Appendix S4 - Plot-level analysis

Supplemental information for Diaz and Ernest, "Maintenance of community function through compensation breaks down over time in a desert rodent community". In review at Ecology.

Contents

In order to calculate energetic compensation and the total energy ratio, we require an estimate for the baseline values of total energy use, kangaroo rat energy use, and small granivore energy use on control plots. Estimating these baselines averages over between-plot variability among the control plots, and for consistency, in the main analysis, we also aggregate across the exclosure plots and focus on treatment-level means. However, we can explore some degree of plot-level variability in our analyses by examining the effect of plot as a random factor within exclosure plots (for total energy and compensation) and across all plots involved in analyses of proportional energy use (controls and exclosures for *C. baileyi*, and only controls for *Dipodomys*).

Calculations of compensation and the total energy ratio

```
control_means <- plotl %>%
  filter(plot_type == "CC") %>%
  group_by(period) %>%
  summarize(mean_total_e = mean(total_e),
            mean_dipo_e = mean(dipo_e),
            mean_smgran_e = mean(smgran_e)) %>%
  ungroup()

plotl_vars <- plotl %>%
  left_join(control_means) %>%
  mutate(energy_ratio = total_e / mean_total_e,
         compensation = (smgran_e - mean_smgran_e) / mean_dipo_e,
         dipo_ratio = dipo_e / total_e,
         pb_ratio = pb_e / total_e) %>%
  filter(plot != remove_plot)
```

```r
compensation_dat <- filter(plotl_vars, oplottype == "EE")
total_e_dat <- filter(plotl_vars, oplottype == "EE")
pb_dat <- filter(plotl_vars, as.numeric(oera) > 1)
dipo_c_dat <- filter(plotl_vars, oplottype == "CC")
```

Compensation

```
comp_plot_gls <- lme(compensation ~ oera , random = ~1|fplot,  correlation = corCAR1(form = ~ period | f

comp_plot_gls_noautoc <- lme(compensation ~ oera , random = ~1|fplot, data = compensation_dat)

comp_plot_gls_norandom <- gls(compensation ~ oera , correlation = corCAR1(form = ~ period | fplot), data


comp_plot_gls_notime <- lme(compensation ~ 1 , random = ~1|fplot,  correlation = corCAR1(form = ~ perioc


comp_plot_gls_notime_nocor <- lme(compensation ~ 1 , random = ~1|fplot, data = compensation_dat)
comp_plot_gls_notime_nocor_norand <- gls(compensation ~ 1 , data = compensation_dat)

AIC(comp_plot_gls)
```

```
## [1] 1360.207
```

```
AIC(comp_plot_gls_noautoc)
```

```
## [1] 1680.916
```

```
AIC(comp_plot_gls_norandom)
```

```
## [1] 1409.83
```

```
AIC(comp_plot_gls_notime)
```

```
## [1] 1408.362
```

```
AIC(comp_plot_gls_notime_nocor)
```

```
## [1] 1879.126
```

```
AIC(comp_plot_gls_notime_nocor_norand)
```

```
## [1] 2036.371
```

```
comp_mean_gls_emmeans <- emmeans(comp_plot_gls, specs = ~ oera)
```

Table S1. Coefficients from GLS for compensation

	Value	Std.Error	DF	t-value	p-value
(Intercept)	0.3451282	0.1048354	1362	3.292096	0.0010199
oera.L	0.0653090	0.0373313	1362	1.749446	0.0804392
oera.Q	-0.2845830	0.0341063	1362	-8.343990	0.0000000

Table S2. Estimates from GLS for compensation

oera	emmean	SE	df	lower.CL	upper.CL
a__pre__pb	0.1827673	0.1091842	3	-0.1647055	0.5302400
b__pre__reorg	0.5774892	0.1078860	3	0.2341478	0.9208306
c__post__reorg	0.2751282	0.1093969	3	-0.0730215	0.6232779

