eDiValo Seedlings Natural Regeneration

## Setup and data structuring

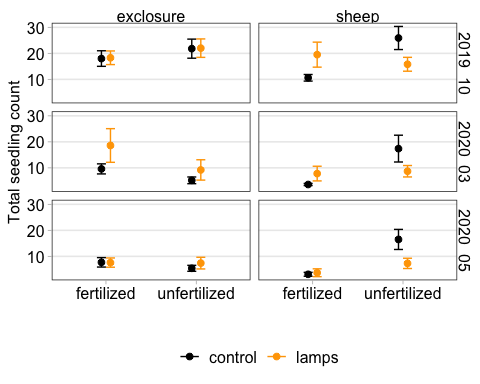
Loads libraries, sets up custom theme for ggplot, and reads in data (code not printed)

## Total seedlings count

Summary for plotting total and richness (code not printed)

Summary for analyzing total and richness (code not printed)

### Total seedling count plot



### Total seedling analysis

#### With time

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| grazing | -5.8 | -12, 0.48 | 0.073 |
| nutrient | 2.1 | -4.2, 8.4 | 0.5 |
| light | 3.3 | -2.5, 9.1 | 0.3 |
| month |  |  |  |
| 2019\_10 |  |  |  |
| 2020\_03 | -8.2 | -12, -4.2 | <0.001 |
| 2020\_05 | -12 | -16, -7.7 | <0.001 |
| 2020\_06 | -17 | -21, -13 | <0.001 |
| grazing \* nutrient | 12 | 3.5, 20 | 0.007 |
| grazing \* light | 0.23 | -7.8, 8.2 | >0.9 |
| grazing \* month |  |  |  |
| sheep \* 2020\_03 | 0.80 | -3.1, 4.7 | 0.7 |
| sheep \* 2020\_05 | 2.7 | -1.2, 6.6 | 0.2 |
| sheep \* 2020\_06 | 3.6 | -0.33, 7.5 | 0.074 |
| nutrient \* light | -1.9 | -9.9, 6.1 | 0.6 |
| nutrient \* month |  |  |  |
| unfertilized \* 2020\_03 | -4.5 | -8.5, -0.62 | 0.024 |
| unfertilized \* 2020\_05 | -1.1 | -5.1, 2.8 | 0.6 |
| unfertilized \* 2020\_06 | -2.3 | -6.2, 1.6 | 0.3 |
| light \* month |  |  |  |
| lamps \* 2020\_03 | 2.2 | -1.8, 6.1 | 0.3 |
| lamps \* 2020\_05 | -1.6 | -5.6, 2.3 | 0.4 |
| lamps \* 2020\_06 | 0.46 | -3.5, 4.4 | 0.8 |
| grazing \* nutrient \* light | -9.1 | -21, 2.6 | 0.13 |

Looking at October and March time points as 1. separate models or 2. a combined sum. I think we can make the argument that if we do it this way we won’t need time series analyses since we expect Oct seedlings to have died or grown by March, mostly not resampling the same individuals. But there are other approaches to this that use the time series angle.

#### Fall only

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| grazing | -7.4 | -16, 1.6 | 0.11 |
| nutrient | 3.8 | -5.2, 13 | 0.4 |
| light | 0.30 | -8.7, 9.3 | >0.9 |
| grazing \* nutrient | 11 | -1.3, 24 | 0.082 |
| grazing \* light | 8.6 | -4.2, 21 | 0.2 |
| nutrient \* light | -0.10 | -13, 13 | >0.9 |
| grazing \* nutrient \* light | -19 | -37, -0.87 | 0.044 |

