Survival Analyses

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This is the document exploring larval survival for the 2016 Athens Field Project (both seasons).

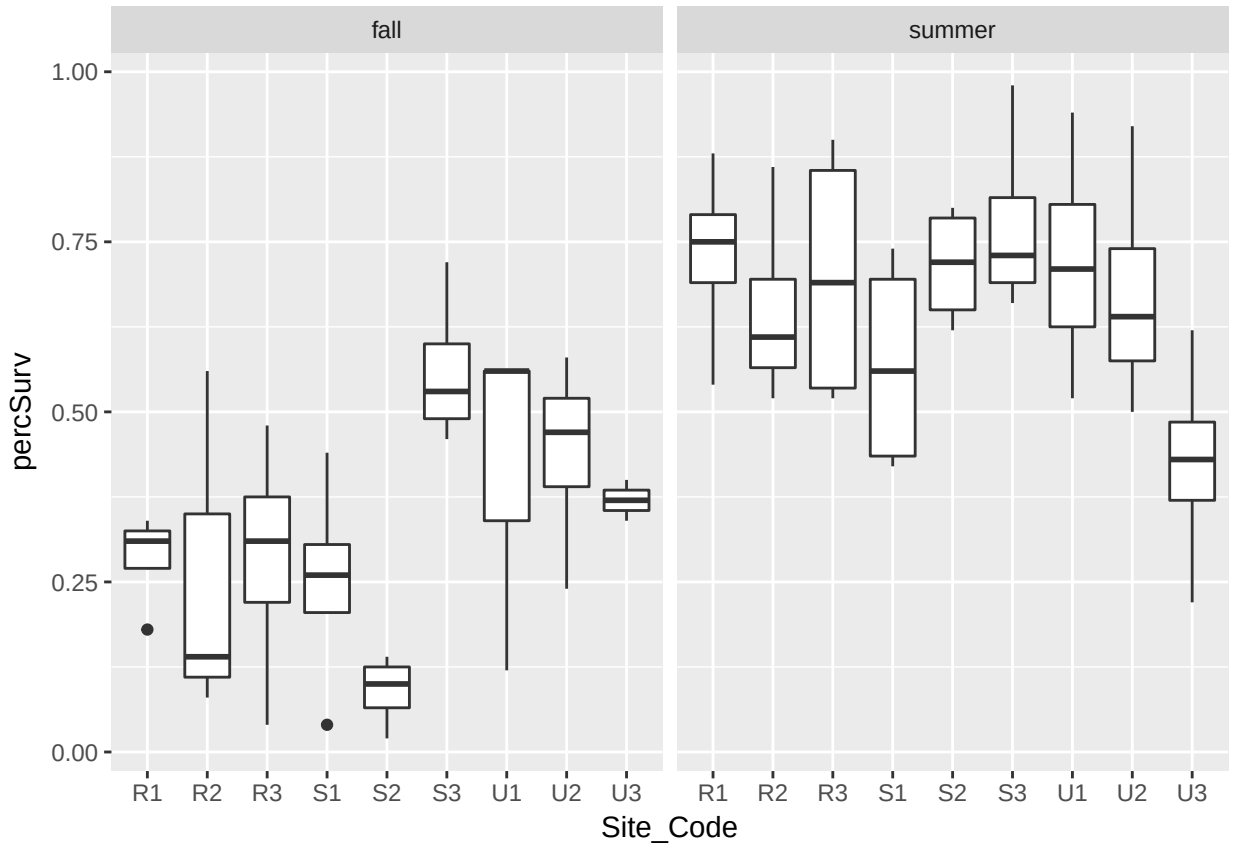
Notebook of Tasks Done

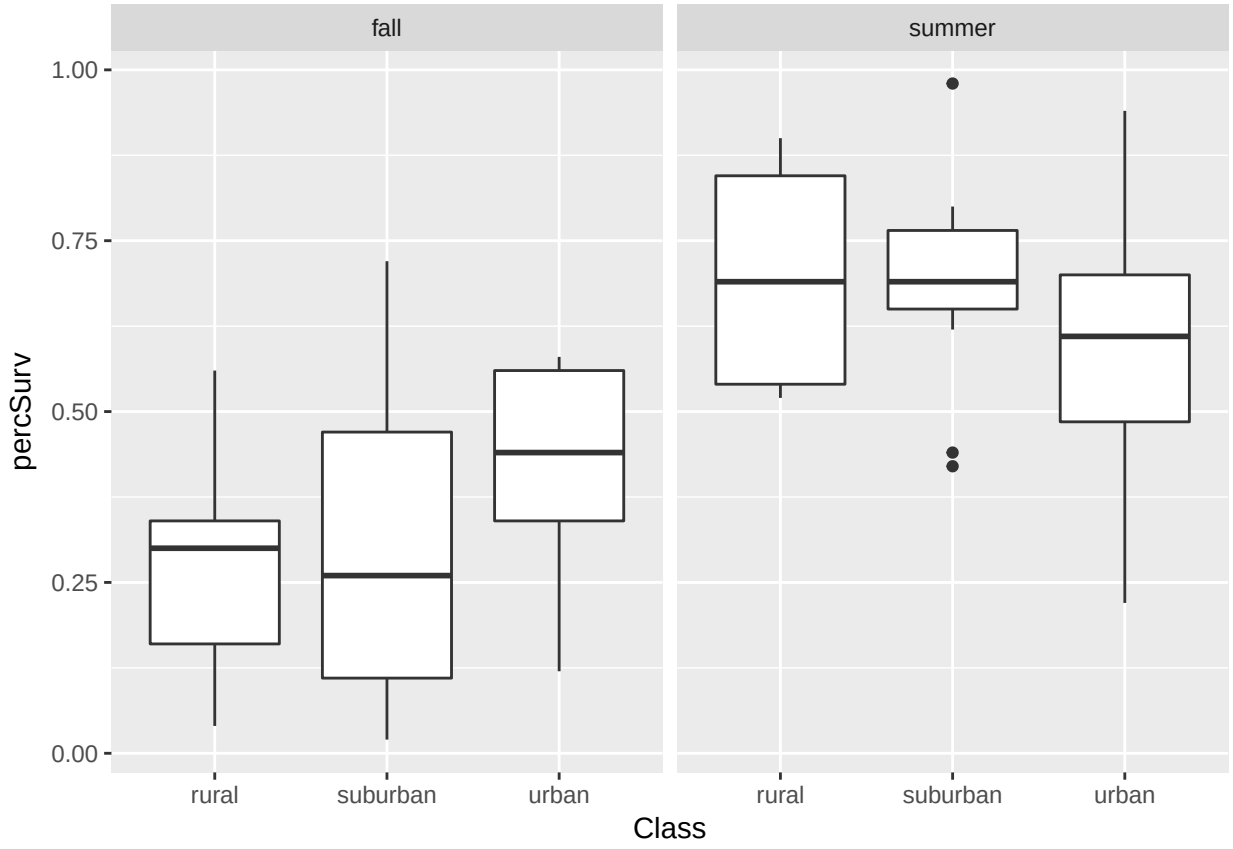
- overall survival per tray by Class and Block using a linear mixed model (this could probably also be a logistic regression) (2017-04-05)
- survival curves using Cox PH: PH Assumptions were very violated, even when turning `Class` into a time dependent variable. Decided against this method (2017-04-10)
- creating individual regression curves for each tray, and then using the growth rate as response variables in a mixed-model (2017-04-16)
- attempting to use a `nls` formula within a lmer statistical model (similar to Shapiro et al. 2016) - Spoke with John and decided to explore the fall data and explain why the survial curves do not fit (2017-05-01)
- plot KM curves and then analyze seasons seperately

Data Visualization

```
## [1] TRUE
```

Investigate tray level survival for some basic box plots. Note, we are only including female survival because that is what contributes to disease and population growth.


fall
summer
1.00
0.75
0.50
0.25
0.00
percSurv
R1
R2
R3
S1
S2
S3
U1
U2
U3
Site_Code


fall
summer
1.00
0.75
0.50
0.25
0.00
percSurv
rural
suburban
urban
Class

In general, I would say survival is more likely in urban in the fall and less likely in urban in the summer, although this is slight. There is no difference between rural and suburban.

