Mosquito Surveillance Report

Joe Brew and Ben Brew

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Contents

Executive Summary

Most Recent Collection

As predicted, mosquito numbers rose steadily for two weeks before declining slightly the most recent trap collection (July 22, 2014) saw moderate levels (125 mosquitoes per trap).

Forecast

We forecast that mosquito levels will remain in the moderate-low range (fewer than 100 per trap through August 11th), with a 95% confidence interval of 0 to 252 per trap.

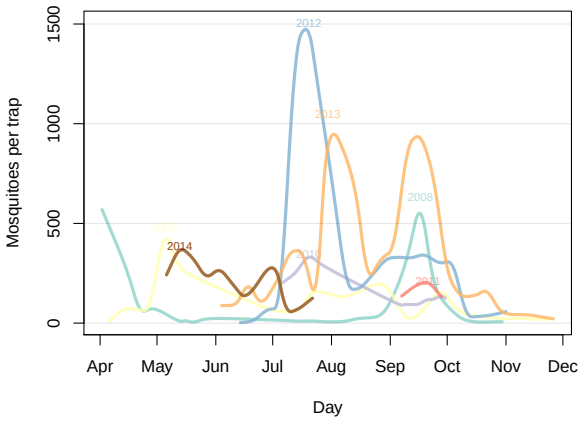
Predictive Model Validation

At 125.2 specimens per trap, the most recent collection was slightly higher than our prediction of 67, but within the 90% confidence range of 0-224.

Visual Overview

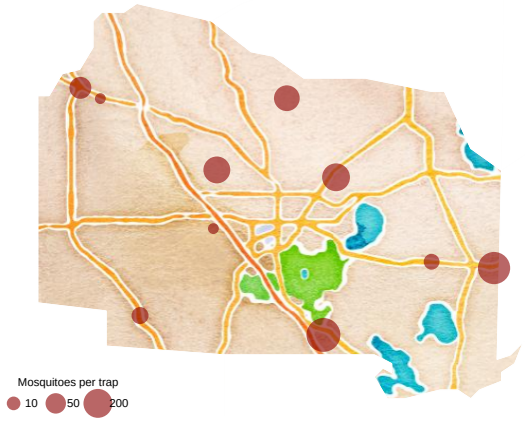
Time

The current mosquito population is lower than usual for this time of year.



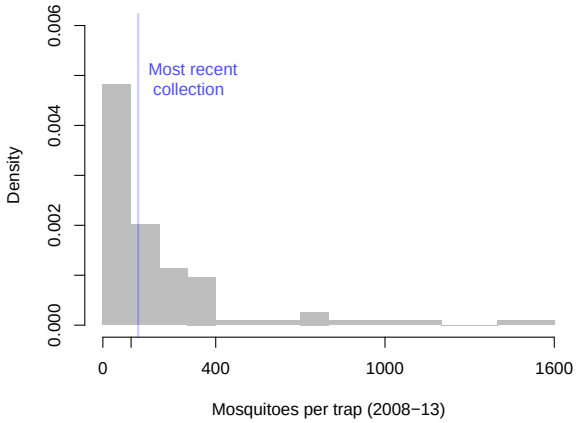
Space

Mosquitoes were largely scattered throughout the county.



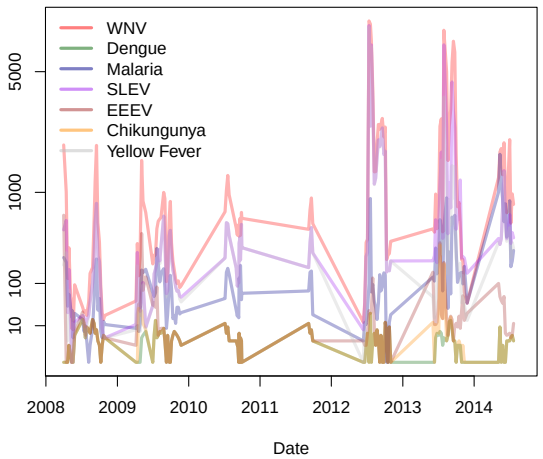
Normality

The most recent collection was at levels equivalent to approximately the 50th percentile of historical (2008-13) levels.



