

Seedling and Sapling Mortality: Finding Ideal Parameters

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1 Summary

This paper explores the range of values and accuracy of the *Seedling and Sapling Mortality* parameter in SORTIE-ND for adult trees in our validation plots. For each set of parameters in the 081815c runs, I varied them by 10% to test whether adjusting the parameters would increase the overall model fit. This will also give us an idea of how much swing these parameters have within the simulations.

For each species/step combination, I'll need to evaluate whether the parameters improve or hurt the model fit. I'll be using a general linear model that regresses the expected values (the "realPlots" means) against the simulated values of the model. The model improves as the slope approaches 1. If realPlots data are on the y-axis, then points or lines that fall above the "1" demarkation line are *underpredicting* the true value; and points or lines that fall below the "1" demarkation line are *overpredicting* the true value.

We'll need to view all of the data – data for the 90, 100, and 110 percent values of the parameters – before we can conduct the analysis.

View the Rnw document to view the code; otherwise, I am only printing outputs to save some space and make this document more readable.

2 Basal Area: At the nintieith percentile

Call:

```
lm(formula = SimAbsBA ~ ExpAbsBA, data = PlotMeans)
```

Residuals:

Min	1Q	Median	3Q	Max
-24.9126	0.5499	1.9937	2.1440	12.1954

Coefficients:

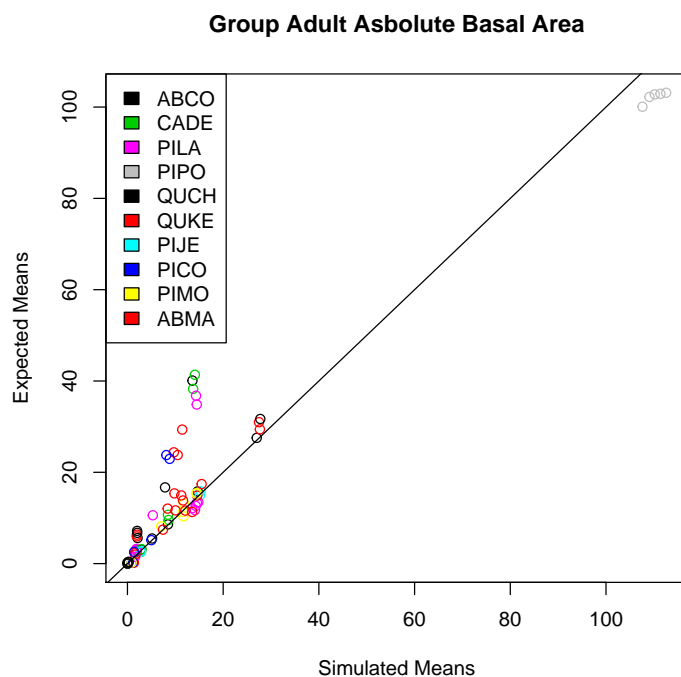
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-2.10150	0.75937	-2.767	0.00673 **
ExpAbsBA	0.99359	0.02866	34.663	< 2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

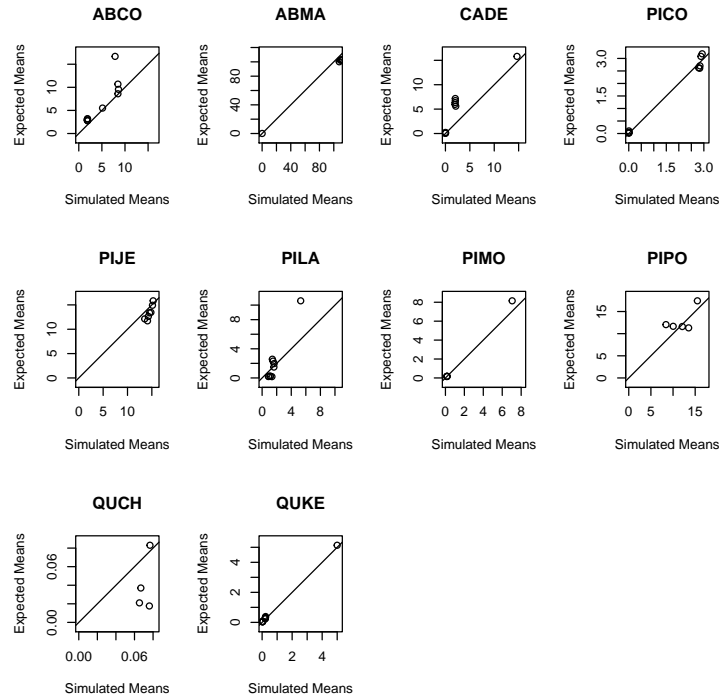
Residual standard error: 6.558 on 100 degrees of freedom

