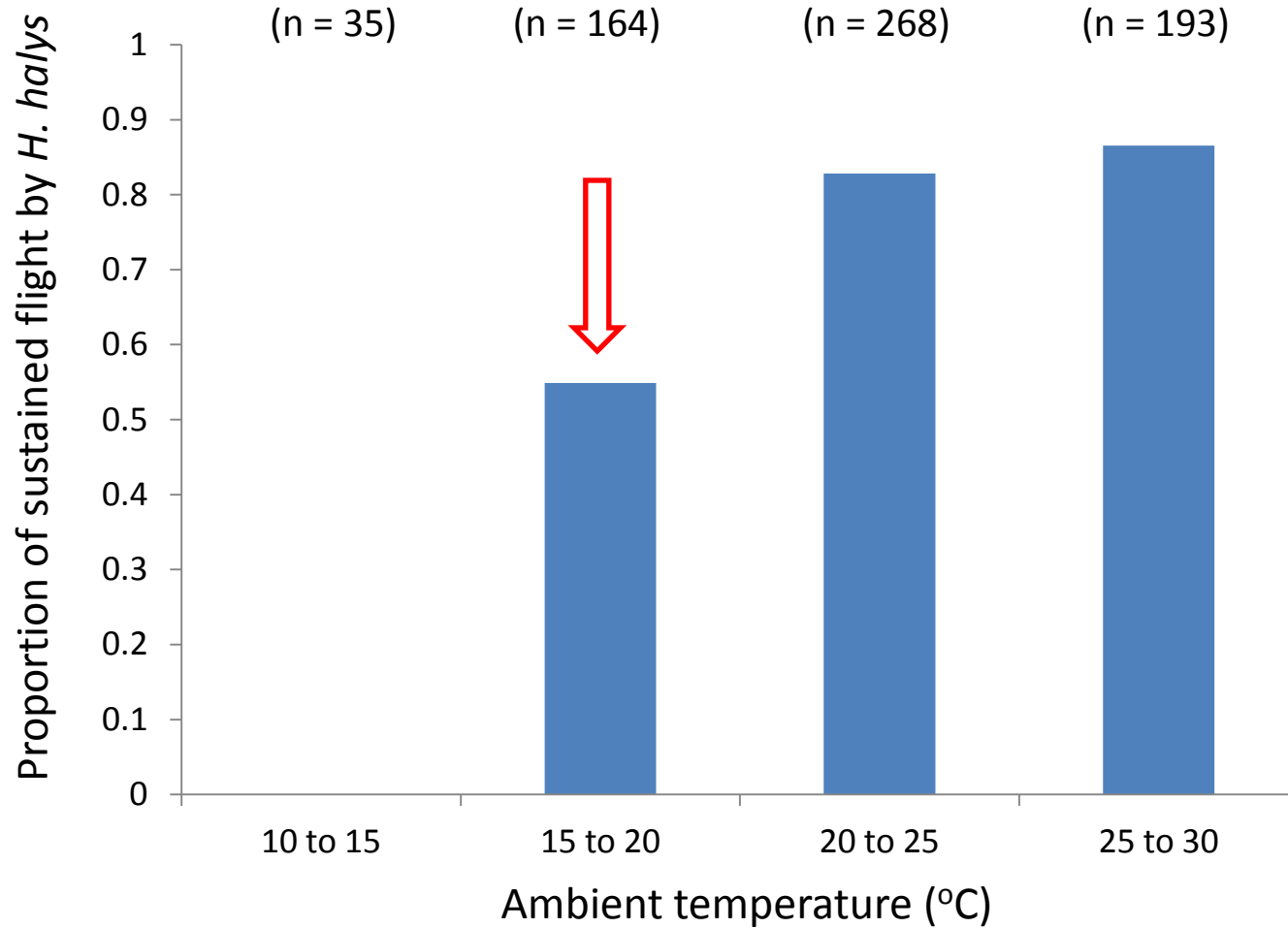
3. Free-flight observation: What is the diurnal flight behavior and pattern of *H. halys*?