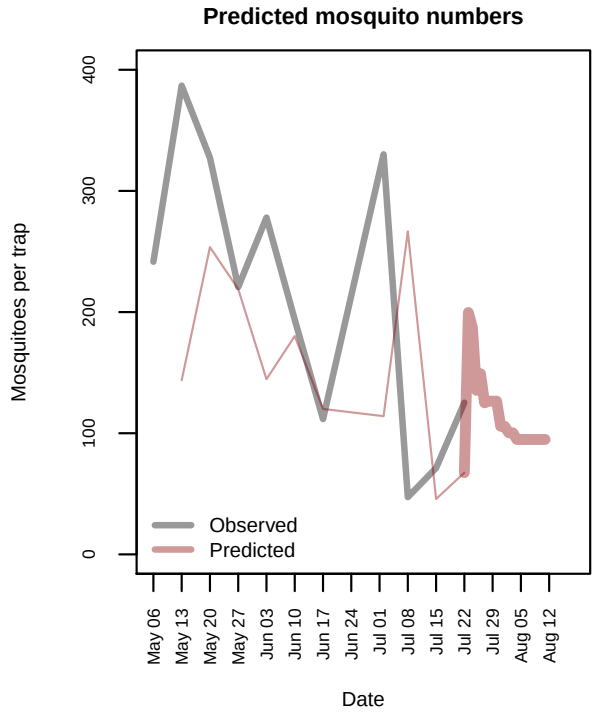
Disease Vectors

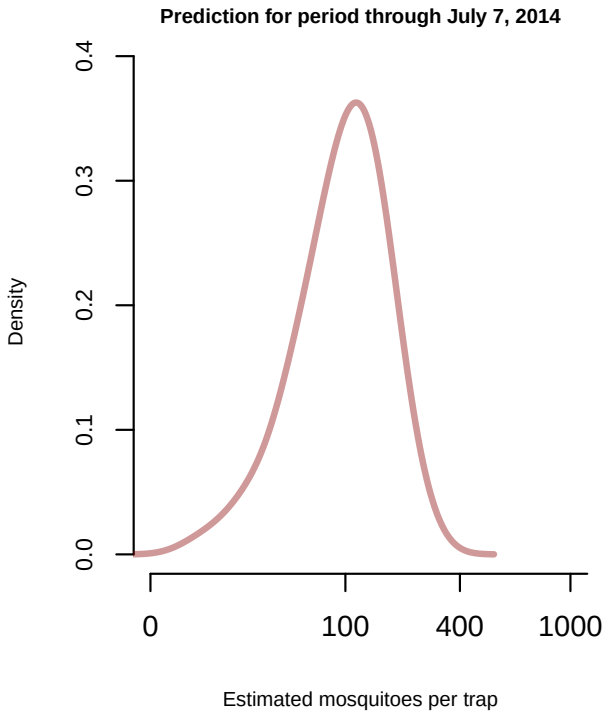
Of recently trapped mosquitoes, no particular vector of any disease saw drastic rises in recent weeks. Of note, only 11 specimens capable of carrying Chikungunya were captured in July (2 in the most recent trapping).

