Adult Mortality: Finding Ideal Parameters

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1   Summary

This paper explores the range of values and accuracy of the *Stochastic 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 nintieth percentile

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

Residuals:
    Min      1Q   Median      3Q     Max
-25.2830   0.1648   1.8907   2.0497  11.8904

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -1.97982    0.76754  -2.579   0.0114 *
ExpAbsBA     0.99114    0.02897  34.210   <2e-16 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 6.629 on 100 degrees of freedom
Multiple R-squared:  0.9213,        Adjusted R-squared:  0.9205
F-statistic:  1170 on 1 and 100 DF,  p-value: < 2.2e-16
```
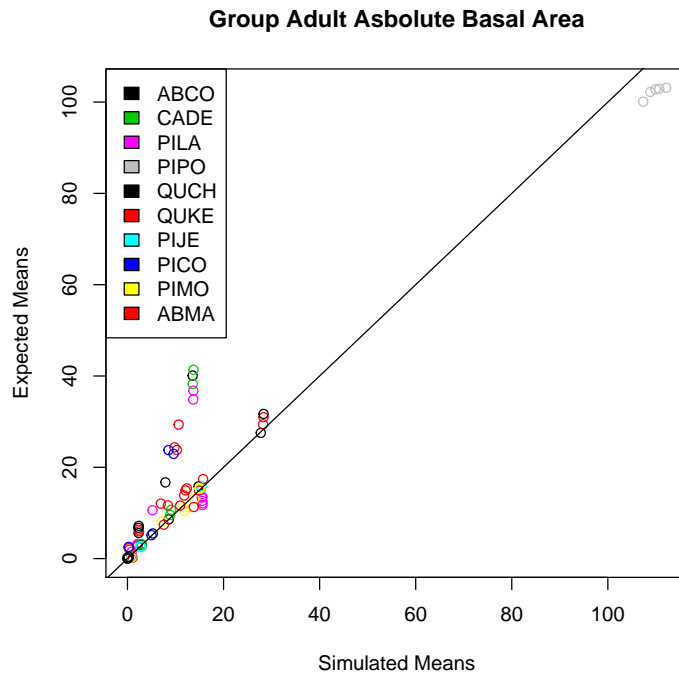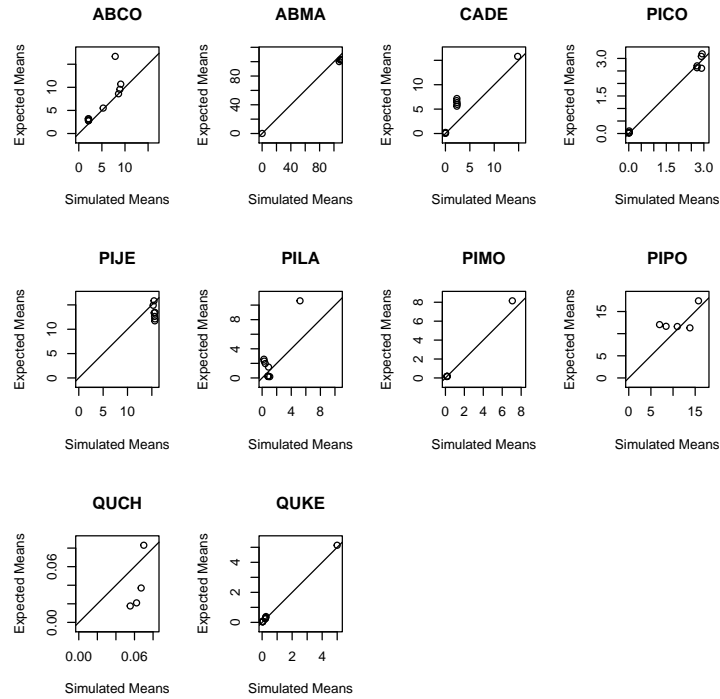
Group Adult Asbolute Basal Area

Now, how are the individual species doing?