#### Spring only

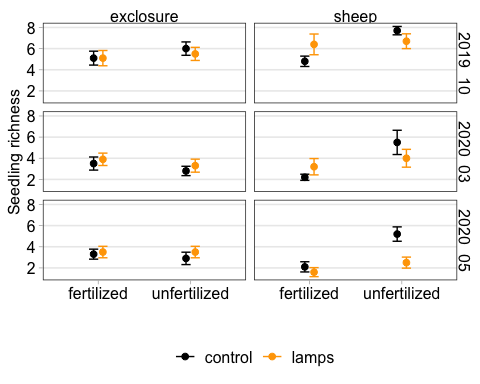
|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| grazing | -6.0 | -15, 3.4 | 0.2 |
| nutrient | -4.4 | -14, 5.0 | 0.4 |
| light | 9.0 | -0.38, 18 | 0.065 |
| grazing \* nutrient | 18 | 4.9, 31 | 0.009 |
| grazing \* light | -4.8 | -18, 8.5 | 0.5 |
| nutrient \* light | -5.0 | -18, 8.3 | 0.5 |
| grazing \* nutrient \* light | -7.9 | -27, 11 | 0.4 |

#### Both combined

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| grazing | -11 | -26, 3.6 | 0.14 |
| nutrient | 2.4 | -13, 18 | 0.8 |
| light | 8.5 | -6.5, 23 | 0.3 |
| grazing \* nutrient | 28 | 6.0, 49 | 0.015 |
| grazing \* light | 3.5 | -18, 25 | 0.7 |
| nutrient \* light | -4.3 | -26, 17 | 0.7 |
| grazing \* nutrient \* light | -26 | -57, 4.2 | 0.095 |

## Seedling richness

### Seedling richness plot



### Seedling richness analysis

#### With time

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| grazing | -0.10 | -1.3, 1.1 | 0.9 |
| nutrient | 0.30 | -0.91, 1.5 | 0.6 |
| light | 0.31 | -0.87, 1.5 | 0.6 |
| month |  |  |  |
| 2019\_10 |  |  |  |
| 2020\_03 | -1.9 | -2.9, -0.89 | <0.001 |
| 2020\_05 | -1.7 | -2.7, -0.72 | <0.001 |
| 2020\_06 | -4.3 | -5.3, -3.3 | <0.001 |
| grazing \* nutrient | 2.7 | 1.2, 4.2 | <0.001 |
| grazing \* light | 0.38 | -1.1, 1.8 | 0.6 |
| grazing \* month |  |  |  |
| sheep \* 2020\_03 | -0.62 | -1.6, 0.38 | 0.2 |
| sheep \* 2020\_05 | -1.4 | -2.4, -0.42 | 0.006 |
| sheep \* 2020\_06 | -0.57 | -1.6, 0.43 | 0.3 |
| nutrient \* light | -0.12 | -1.6, 1.3 | 0.9 |
| nutrient \* month |  |  |  |
| unfertilized \* 2020\_03 | -0.42 | -1.4, 0.58 | 0.4 |
| unfertilized \* 2020\_05 | -0.22 | -1.2, 0.78 | 0.7 |
| unfertilized \* 2020\_06 | -0.37 | -1.4, 0.63 | 0.5 |
| light \* month |  |  |  |
| lamps \* 2020\_03 | 0.12 | -0.89, 1.1 | 0.8 |
| lamps \* 2020\_05 | -0.58 | -1.6, 0.43 | 0.3 |
| lamps \* 2020\_06 | 0.12 | -0.89, 1.1 | 0.8 |
| grazing \* nutrient \* light | -1.8 | -3.9, 0.27 | 0.092 |

#### Fall only

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **log(IRR)** | **95% CI** | **p-value** |
| grazing | -0.06 | -0.45, 0.33 | 0.8 |
| nutrient | 0.16 | -0.21, 0.54 | 0.4 |
| light | 0.00 | -0.39, 0.39 | >0.9 |
| grazing \* nutrient | 0.31 | -0.21, 0.83 | 0.2 |
| grazing \* light | 0.29 | -0.25, 0.83 | 0.3 |
| nutrient \* light | -0.09 | -0.62, 0.45 | 0.7 |
| grazing \* nutrient \* light | -0.34 | -1.1, 0.39 | 0.4 |