Likelihood of sustained flight



Likelihood of sustained flight

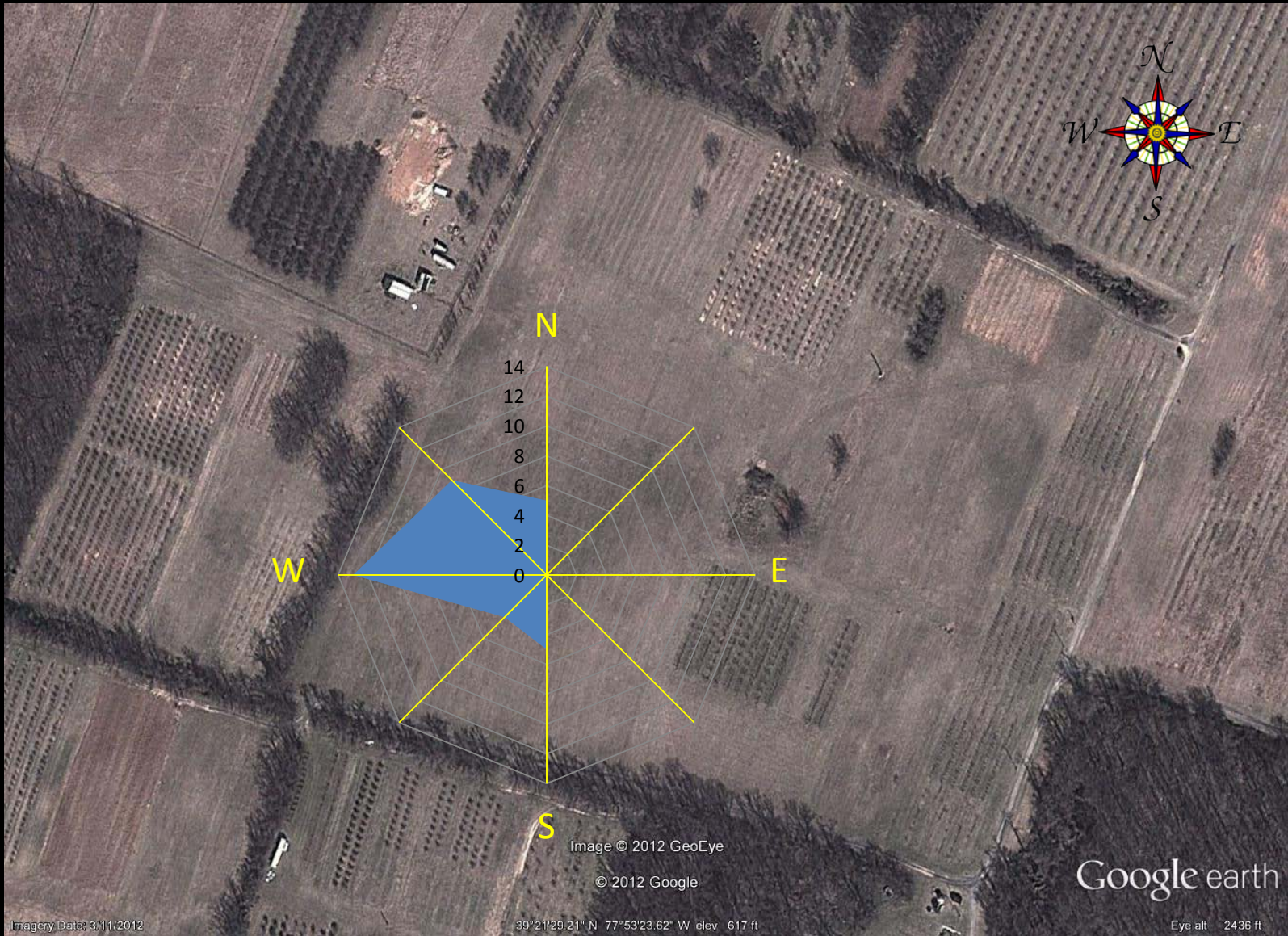