```
>    sppSlopes

    species        ba90
1      ABCO   2.9928258
2      ABMA   0.9303770
3      CADE   0.9881693
4      PICO   0.9894498
5      PIJE  -8.5810067
6      PILA   2.5893228
7      PIMO   1.0665150
8      PIPO   0.4462360
9      QUCH   3.8575875
10     QUKE   1.0103042
```

3 At the original parameter designation

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

Residuals:
    Min      1Q  Median      3Q     Max
-25.4994  0.6266  1.8614  2.1016  11.8698

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -1.92879    0.76443  -2.523   0.0132 *
ExpAbsBA     0.98574    0.02886  34.162   <2e-16 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 6.602 on 100 degrees of freedom
Multiple R-squared:  0.9211,       Adjusted R-squared:  0.9203
F-statistic:  1167 on 1 and 100 DF,  p-value: < 2.2e-16
```
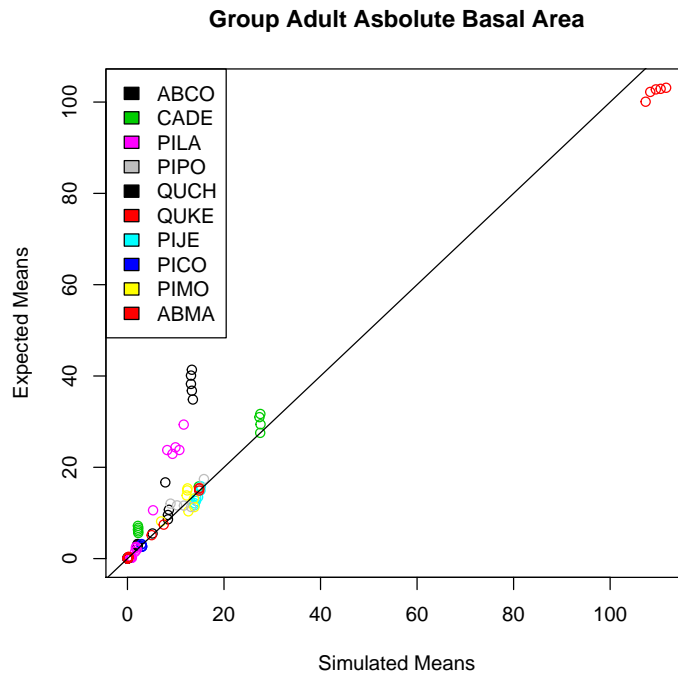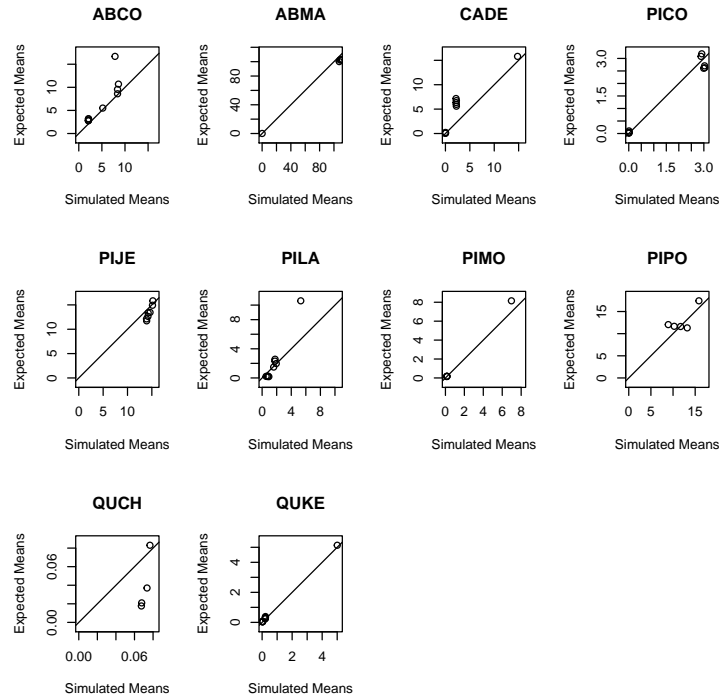
Group Adult Asbolute Basal Area

```
>    sppSlopes

   species        ba90       ba100
1     ABCO   2.9928258   3.1019378
2     ABMA   0.9303770   0.9334313
3     CADE   0.9881693   1.0087895
4     PICO   0.9894498   0.9387414
5     PIJE  -8.5810067   2.6774396
6     PILA   2.5893228   2.6625704
7     PIMO   1.0665150   1.0023397
8     PIPO   0.4462360   0.7170184
9     QUCH   3.8575875   6.2062555
10    QUKE   1.0103042   1.0189905
```