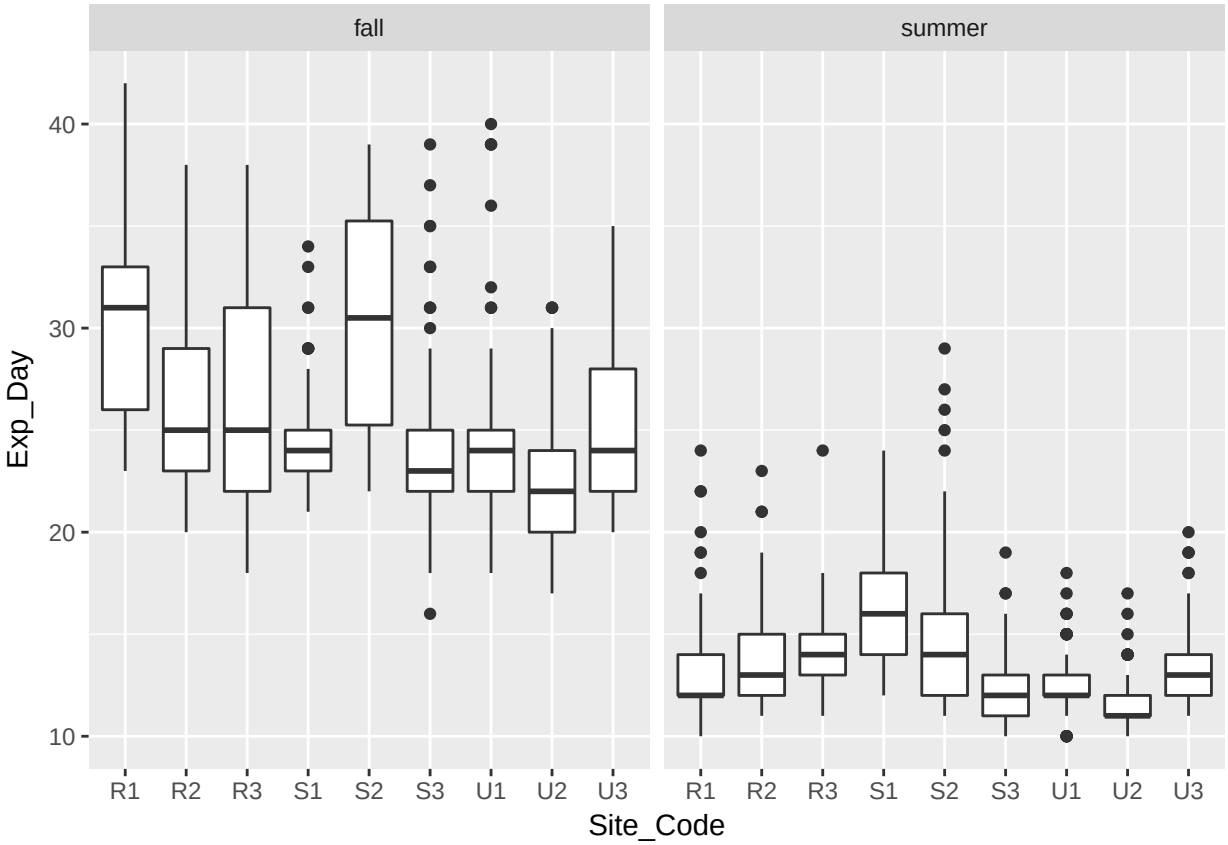
Mixed Model Emergence Percentages

	F	Df	Df.res	Pr(>F)
Class	0.0039292	2	5.987797	0.9960811
block	73.9394753	1	56.246604	0.0000000
Class:block	2.6202328	2	56.274644	0.0816501

Block had a significant effect. With higher survival in the summer than the fall.

Development Rates

We can also look at the time to development (i.e. emergence day) for block and class.



It took much longer in the fall than in the summer for mosquitoes to emerge, implying they were developing more slowly. To get at the rate, we need to to plot this as a logistic regression (or survival curve).