Prevailing flight direction over time



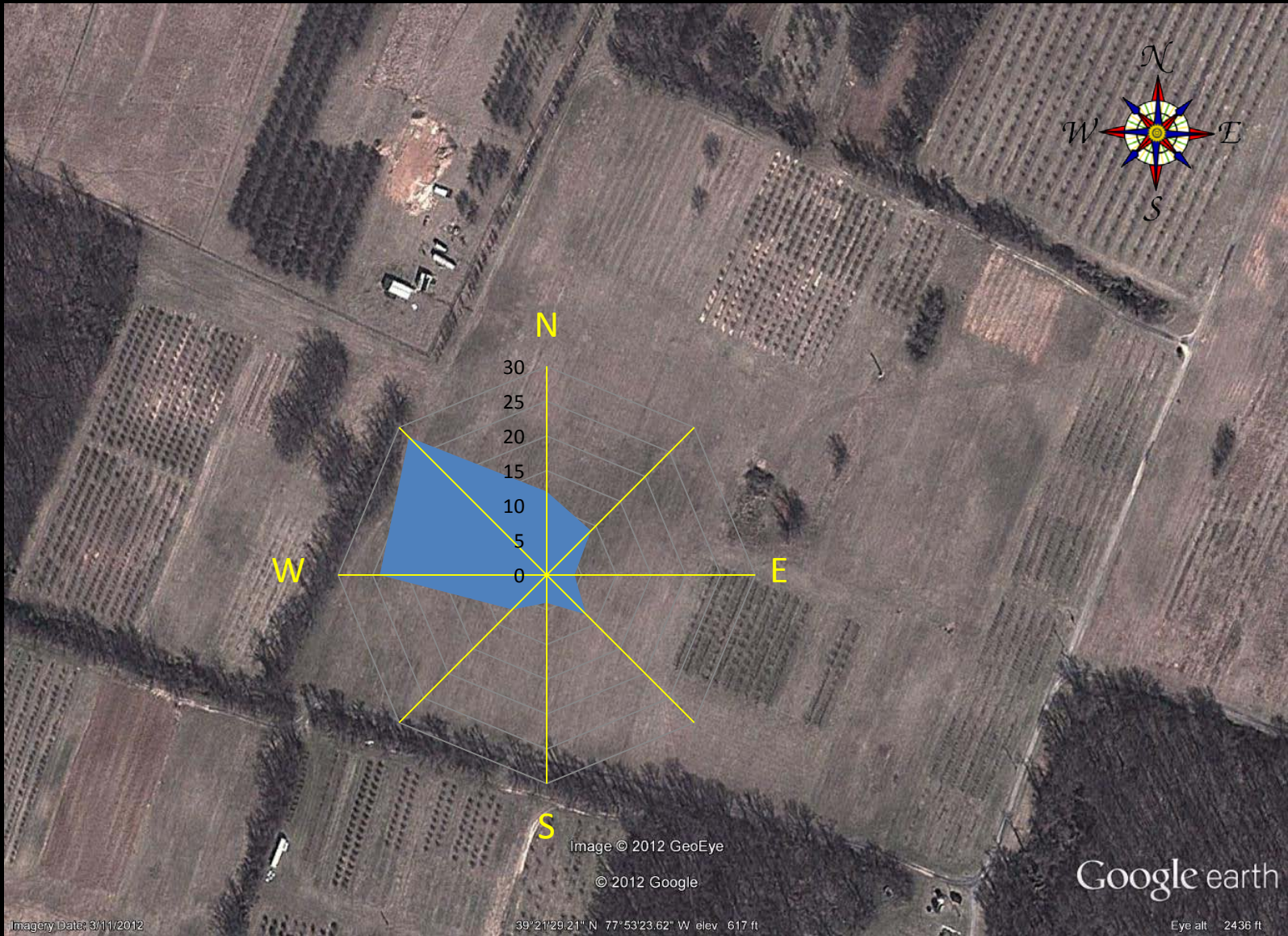
Flight direction: 8:00-10:00

(n = 36)