Table S3. Contrasts from GLS for compensation

contrast	estimate	SE	df	t.ratio	p.value
a__pre__pb - b__pre__reorg	-0.3947220	0.0491845	1362	-8.025330	0.0000
a__pre__pb - c__post__reorg	-0.0923609	0.0527944	1362	-1.749446	0.1873
b__pre__reorg - c__post__reorg	0.3023610	0.0496411	1362	6.090948	0.0000

Total energy use

```
## [1] 474.8558
```

```
## [1] 924.183
```

```
## [1] 507.7842
```

```
## [1] 543.5425
```

```
## [1] 1266.21
```

```
## [1] 1382.747
```

Table S4. Coefficients from GLS on total energy ratio

	Value	Std.Error	DF	t-value	p-value
(Intercept)	0.5018200	0.0709701	1362	7.070865	0.0e+00
oera.L	0.1454309	0.0301324	1362	4.826392	1.5e-06
oera.Q	-0.2545852	0.0273660	1362	-9.302977	0.0e+00

Table S5. Estimates from GLS on total energy ratio

oera	emmean	SE	df	lower.CL	upper.CL
a__pre__pb	0.2950508	0.0751321	3	0.0559470	0.5341547
b__pre__reorg	0.7096879	0.0738511	3	0.4746606	0.9447151
c__post__reorg	0.5007212	0.0752881	3	0.2611207	0.7403216

Table S6. Contrasts from GLS on total energy ratio

contrast	estimate	SE	df	t.ratio	p.value
a__pre__pb - b__pre__reorg	-0.4146370	0.0395736	1362	-10.477622	0
a__pre__pb - c__post__reorg	-0.2056703	0.0426137	1362	-4.826392	0
b__pre__reorg - c__post__reorg	0.2089667	0.0398571	1362	5.242901	0

Kangaroo rat proportional energy use

```
## [1] 1040.861
```

```
## [1] 1108.49
```

Table S7. Coefficients from GLM on Dipodomys energy use.

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	2.181163	0.1305753	16.704251	0
oera.L	-1.946096	0.2664545	-7.303670	0
oera.Q	1.124620	0.1769225	6.356572	0

Table S8. Estimates from GLM on Dipodomys energy use.

oera	prob	SE	df	asymp.LCL	asymp.UCL
a__pre__pb	0.9823009	0.0062020	Inf	0.9701452	0.9944566
b__pre__reorg	0.7795273	0.0183934	Inf	0.7434769	0.8155777
c__post__reorg	0.7797464	0.0208516	Inf	0.7388780	0.8206149

Table S9. Contrasts from GLMER on Dipodomys energy use.

contrast	estimate	SE	df	z.ratio	p.value
a__pre__pb - b__pre__reorg	0.2027736	0.0194108	Inf	10.4464200	0
a__pre__pb - c__post__reorg	0.2025545	0.0217545	Inf	9.3109407	0
b__pre__reorg - c__post__reorg	-0.0002191	0.0278048	Inf	-0.0078811	1

C. baileyi proportional energy use

```
## [1] 1021.318
```

```
## [1] 1020.263
```

```
## [1] 1042.758
```

```
## [1] 1321.149
```

```
## [1] 1166.653
```

```
## [1] 1162.901
```

```
## [1] 1869.097
```

```
## [1] 2036.489
```

Table S10. Coefficients from GLM on C. baileyi energy use

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-2.443643	0.2067789	-11.81766	0
oera.L	-1.866286	0.1530068	-12.19740	0
oplottype.L	3.265183	0.2913472	11.20719	0

Table S11. Estimates from GLM on C. baileyi energy use

oera	prob	SE	df	asymp.LCL	asymp.UCL
b__pre__reorg	0.2452738	0.0433568	Inf	0.1602961	0.3302516
c__post__reorg	0.0226805	0.0051542	Inf	0.0125784	0.0327827

Table S12. Contrasts from GLM on C. baileyi energy use.

contrast	estimate	SE	df	z.ratio	p.value
b__pre__reorg - c__post__reorg	0.2225933	0.0406393	Inf	5.477298	0