#### Spring only

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **log(IRR)** | **95% CI** | **p-value** |
| grazing | -0.46 | -1.00, 0.07 | 0.087 |
| nutrient | -0.22 | -0.72, 0.27 | 0.4 |
| light | 0.11 | -0.35, 0.56 | 0.6 |
| grazing \* nutrient | 1.1 | 0.44, 1.8 | 0.001 |
| grazing \* light | 0.27 | -0.44, 0.97 | 0.5 |
| nutrient \* light | 0.06 | -0.62, 0.73 | 0.9 |
| grazing \* nutrient \* light | -0.75 | -1.7, 0.21 | 0.12 |

#### Both combined

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **log(IRR)** | **95% CI** | **p-value** |
| grazing | -0.19 | -0.51, 0.12 | 0.2 |
| nutrient | 0.12 | -0.17, 0.42 | 0.4 |
| light | 0.05 | -0.25, 0.34 | 0.8 |
| grazing \* nutrient | 0.60 | 0.18, 1.0 | 0.005 |
| grazing \* light | 0.27 | -0.16, 0.70 | 0.2 |
| nutrient \* light | -0.05 | -0.46, 0.37 | 0.8 |
| grazing \* nutrient \* light | -0.48 | -1.1, 0.10 | 0.10 |

#### April/May

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **log(IRR)** | **95% CI** | **p-value** |
| grazing | -0.45 | -1.00, 0.09 | 0.10 |
| nutrient | -0.13 | -0.63, 0.37 | 0.6 |
| light | 0.06 | -0.42, 0.53 | 0.8 |
| grazing \* nutrient | 1.0 | 0.33, 1.7 | 0.004 |
| grazing \* light | -0.33 | -1.1, 0.47 | 0.4 |
| nutrient \* light | 0.13 | -0.55, 0.81 | 0.7 |
| grazing \* nutrient \* light | -0.59 | -1.6, 0.47 | 0.3 |

## Seedling Traits

For the trait analyses we will look at the data sliced a slightly different way–the max number of seedlings per species across the time points (peak emergence for each species)

### Species traits abundance models

The data is overdispersed and/or zero-inflated. We want to try to put together a model format that seems reasonable before adding in the trait data. Using the ‘glmmTMB’ package, which is detailed in “glmmTMB Balances Speed and Flexibility Among Packages for Zero-inflated Generalized Linear Mixed Modeling” by Brooks et al 2017, and the AICtab() function in the ‘bblme’ package for convenient AIC comparisons of different models.

Options for model distrubtions are: Poisson, and negative binomial, as well as zero-inflated or hurdle models. Starting with just the simple ones, negative binomial is much better than poisson and seems to do pretty well.

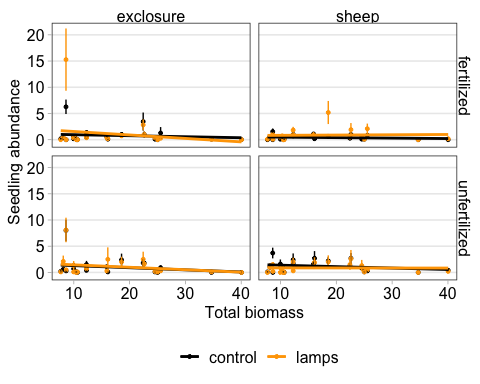
Can try looking at the zero-inflated forms later. For the zi setup, could consider doing a random factor for species in the zero-inflation part, and then the trait in the abundance-if-present part?

Moving forward to the trait analyses. Running preliminary analyses for now with each trait separately. Could also consider models that include multiple traits, especially since most of the traits aren’t strongly correlated with each other.

For each trait, we are comparing five models: 0 – null model without the traits, with a random variable for species 1 – just the trait, no random variable for species 2 – trait and random variable for species full – all 2-way, 3-way, and 4-way interactions specific – 3-way interactions for grazing x light x trait and grazing x light x nutrients, which are the ones that are significant in some of the models.

Results below each model show the summary for the specific model, an AIC table comparing these options, and the under- or over-dispersion coefficient.

### Total biomass

Preliminary plot of raw data 

Preliminary analysis of total biomass trait using a negative binomial distribution.