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4 At the one hundred and tenth percentile

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

Residuals:
    Min      1Q  Median      3Q     Max
-24.6278  0.1299  1.8553  2.0162 11.2939

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -1.96457    0.74503  -2.637   0.0097 **
ExpAbsBA     0.98375    0.02812  34.980   <2e-16 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 6.435 on 100 degrees of freedom
Multiple R-squared:  0.9244,        Adjusted R-squared:  0.9237
F-statistic:  1224 on 1 and 100 DF,  p-value: < 2.2e-16
```
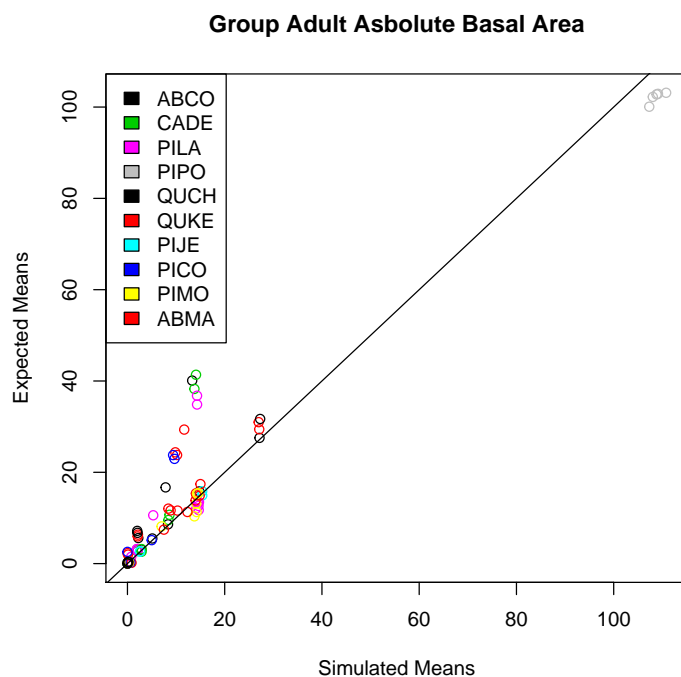
Group Adult Asbolute Basal Area

ABCO **ABMA** **CADE** **PICO**

Expected Means — Simulated Means

PIJE **PILA** **PIMO** **PIPO**

Expected Means — Simulated Means

QUCH **QUKE**

Expected Means — Simulated Means