Multiple R-squared: 0.9232, Adjusted R-squared: 0.9224

F-statistic: 1202 on 1 and 100 DF, p-value: < 2.2e-16



Now, how are the individual species doing?



```
> sppSlopes
```

```

species      ba90
1      ABCO 2.8766174
2      ABMA 0.9271300
3      CADE 1.0052458
4      PICO 0.9819008
5      PIJE 2.2122491
6      PILA 2.7750609
7      PIMO 1.1395556
8      PIPO 0.5983266
9      QUCH 2.3647787
10     QUKE 1.0449249
```

3 At the original parameter designation

Call:

```
lm(formula = SimAbsBA ~ ExpAbsBA, data = PlotMeans)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-24.5872	0.6374	1.8231	2.1861	11.1059

Coefficients:

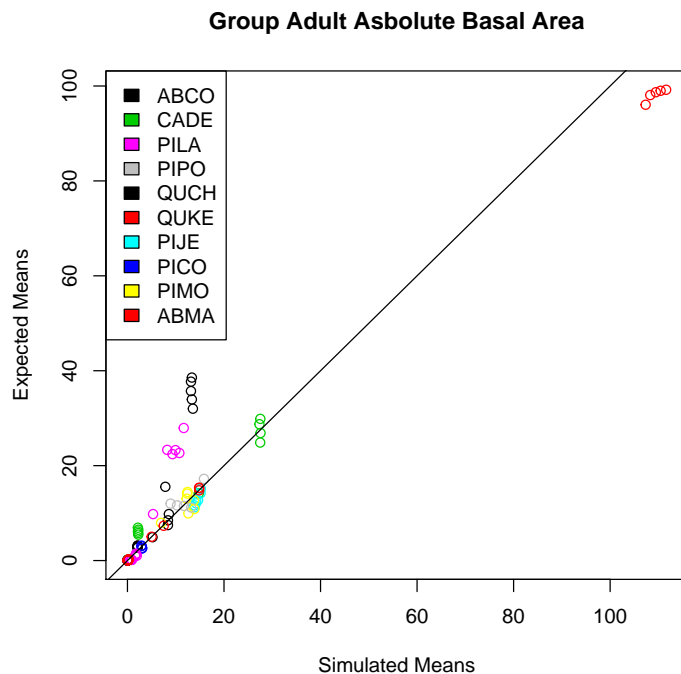
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-1.8487	0.7418	-2.492	0.0143 *
ExpAbsBA	1.0316	0.0293	35.208	<2e-16 ***

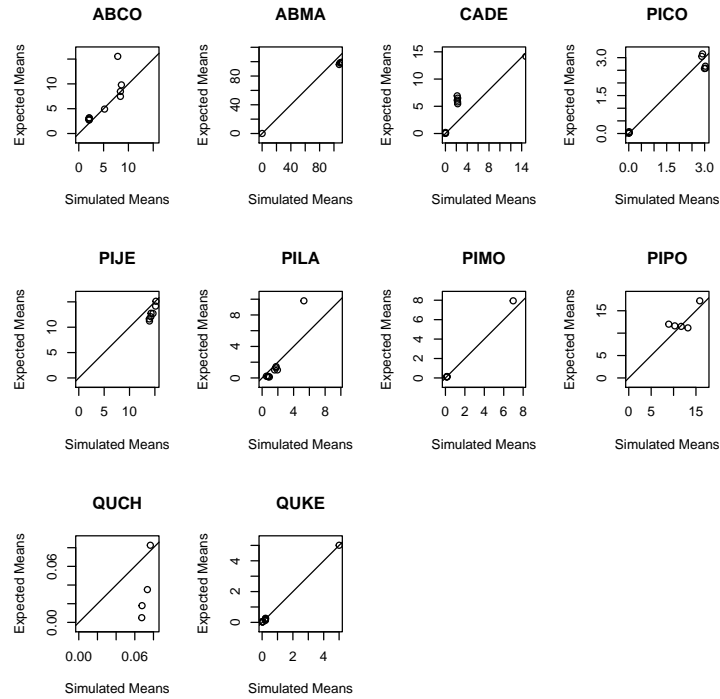
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.421 on 100 degrees of freedom

Multiple R-squared: 0.9254, Adjusted R-squared: 0.9246

F-statistic: 1240 on 1 and 100 DF, p-value: < 2.2e-16