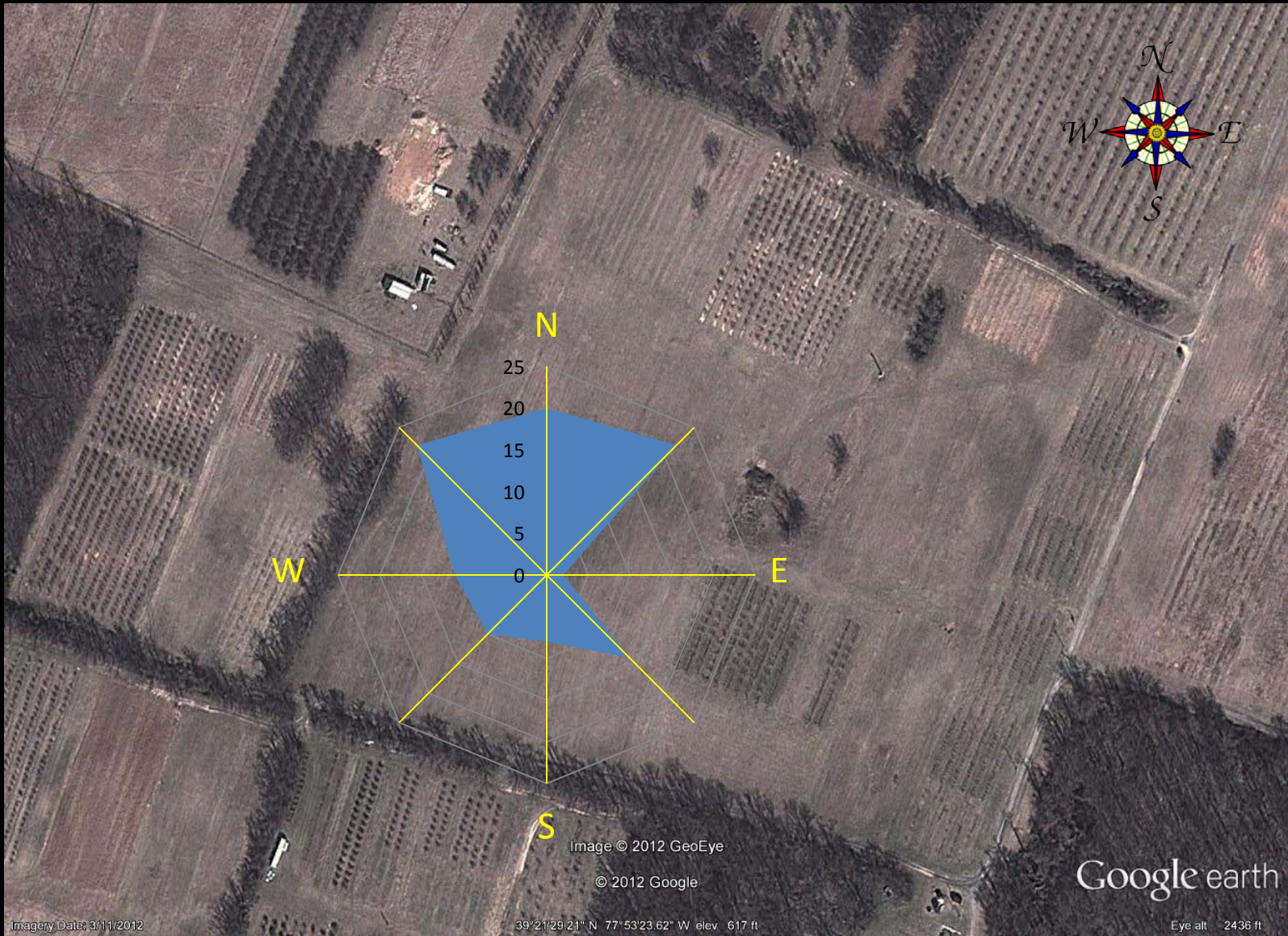
Flight direction: 10:00-12:00

(n = 96)