```
> sppSlopes
```
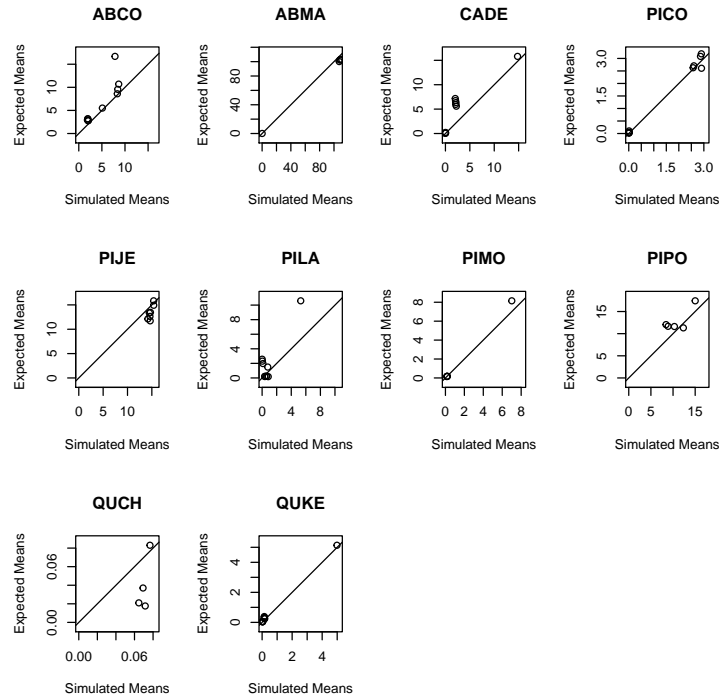
	species	ba90	ba100	ba110
1	ABCO	2.9928258	3.1019378	2.9203161
2	ABMA	0.9303770	0.9334313	0.9390778
3	CADE	0.9881693	1.0087895	1.0194874
4	PICO	0.9894498	0.9387414	1.0121360
5	PIJE	-8.5810067	2.6774396	2.8873227
6	PILA	2.5893228	2.6625704	2.4235302
7	PIMO	1.0665150	1.0023397	0.9308032
8	PIPO	0.4462360	0.7170184	0.7361313
9	QUCH	3.8575875	6.2062555	4.7766558
10	QUKE	1.0103042	1.0189905	1.0343655

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5 Adult Density: At the ninetieth percentile

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

Residuals:
    Min      1Q  Median      3Q     Max
-773.90  -73.43  -49.46   -4.22  716.22

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 51.63236   22.50551   2.294   0.0239 *
ExpAbsDen    0.35255    0.02594  13.590   <2e-16 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 196.2 on 100 degrees of freedom
Multiple R-squared:  0.6487,        Adjusted R-squared:  0.6452
F-statistic: 184.7 on 1 and 100 DF,  p-value: < 2.2e-16
```
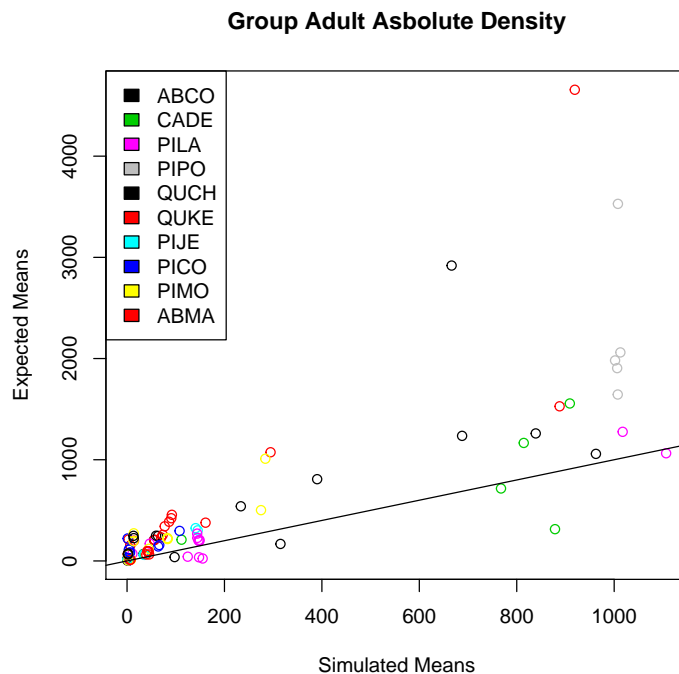
Group Adult Asbolute Density