```
> sppSlopes

species    ba90    ba100
1   ABCO 2.8766174 2.8679859
2   ABMA 0.9271300 0.8968508
3   CADE 1.0052458 0.9240230
4   PICO 0.9819008 0.9295847
5   PIJE 2.2122491 2.4811348
6   PILA 2.7750609 2.5907967
7   PIMO 1.1395556 0.9567542
8   PIPO 0.5983266 0.6919119
9   QUCH 2.3647787 7.0914178
10  QUKE 1.0449249 1.0172449
```

4 At the one hundred and tenth percentile

Call:

```
lm(formula = SimAbsBA ~ ExpAbsBA, data = PlotMeans)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-25.9582	0.8691	1.8924	2.0398	11.3801

Coefficients:

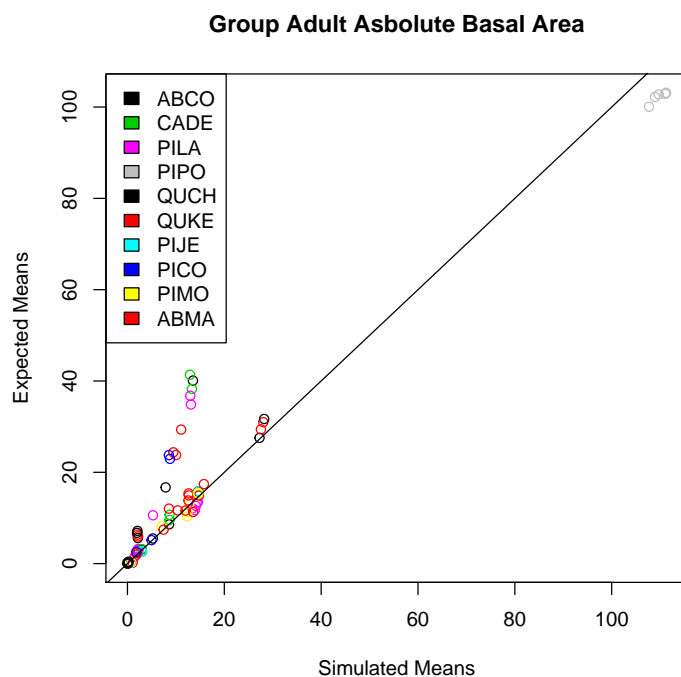
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	-1.98195	0.77226	-2.566	0.0118 *
ExpAbsBA	0.98767	0.02915	33.882	<2e-16 ***