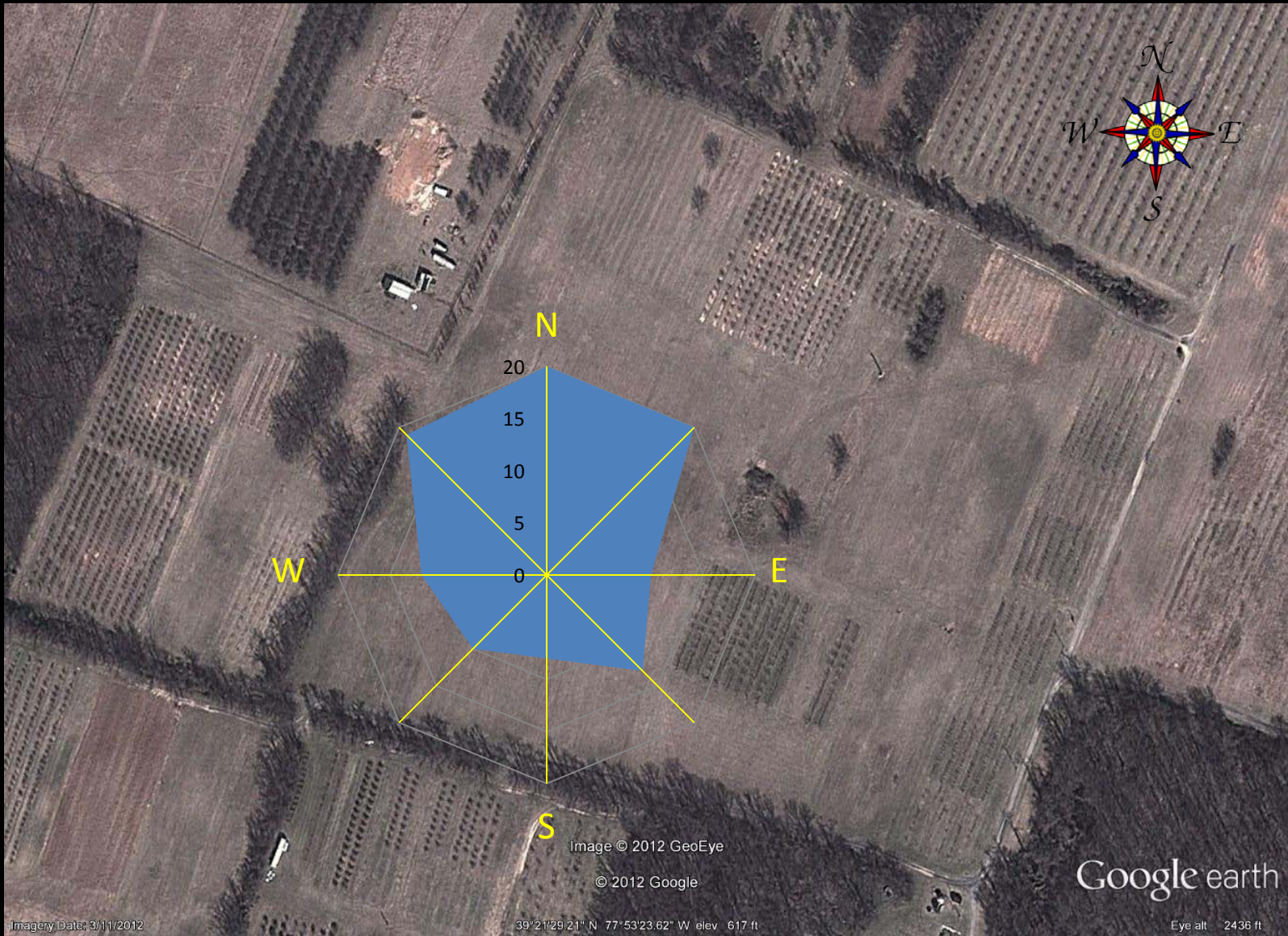
Flight direction: 12:00-14:00

(n = 109)