Now, how are the individual species doing?
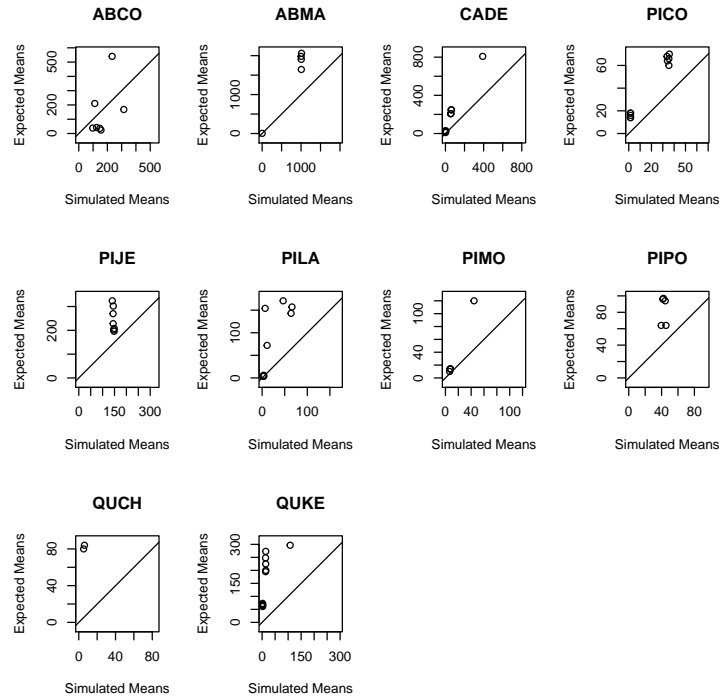
```
>   sppSlopes

    species        ba90       ba100       ba110         den90
1     ABCO    2.9928258   3.1019378   2.9203161    1.3382443
2     ABMA    0.9303770   0.9334313   0.9390778    2.2077106
3     CADE    0.9881693   1.0087895   1.0194874    2.3013427
4     PICO    0.9894498   0.9387414   1.0121360    1.4867684
5     PIJE   -8.5810067   2.6774396   2.8873227  -15.7545073
6     PILA    2.5893228   2.6625704   2.4235302    2.3663079
7     PIMO    1.0665150   1.0023397   0.9308032    4.0416817
8     PIPO    0.4462360   0.7170184   0.7361313    0.3540432
9     QUCH    3.8575875   6.2062555   4.7766558  -15.0509745
10    QUKE    1.0103042   1.0189905   1.0343655    2.5407689
```