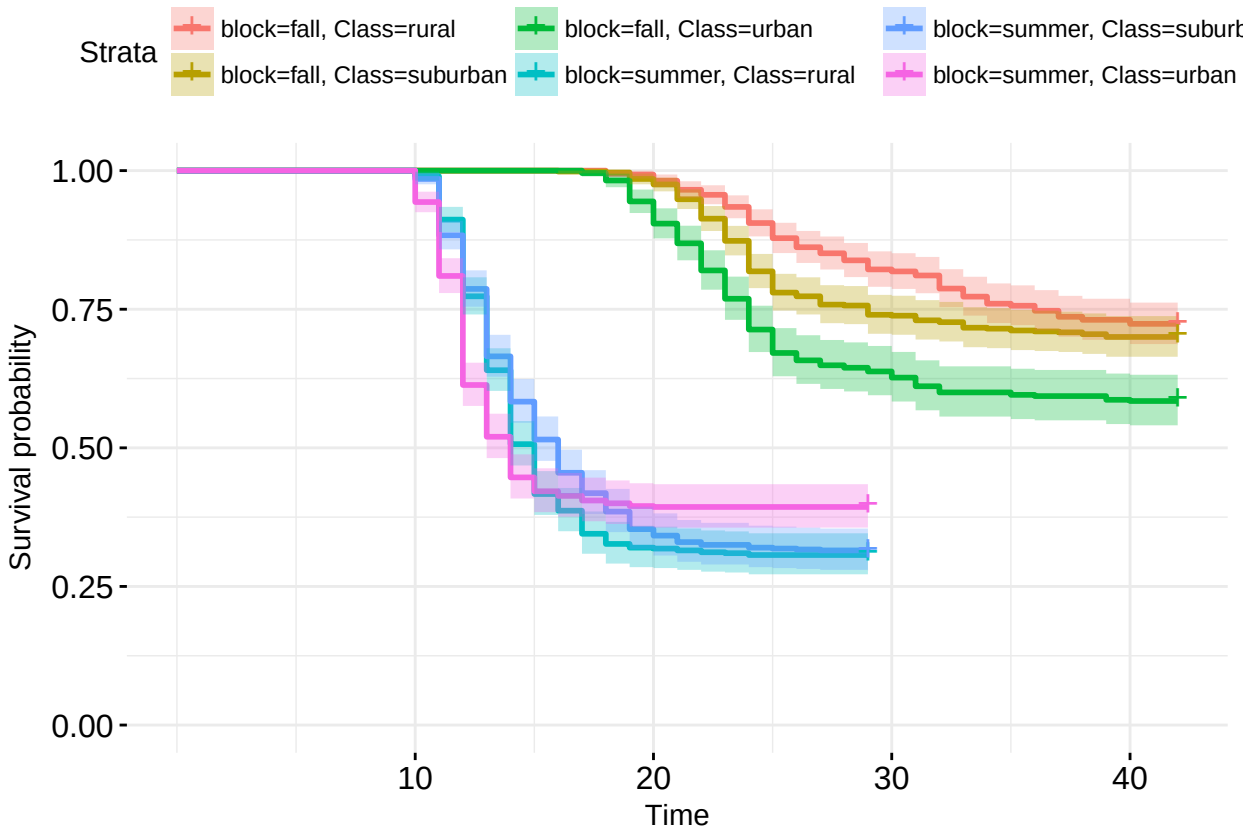
Survival Analysis

Format Data

Using `emergExp`, in which each mosquito has its own row, we then fillIn rows for mosquitoes which did not emerge. Again, assuming 50 F per tray.

Cox PH by Block and Season

```
## , , Class = rural
##
##      block
## event fall summer
##     0  397    184
##     1  153    416
##
## , , Class = suburban
##
##      block
## event fall summer
##     0  420    188
##     1  180    412
##
## , , Class = urban
##
##      block
## event fall summer
##     0  263    236
##     1  187    364
```



Summary: There is clearly an effect of season on emergence. Although it does seem that urban sites go from having lower emergence in the summer to higher in the fall, the survival models are not significantly different.

I think it makes the most sense to report on the survival statistics and show the curves, noting that the only significant differences are across season.