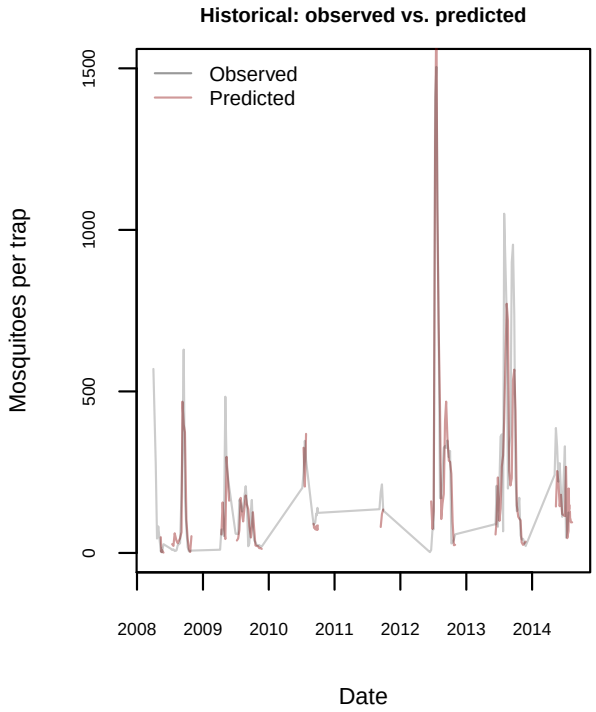


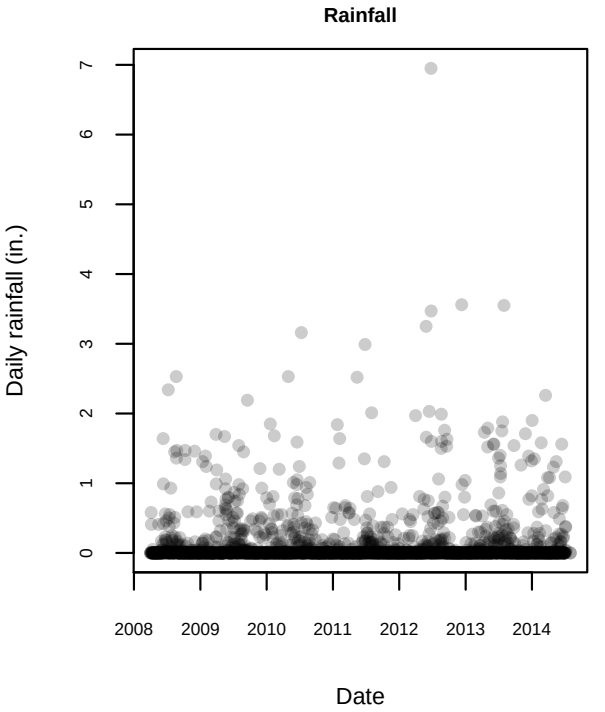
Forecast

We use recursive, quadratic linear regression modelling to forecast the average number of mosquitoes per trap up to 15 days in advance.[1]