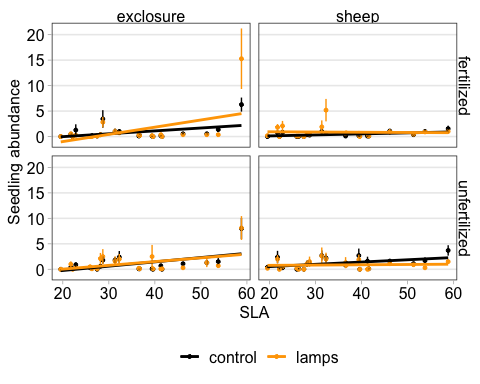
## Family: nbinom2 ( log )  
## Formula:   
## count.max ~ grazing \* nutrient + light + bm.tot + light \* grazing \*   
## bm.tot + light \* grazing \* nutrient + (1 | species) + (1 |   
## block:plotid)  
## Data: nat.seedlings.traits  
##   
## AIC BIC logLik deviance df.resid   
## 3618.9 3701.1 -1794.5 3588.9 1749   
##   
## Random effects:  
##   
## Conditional model:  
## Groups Name Variance Std.Dev.  
## species (Intercept) 2.1960 1.4819   
## block:plotid (Intercept) 0.2126 0.4611   
## Number of obs: 1764, groups: species, 21; block:plotid, 80  
##   
## Overdispersion parameter for nbinom2 family (): 0.547   
##   
## Conditional model:  
## Estimate Std. Error z value  
## (Intercept) -0.570288 0.766771 -0.744  
## grazingsheep -0.462032 0.445450 -1.037  
## nutrientunfertilized 0.314901 0.281631 1.118  
## lightlamps 0.371599 0.413202 0.899  
## bm.tot -0.043618 0.039841 -1.095  
## grazingsheep:nutrientunfertilized 0.819363 0.406056 2.018  
## grazingsheep:lightlamps -0.163276 0.606388 -0.269  
## lightlamps:bm.tot -0.022975 0.021173 -1.085  
## grazingsheep:bm.tot 0.009146 0.021211 0.431  
## nutrientunfertilized:lightlamps -0.036093 0.388629 -0.093  
## grazingsheep:lightlamps:bm.tot 0.052388 0.029274 1.790  
## grazingsheep:nutrientunfertilized:lightlamps -1.120730 0.565313 -1.982  
## Pr(>|z|)   
## (Intercept) 0.4570   
## grazingsheep 0.2996   
## nutrientunfertilized 0.2635   
## lightlamps 0.3685   
## bm.tot 0.2736   
## grazingsheep:nutrientunfertilized 0.0436 \*  
## grazingsheep:lightlamps 0.7877   
## lightlamps:bm.tot 0.2779   
## grazingsheep:bm.tot 0.6663   
## nutrientunfertilized:lightlamps 0.9260   
## grazingsheep:lightlamps:bm.tot 0.0735 .  
## grazingsheep:nutrientunfertilized:lightlamps 0.0474 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## dAIC df  
## m.biomass.specific 0.0 15  
## m.biomass.0 3.3 8   
## m.biomass.2 4.5 9   
## m.biomass.full 4.7 19  
## m.biomass.1 433.1 8