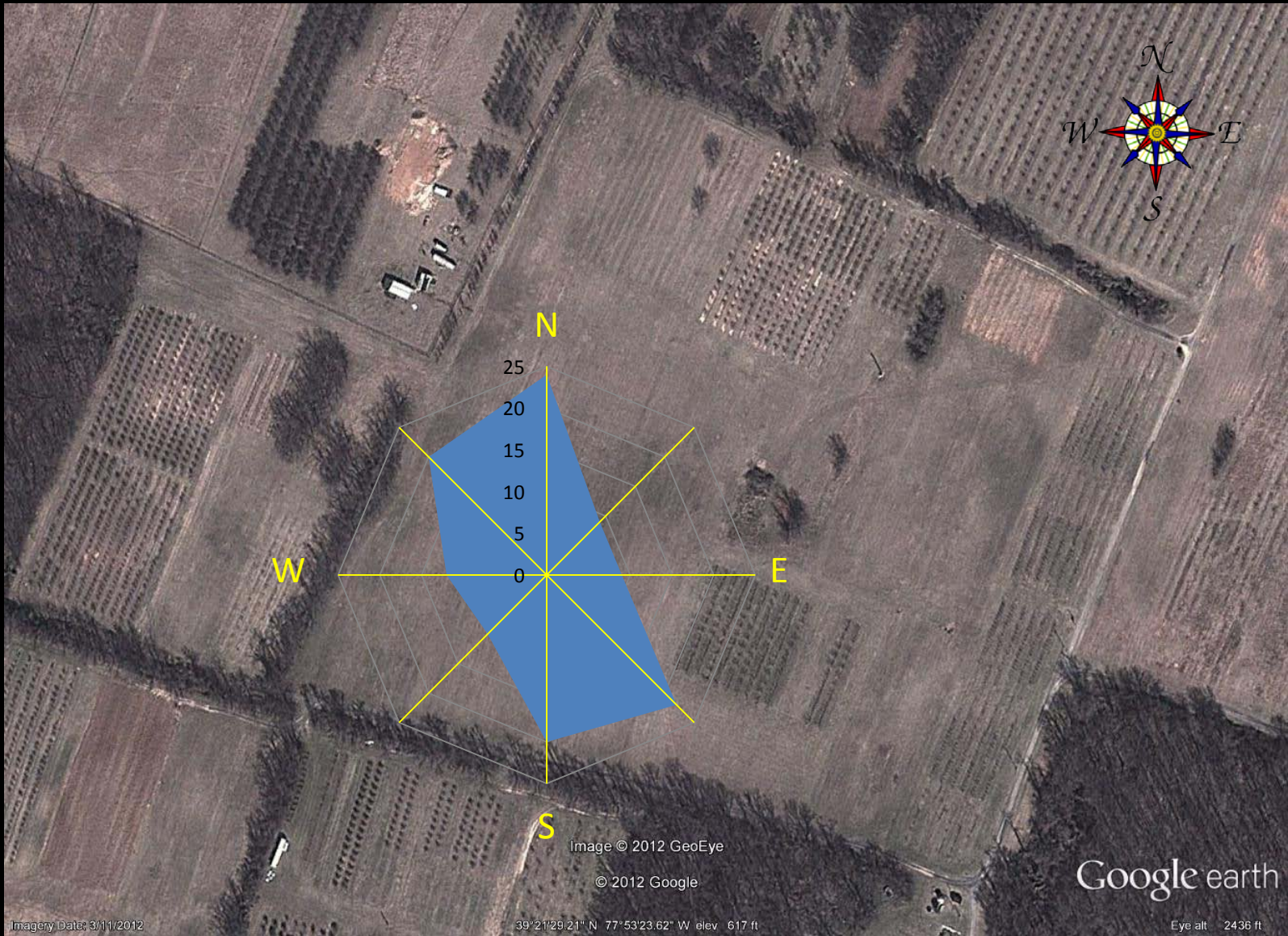
Flight direction: 14:00-16:00

(n = 112)

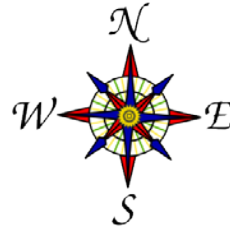


Flight direction: 16:00-18:00

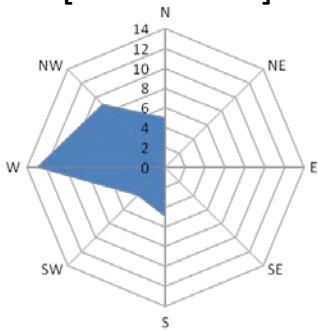
(n = 126)



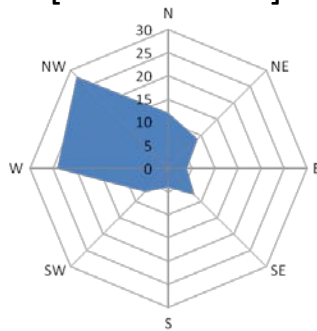
Prevailing flight direction over time



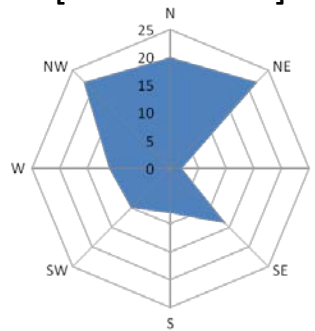
[8:00-10:00]



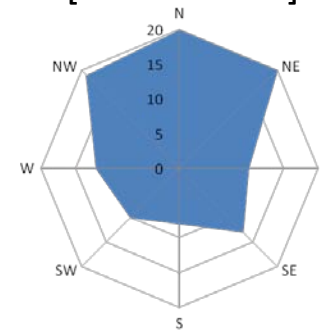
[10:00-12:00]



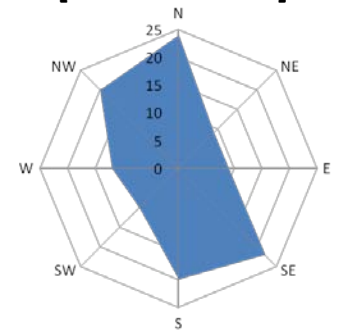
[12:00-14:00]



[14:00-16:00]



[16:00-18:00]



Summary

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- 13% of dead trees can potentially harbor overwintering *H. halys*.

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Summary

- 13% of dead trees can potentially harbor overwintering *H. halys*.
- *H. halys* have capacity to fly >1 km within a day.
- Harmonic radar system has a promising potential for use with *H. halys*.
- Flight by *H. halys* was affected at least by temperature and sun's position.

Leskey Lab



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