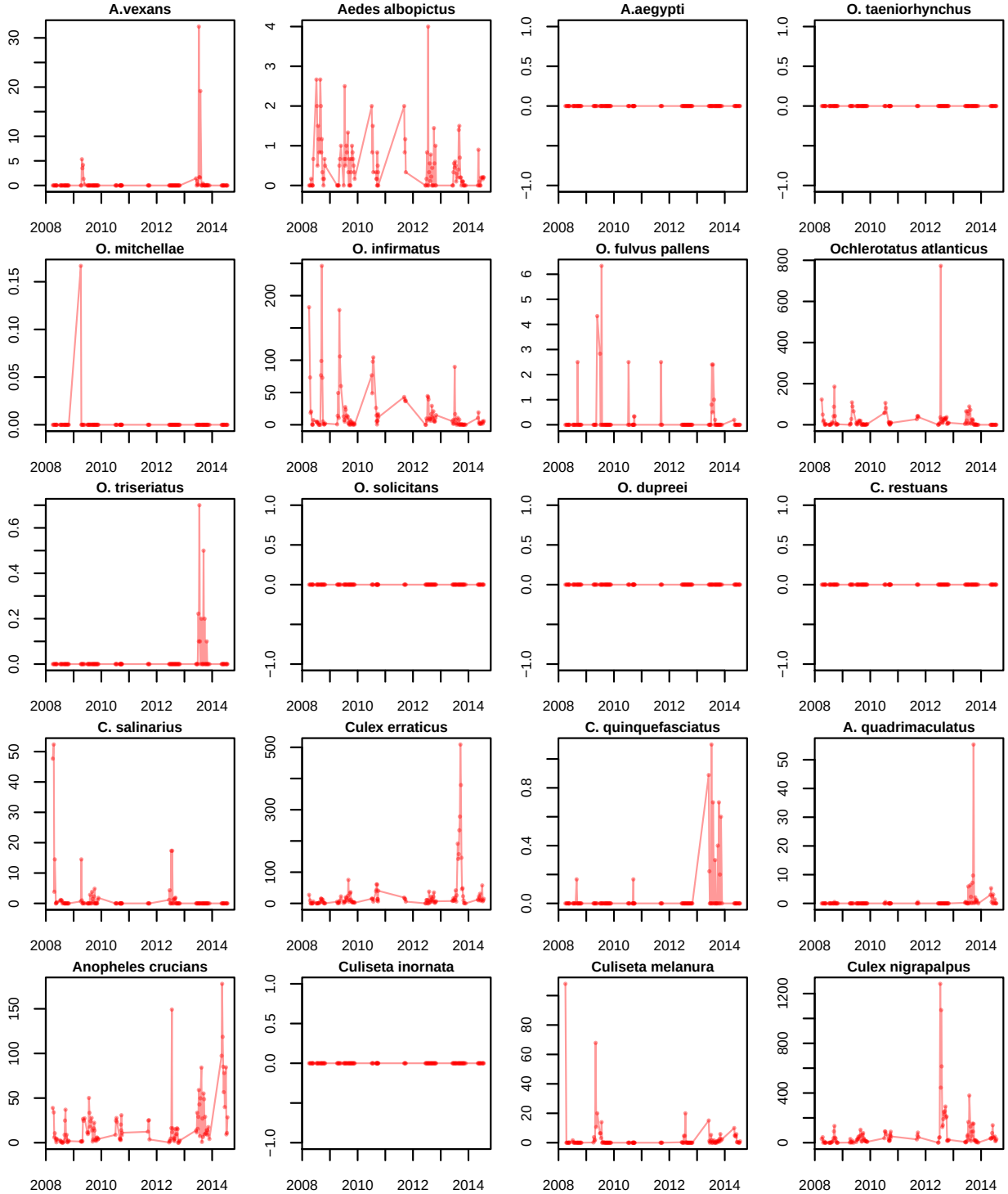


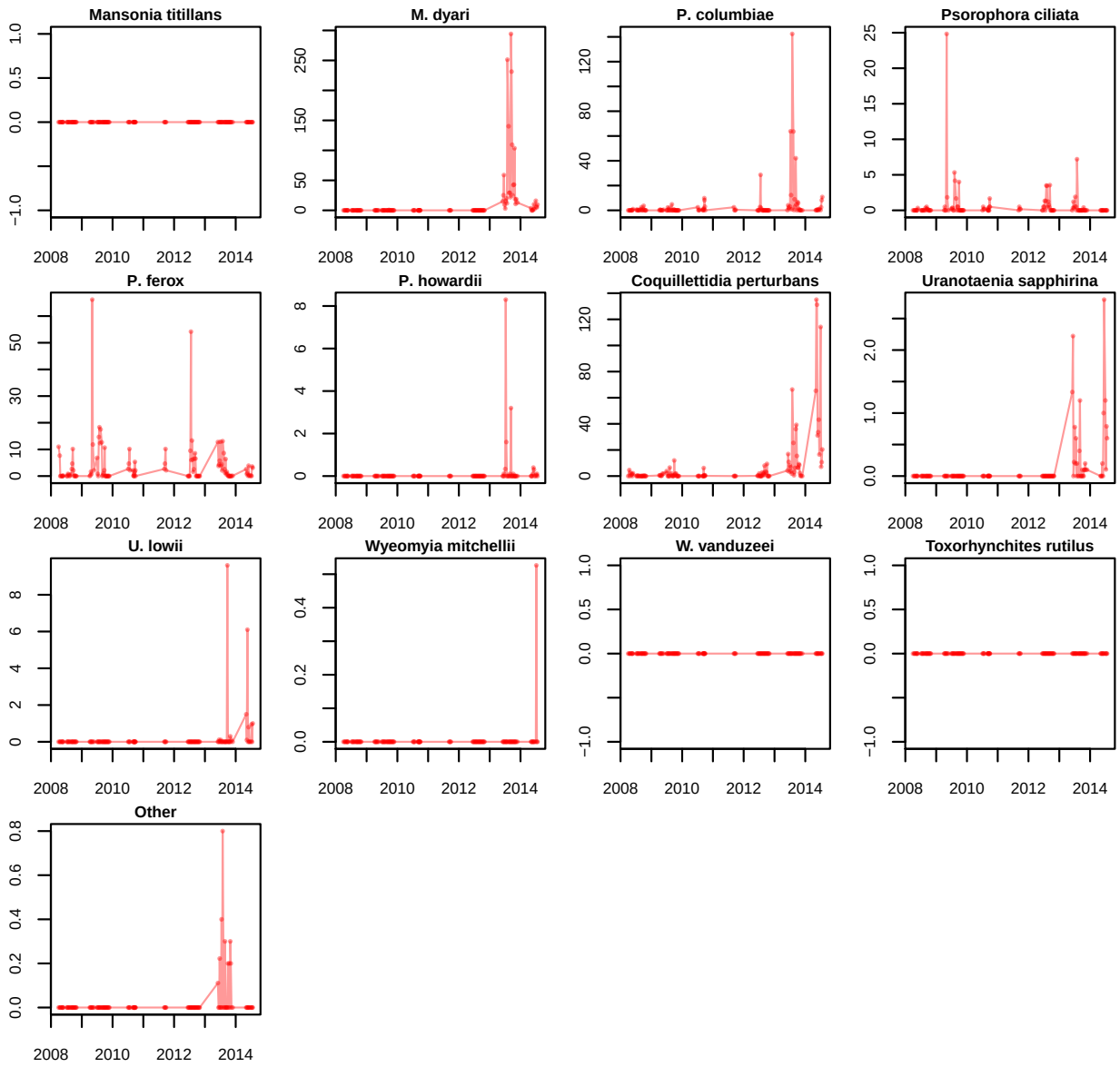
[1] We are actively experimenting with non-parametric approaches to improve modelling accuracy, and expect to have a modified KNN model with better results by late July.

Vectors of Disease by Location

Mosquito Types

No particular species shows abnormal growth in recent weeks.




Mansonia titillans
M. dyari
P. columbiae
Psorophora ciliata
P. ferox
P. howardii
Coquillettidia perturbans
Uranotaenia sapphirina
U. lowii
Wyeomyia mitchellii
W. vanduzeei
Toxorhynchites rutilus
Other
2008
2010
2012
2014

Details of Predictive Model

Historically, the model has performed well, correctly predicting the late summer spikes in 2012 and 2013. Given the preference for accuracy at high numbers, the model intentionally includes outlying high observations, thereby weighting them.

Having simulated more than 65,000 unique models, our best fit equation (using the sum of least squares approach) was:

$$\hat{Y} = \beta_0 + \beta_1^2(5.6508) + \beta_2(0.5938)$$

where $\hat{Y}$ is the estimated mean number of mosquitoes per trap, β_0 is set to 0, β_1 is the cumulative rainfall in the period 15 to 29 days prior to the date of prediction and β_2 is the mean number of mosquitoes per trap in the most recent prior trap collection.

Though an original model relied only on rainfall, incorporating the most recent trap predicition saw our R-squared improve from 0.52 to 0.82. This means that we can now explain over 80% of the variance in mosquito populations up to 15 days ahead of time.