## [1] 0.8960955

### SLA

Preliminary plot of raw data



Preliminary analysis of SLA

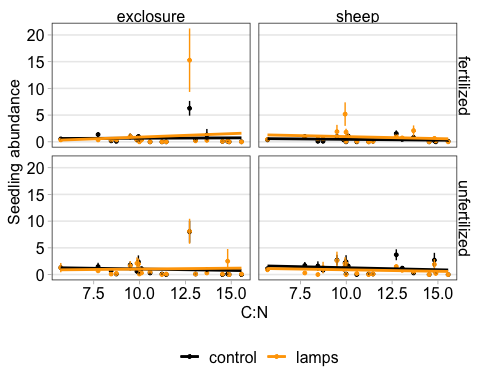
## Family: nbinom2 ( log )  
## Formula:   
## count.max ~ grazing \* nutrient + light + sla.2 + light \* grazing \*   
## sla.2 + grazing \* nutrient \* light + (1 | species) + (1 |   
## block:plotid)  
## Data: nat.seedlings.traits  
##   
## AIC BIC logLik deviance df.resid   
## 3605.2 3687.3 -1787.6 3575.2 1749   
##   
## Random effects:  
##   
## Conditional model:  
## Groups Name Variance Std.Dev.  
## species (Intercept) 1.8834 1.3724   
## block:plotid (Intercept) 0.2293 0.4789   
## Number of obs: 1764, groups: species, 21; block:plotid, 80  
##   
## Overdispersion parameter for nbinom2 family (): 0.57   
##   
## Conditional model:  
## Estimate Std. Error z value  
## (Intercept) -3.612193 1.087142 -3.323  
## grazingsheep 0.032836 0.549965 0.060  
## nutrientunfertilized 0.306959 0.285961 1.073  
## lightlamps -0.361891 0.524493 -0.690  
## sla.2 0.065797 0.029036 2.266  
## grazingsheep:nutrientunfertilized 0.820469 0.411833 1.992  
## grazingsheep:lightlamps 2.289591 0.761706 3.006  
## lightlamps:sla.2 0.009456 0.011464 0.825  
## grazingsheep:sla.2 -0.009340 0.012275 -0.761  
## nutrientunfertilized:lightlamps 0.008819 0.395176 0.022  
## grazingsheep:lightlamps:sla.2 -0.044547 0.017131 -2.600  
## grazingsheep:nutrientunfertilized:lightlamps -1.155122 0.573714 -2.013  
## Pr(>|z|)   
## (Intercept) 0.000892 \*\*\*  
## grazingsheep 0.952391   
## nutrientunfertilized 0.283079   
## lightlamps 0.490206   
## sla.2 0.023448 \*   
## grazingsheep:nutrientunfertilized 0.046345 \*   
## grazingsheep:lightlamps 0.002648 \*\*   
## lightlamps:sla.2 0.409464   
## grazingsheep:sla.2 0.446713   
## nutrientunfertilized:lightlamps 0.982196   
## grazingsheep:lightlamps:sla.2 0.009313 \*\*   
## grazingsheep:nutrientunfertilized:lightlamps 0.044071 \*   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## dAIC df  
## m.sla.specific 0.0 15  
## m.sla.full 5.1 19  
## m.sla.2 15.5 9   
## m.sla.0 17.1 8   
## m.sla.1 386.4 8

## [1] 0.9028797

### C:N

Preliminary plot of raw data



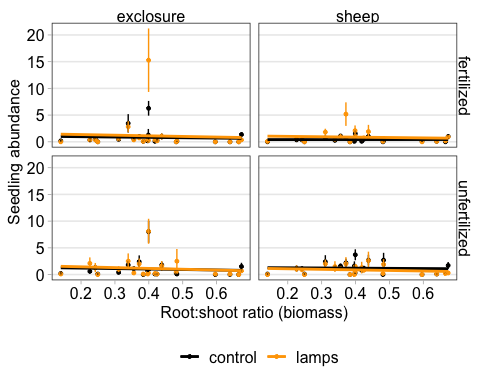
Preliminary analysis of C:N. Here there are two specific models, a includes the 3-way interaction between light, grazing, and C:N (which is not significant, but is consistent with the other models above. Also the light x C:N interaction is significant) and b which drops this interaction but then also loses the significance of the light x C:N interaction (but has a better AIC value). Really it’s a question of how we want to present/evaluate models–one option is to keep the same “specific” format for all traits, the other is to select it individually for each trait. Also if we are evaluating models based on their predicted significant interactions or on the AIC comparisons.