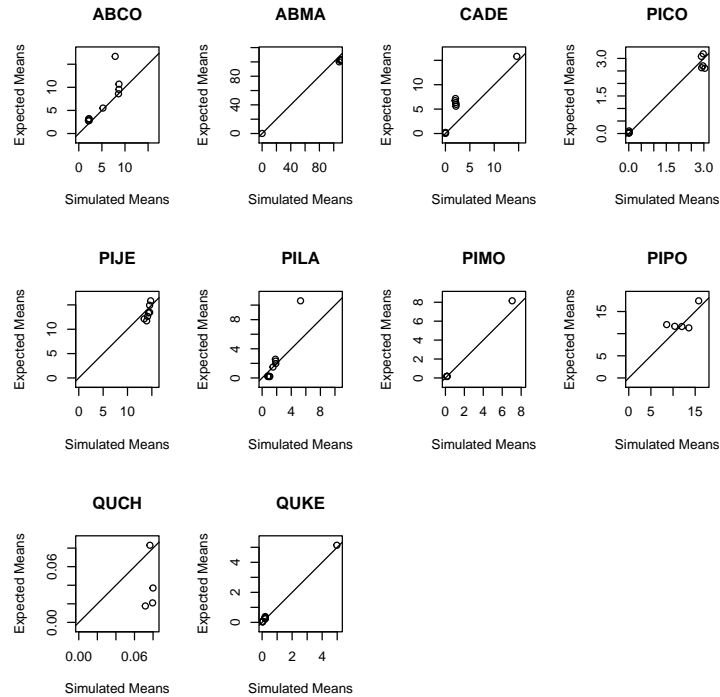
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 6.67 on 100 degrees of freedom

Multiple R-squared: 0.9199, Adjusted R-squared: 0.9191

F-statistic: 1148 on 1 and 100 DF, p-value: < 2.2e-16





```
> sppSlopes

species    ba90    ba100    ba110
1   ABCO 2.8766174 2.8679859 3.1357509
2   ABMA 0.9271300 0.8968508 0.9311750
3   CADE 1.0052458 0.9240230 0.9966785
4   PICO 0.9819008 0.9295847 0.9463342
5   PIJE 2.2122491 2.4811348 2.7615084
6   PILA 2.7750609 2.5907967 2.8381504
7   PIMO 1.1395556 0.9567542 1.0481454
8   PIPO 0.5983266 0.6919119 0.6280481
9   QUCH 2.3647787 7.0914178 1.0675412
10  QUKE 1.0449249 1.0172449 1.0323242
```

5 Adult Density: At the ninetieth percentile

Call:

```
lm(formula = SimAbsDen ~ ExpAbsDen, data = PlotMeans)
```

Residuals:

Min	1Q	Median	3Q	Max
-810.53	-77.19	-52.97	-8.45	800.04

Coefficients:

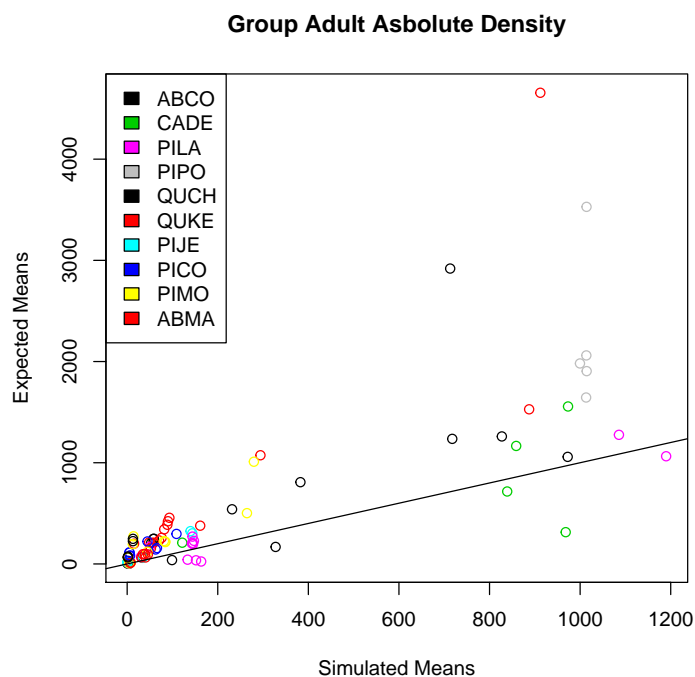
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	55.70159	23.78273	2.342	0.0212 *
ExpAbsDen	0.35802	0.02741	13.060	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