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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 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 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
```
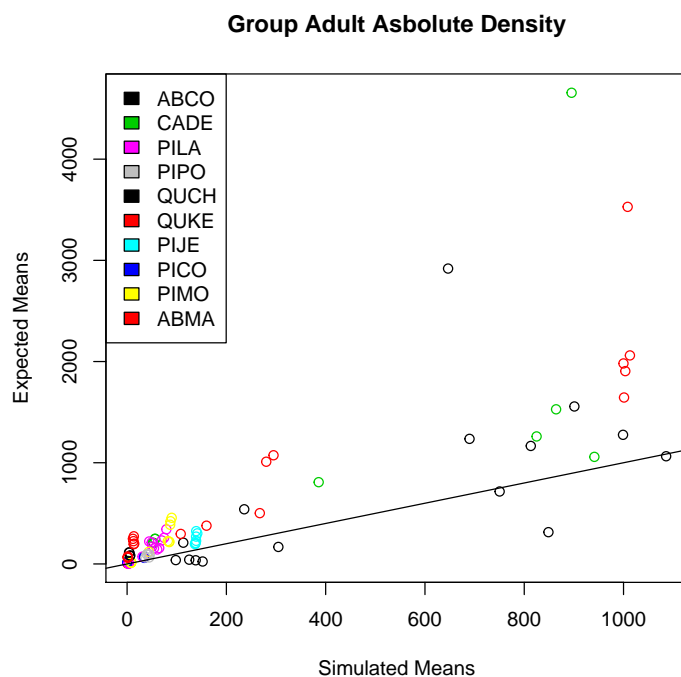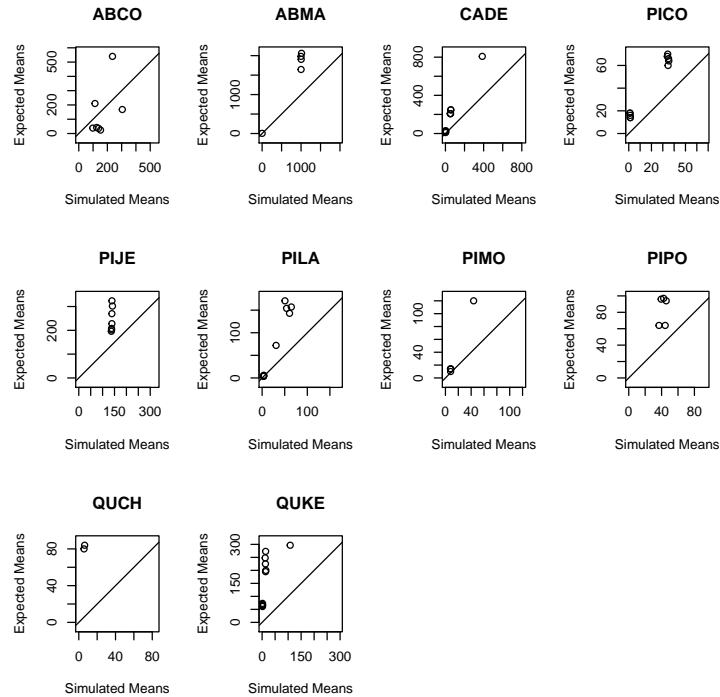
Group Adult Asbolute Density