## Family: nbinom2 ( log )  
## Formula: count.max ~ grazing \* nutrient + light + c.n.ratio + light \*   
## grazing \* c.n.ratio + grazing \* nutrient \* light + (1 | species) +   
## (1 | block:plotid)  
## Data: nat.seedlings.traits  
##   
## AIC BIC logLik deviance df.resid   
## 3313.5 3394.9 -1641.7 3283.5 1665   
##   
## Random effects:  
##   
## Conditional model:  
## Groups Name Variance Std.Dev.  
## species (Intercept) 2.0498 1.4317   
## block:plotid (Intercept) 0.2771 0.5264   
## Number of obs: 1680, groups: species, 20; block:plotid, 80  
##   
## Overdispersion parameter for nbinom2 family (): 0.575   
##   
## Conditional model:  
## Estimate Std. Error z value  
## (Intercept) 1.63139 1.51901 1.074  
## grazingsheep -0.91280 0.71879 -1.270  
## nutrientunfertilized 0.40667 0.30825 1.319  
## lightlamps -1.31714 0.73069 -1.803  
## c.n.ratio -0.28862 0.13353 -2.161  
## grazingsheep:nutrientunfertilized 0.71482 0.44219 1.616  
## grazingsheep:lightlamps 1.65312 1.00994 1.637  
## lightlamps:c.n.ratio 0.12507 0.06202 2.017  
## grazingsheep:c.n.ratio 0.07549 0.06162 1.225  
## nutrientunfertilized:lightlamps -0.01409 0.42316 -0.033  
## grazingsheep:lightlamps:c.n.ratio -0.08985 0.08558 -1.050  
## grazingsheep:nutrientunfertilized:lightlamps -1.21406 0.61467 -1.975  
## Pr(>|z|)   
## (Intercept) 0.2828   
## grazingsheep 0.2041   
## nutrientunfertilized 0.1871   
## lightlamps 0.0715 .  
## c.n.ratio 0.0307 \*  
## grazingsheep:nutrientunfertilized 0.1060   
## grazingsheep:lightlamps 0.1017   
## lightlamps:c.n.ratio 0.0437 \*  
## grazingsheep:c.n.ratio 0.2205   
## nutrientunfertilized:lightlamps 0.9734   
## grazingsheep:lightlamps:c.n.ratio 0.2938   
## grazingsheep:nutrientunfertilized:lightlamps 0.0483 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## dAIC df  
## m.cn.specific.b 0.0 13  
## m.cn.specific.a 2.4 15  
## m.cn.2 2.7 9   
## m.cn.full 7.6 19  
## m.cn.0 311.2 8   
## m.cn.1 459.8 8