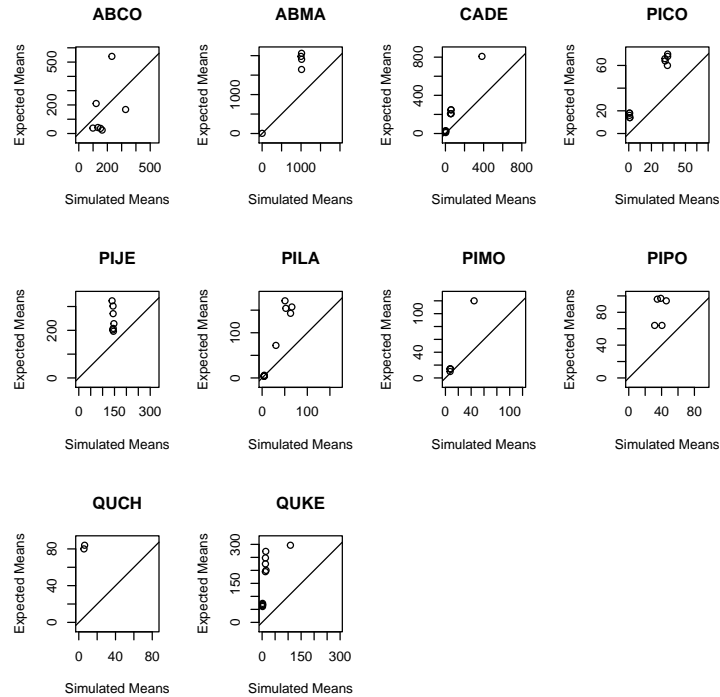
Residual standard error: 207.3 on 100 degrees of freedom

Multiple R-squared: 0.6304, Adjusted R-squared: 0.6267

F-statistic: 170.6 on 1 and 100 DF, p-value: < 2.2e-16



Now, how are the individual species doing?



> sppSlopes

	species	ba90	ba100	ba110	den90
1	ABCO	2.8766174	2.8679859	3.1357509	1.220608
2	ABMA	0.9271300	0.8968508	0.9311750	2.202152
3	CADE	1.0052458	0.9240230	0.9966785	2.296417
4	PICO	0.9819008	0.9295847	0.9463342	1.521204
5	PIJE	2.2122491	2.4811348	2.7615084	-13.629032
6	PILA	2.7750609	2.5907967	2.8381504	3.549251
7	PIMO	1.1395556	0.9567542	1.0481454	4.031545
8	PIPO	0.5983266	0.6919119	0.6280481	1.134669
9	QUCH	2.3647787	7.0914178	1.0675412	-23.467487
10	QUKE	1.0449249	1.0172449	1.0323242	2.591498

6 At the original parameter designation

Call:

```
lm(formula = SimAbsDen ~ ExpAbsDen, data = PlotMeans)
```

Residuals:

Min	1Q	Median	3Q	Max
-776.11	-73.57	-48.99	-4.74	687.39

Coefficients:

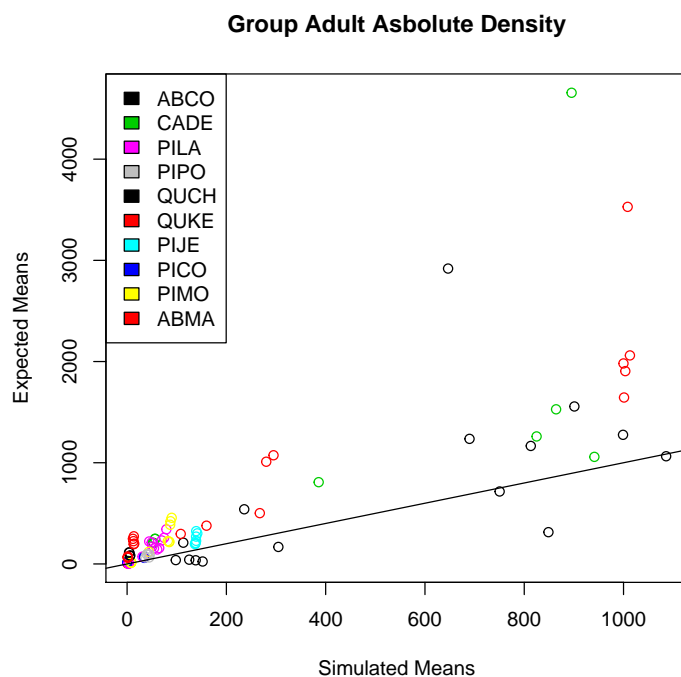
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	52.13734	22.09152	2.36	0.0202 *
ExpAbsDen	0.34780	0.02546	13.66	<2e-16 ***