```
>   sppSlopes

   species        ba90       ba100       ba110          den90        den100
1     ABCO   2.9928258   3.1019378   2.9203161      1.3382443      1.366993
2     ABMA   0.9303770   0.9334313   0.9390778      2.2077106      2.218563
3     CADE   0.9881693   1.0087895   1.0194874      2.3013427      2.345902
4     PICO   0.9894498   0.9387414   1.0121360      1.4867684      1.479854
5     PIJE  -8.5810067   2.6774396   2.8873227    -15.7545073     27.477350
6     PILA   2.5893228   2.6625704   2.4235302      2.3663079      3.557684
7     PIMO   1.0665150   1.0023397   0.9308032      4.0416817      4.056143
8     PIPO   0.4462360   0.7170184   0.7361313      0.3540432      1.296860
9     QUCH   3.8575875   6.2062555   4.7766558    -15.0509745    -15.618990
10    QUKE   1.0103042   1.0189905   1.0343655      2.5407689      2.577005
```

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7   At the one hundred and tenth percentile

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

Residuals:
    Min      1Q  Median      3Q     Max
-767.34  -71.33  -46.94   -3.85  686.55

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 49.36754   22.10366   2.233   0.0277 *
ExpAbsDen    0.34679    0.02548  13.611   <2e-16 ***
---
Signif. codes:  0 âĂŸ***âĂŹ 0.001 âĂŸ**âĂŹ 0.01 âĂŸ*âĂŹ 0.05 âĂŸ.âĂŹ 0.1 âĂŸ âĂŹ 1

Residual standard error: 192.7 on 100 degrees of freedom
Multiple R-squared:  0.6495,        Adjusted R-squared:  0.646
F-statistic: 185.3 on 1 and 100 DF,  p-value: < 2.2e-16
```
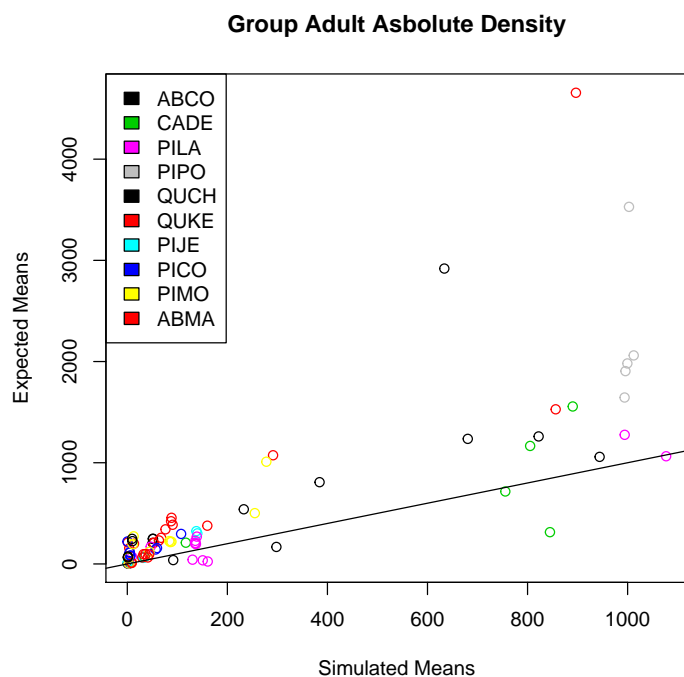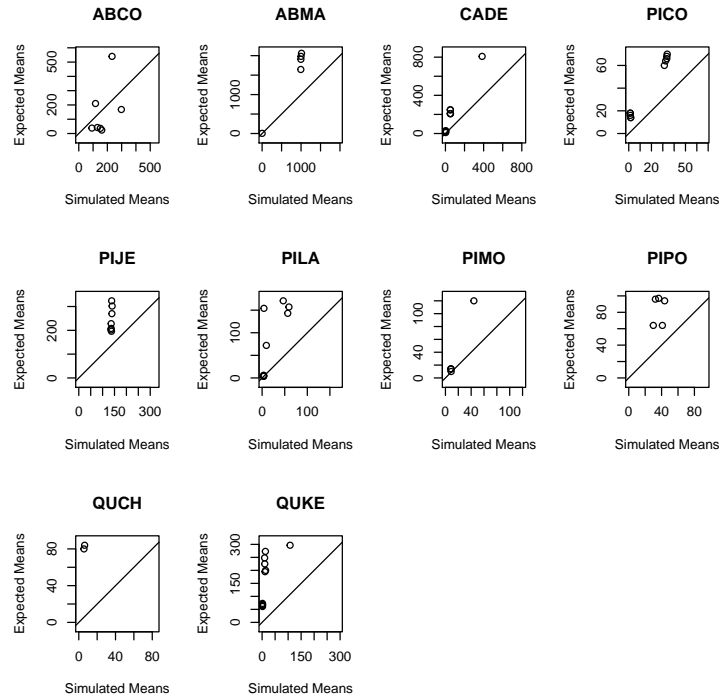

Group Adult Asbolute Density

```
> sppSlopes

   species       ba90       ba100      ba110        den90       den100       den110
1    ABCO  2.9928258  3.1019378  2.9203161    1.3382443    1.366993    1.3684776
2    ABMA  0.9303770  0.9334313  0.9390778    2.2077106    2.218563    2.2277121
3    CADE  0.9881693  1.0087895  1.0194874    2.3013427    2.345902    2.3504348
4    PICO  0.9894498  0.9387414  1.0121360    1.4867684    1.479854    1.5770970
5    PIJE -8.5810067  2.6774396  2.8873227  -15.7545073   27.477350   23.6018957
6    PILA  2.5893228  2.6625704  2.4235302    2.3663079    3.557684    2.5267085
7    PIMO  1.0665150  1.0023397  0.9308032    4.0416817    4.056143    3.9716315
8    PIPO  0.4462360  0.7170184  0.7361313    0.3540432    1.296860    0.5008582
9    QUCH  3.8575875  6.2062555  4.7766558  -15.0509745  -15.618990  -21.5706398
10   QUKE  1.0103042  1.0189905  1.0343655    2.5407689    2.577005    2.6301308

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

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