## [1] 0.8488508

### Root-shoot ratio

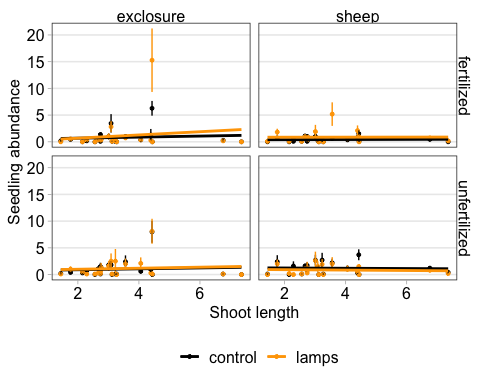
Preliminary plot of raw data 

## Family: nbinom2 ( log )  
## Formula:   
## count.max ~ grazing \* nutrient + light + rt.sh.bm + light \* grazing \*   
## rt.sh.bm + grazing \* nutrient \* light + (1 | species) + (1 |   
## block:plotid)  
## Data: nat.seedlings.traits  
##   
## AIC BIC logLik deviance df.resid   
## 3623.6 3705.7 -1796.8 3593.6 1749   
##   
## Random effects:  
##   
## Conditional model:  
## Groups Name Variance Std.Dev.  
## species (Intercept) 2.2329 1.4943   
## block:plotid (Intercept) 0.2155 0.4643   
## Number of obs: 1764, groups: species, 21; block:plotid, 80  
##   
## Overdispersion parameter for nbinom2 family (): 0.538   
##   
## Conditional model:  
## Estimate Std. Error z value  
## (Intercept) -0.35270 1.09730 -0.321  
## grazingsheep -1.04020 0.56717 -1.834  
## nutrientunfertilized 0.32163 0.28354 1.134  
## lightlamps 0.28396 0.56096 0.506  
## rt.sh.bm -2.33316 2.51423 -0.928  
## grazingsheep:nutrientunfertilized 0.81477 0.40854 1.994  
## grazingsheep:lightlamps 0.87828 0.80317 1.093  
## lightlamps:rt.sh.bm -0.65264 1.26070 -0.518  
## grazingsheep:rt.sh.bm 1.81416 1.20034 1.511  
## nutrientunfertilized:lightlamps -0.03474 0.39094 -0.089  
## grazingsheep:lightlamps:rt.sh.bm -0.47120 1.75116 -0.269  
## grazingsheep:nutrientunfertilized:lightlamps -1.13411 0.56871 -1.994  
## Pr(>|z|)   
## (Intercept) 0.7479   
## grazingsheep 0.0667 .  
## nutrientunfertilized 0.2566   
## lightlamps 0.6127   
## rt.sh.bm 0.3534   
## grazingsheep:nutrientunfertilized 0.0461 \*  
## grazingsheep:lightlamps 0.2742   
## lightlamps:rt.sh.bm 0.6047   
## grazingsheep:rt.sh.bm 0.1307   
## nutrientunfertilized:lightlamps 0.9292   
## grazingsheep:lightlamps:rt.sh.bm 0.7879   
## grazingsheep:nutrientunfertilized:lightlamps 0.0461 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## dAIC df  
## m.rt.sh.bm.0 0.0 8   
## m.rt.sh.bm.specific 1.3 15  
## m.rt.sh.bm.2 1.4 9   
## m.rt.sh.bm.full 8.7 19  
## m.rt.sh.bm.1 451.5 8

## [1] 0.8786404

### Shoot length plot

Preliminary plot of raw data 

## Family: nbinom2 ( log )  
## Formula:   
## count.max ~ grazing \* nutrient + light + len.sh + light \* grazing \*   
## len.sh + grazing \* nutrient \* light + (1 | species) + (1 |   
## block:plotid)  
## Data: nat.seedlings.traits  
##   
## AIC BIC logLik deviance df.resid   
## 3626.7 3708.8 -1798.3 3596.7 1749   
##   
## Random effects:  
##   
## Conditional model:  
## Groups Name Variance Std.Dev.  
## species (Intercept) 2.3041 1.518   
## block:plotid (Intercept) 0.2181 0.467   
## Number of obs: 1764, groups: species, 21; block:plotid, 80  
##   
## Overdispersion parameter for nbinom2 family (): 0.534   
##   
## Conditional model:  
## Estimate Std. Error z value  
## (Intercept) -0.87069 0.94562 -0.921  
## grazingsheep -0.73703 0.51013 -1.445  
## nutrientunfertilized 0.31407 0.28444 1.104  
## lightlamps -0.40446 0.52609 -0.769  
## len.sh -0.12723 0.25249 -0.504  
## grazingsheep:nutrientunfertilized 0.82357 0.41023 2.008  
## grazingsheep:lightlamps 1.00606 0.70715 1.423  
## lightlamps:len.sh 0.12500 0.12995 0.962  
## grazingsheep:len.sh 0.12638 0.12303 1.027  
## nutrientunfertilized:lightlamps -0.01540 0.39246 -0.039  
## grazingsheep:lightlamps:len.sh -0.09482 0.16923 -0.560  
## grazingsheep:nutrientunfertilized:lightlamps -1.15585 0.57108 -2.024  
## Pr(>|z|)   
## (Intercept) 0.3572   
## grazingsheep 0.1485   
## nutrientunfertilized 0.2695   
## lightlamps 0.4420   
## len.sh 0.6143   
## grazingsheep:nutrientunfertilized 0.0447 \*  
## grazingsheep:lightlamps 0.1548   
## lightlamps:len.sh 0.3361   
## grazingsheep:len.sh 0.3043   
## nutrientunfertilized:lightlamps 0.9687   
## grazingsheep:lightlamps:len.sh 0.5753   
## grazingsheep:nutrientunfertilized:lightlamps 0.0430 \*  
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

## dAIC df  
## m.len.sh.0 0.0 8   
## m.len.sh.2 2.0 9   
## m.len.sh.specific 4.4 15  
## m.len.sh.full 9.9 19  
## m.len.sh.1 452.9 8

## [1] 0.8821429