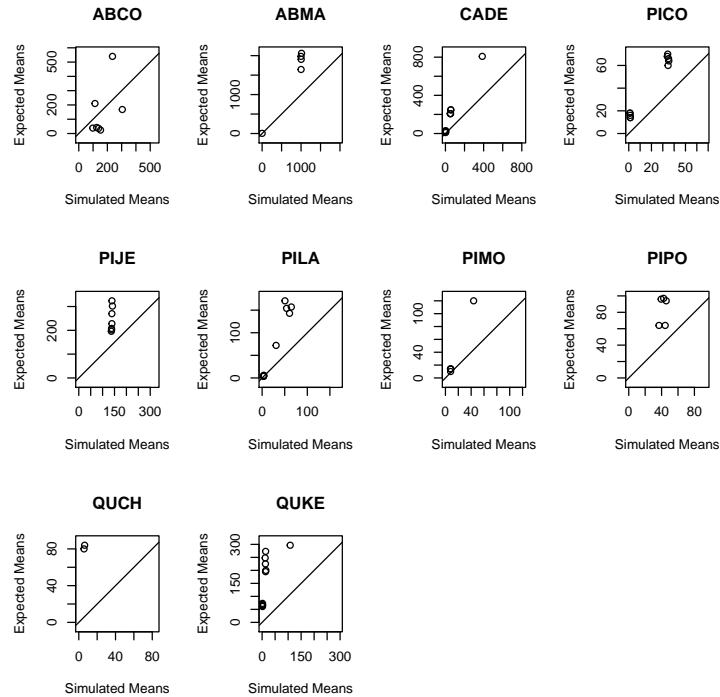
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 192.5 on 100 degrees of freedom

Multiple R-squared: 0.651, Adjusted R-squared: 0.6475

F-statistic: 186.6 on 1 and 100 DF, p-value: < 2.2e-16





> sppSlopes

	species	ba90	ba100	ba110	den90	den100
1	ABCO	2.8766174	2.8679859	3.1357509	1.220608	1.366993
2	ABMA	0.9271300	0.8968508	0.9311750	2.202152	2.218563
3	CADE	1.0052458	0.9240230	0.9966785	2.296417	2.345902
4	PICO	0.9819008	0.9295847	0.9463342	1.521204	1.479854
5	PIJE	2.2122491	2.4811348	2.7615084	-13.629032	27.477350
6	PILA	2.7750609	2.5907967	2.8381504	3.549251	3.557684
7	PIMO	1.1395556	0.9567542	1.0481454	4.031545	4.056143
8	PIPO	0.5983266	0.6919119	0.6280481	1.134669	1.296860
9	QUCH	2.3647787	7.0914178	1.0675412	-23.467487	-15.618990
10	QUKE	1.0449249	1.0172449	1.0323242	2.591498	2.577005

7 At the one hundred and tenth percentile

Call:

```
lm(formula = SimAbsDen ~ ExpAbsDen, data = PlotMeans)
```

Residuals:

Min	1Q	Median	3Q	Max
-753.40	-69.28	-46.22	2.88	626.56

Coefficients:

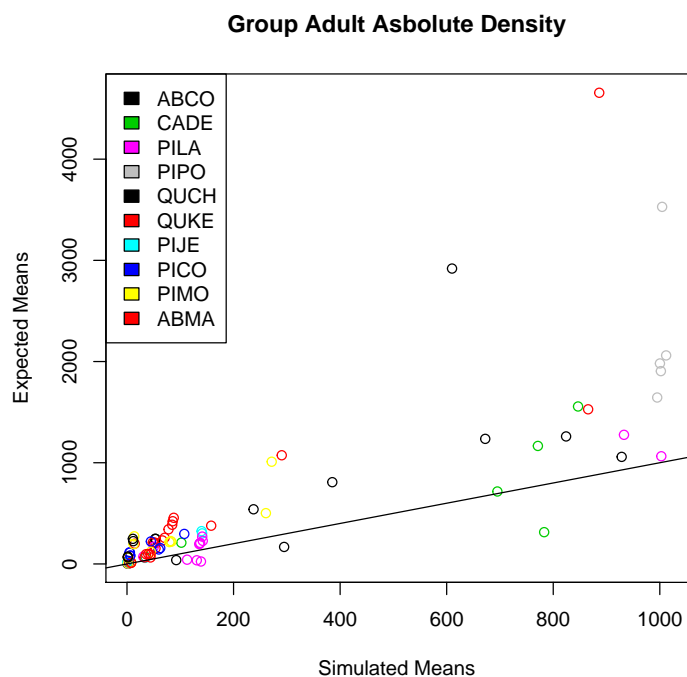
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	49.11265	21.05987	2.332	0.0217 *
ExpAbsDen	0.34163	0.02427	14.074	<2e-16 ***

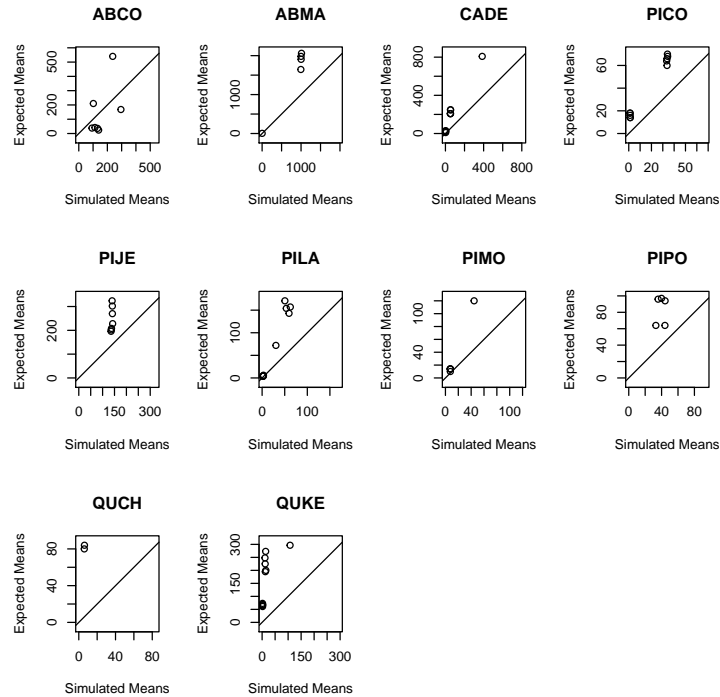
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 183.6 on 100 degrees of freedom

Multiple R-squared: 0.6645, Adjusted R-squared: 0.6611

F-statistic: 198.1 on 1 and 100 DF, p-value: < 2.2e-16





```
> sppSlopes
```

	species	ba90	ba100	ba110	den90	den100	den110
1	ABCO	2.8766174	2.8679859	3.1357509	1.220608	1.366993	1.4889018
2	ABMA	0.9271300	0.8968508	0.9311750	2.202152	2.218563	2.2226695
3	CADE	1.0052458	0.9240230	0.9966785	2.296417	2.345902	2.3562069
4	PICO	0.9819008	0.9295847	0.9463342	1.521204	1.479854	1.5199374
5	PIJE	2.2122491	2.4811348	2.7615084	-13.629032	27.477350	13.0711825
6	PILA	2.7750609	2.5907967	2.8381504	3.549251	3.557684	3.6246472
7	PIMO	1.1395556	0.9567542	1.0481454	4.031545	4.056143	4.1586607
8	PIPO	0.5983266	0.6919119	0.6280481	1.134669	1.296860	0.4535111
9	QUCH	2.3647787	7.0914178	1.0675412	-23.467487	-15.618990	-24.5395020
10	QUKE	1.0449249	1.0172449	1.0323242	2.591498	2.577005	2.6338477

```
> write.csv(sppSlopes, file=paste(parName, ".csv", sep=""))
```