Case: Fish

Story

To study the influence of ocean grazers on regeneration rats of seaweed in the intertidal zone, a researcher scraped rock plots free of seaweed and observed the degree of regeneration when certain types of seaweed-grazing animals were denied access. The grazers were limpets (L), small fishes (f) and large fishes (F). A plot was taken to be a square rock surface, 100 cm on each side. Each plot received one of six treatments, named here by which grazers were allowed access.

symbol	description
LfF	All three grazers were allowed access
fF	Limpets were excluded by surrounding the plot with caustic paint
Lf	Large fish were excluded by covering the plot with a course net
f	Limpets and large fish were excluded
L	Small and large fish were excluded by covering the plot with a fine net
C	Control: limpets, small fish and large fish were all excluded

Because the intertidal zone is a highly variable environment, the researcher applied the treatments in eight blocks of twelve plots each. Within each block she randomly assigned treatments to plots so that each treatment was applied to two plots. The blocks covered a wide range of tidal conditions

symbol	description
Block 1	just below high tide level, exposed to heavy surf
Block 2	just below high tide level, protected from the surf
Block 3	midtide, exposed
Block 4	midtide, protected
Block 5	just above low tide level, exposed
Block 6	just above low tide level, protected
Block 7	on near-vertical rock wall, midtide level, exposed
Block 8	on near-vertical rock wall, midtide level, protected

Variables

variable name	description
cover	percentage of regenerated seaweed
block	blocks for different tidal situations
treat	treatment, i.e. what fishes are excluded

Exercise

1. Make appropriate plots to investigate whether treatments or blocks have any influence on the percentage of regenerated seaweed
2. Fit a two-way analysis of variance model.
3. Check the underlying assumptions of your previous model. If the assumptions were not fulfilled then improve your model with a transformation.
4. Test the model using a 5% significance level
5. Is there evidence of any interaction effects?
6. Try to combine some of the treatment group and test whether your combinations are allowed
7. Split the block in two factors zone (4 levels) and exposed yes/no. Use zone*exposure instead of block. Is the interaction statistically significant?

Hint: y=cover/100 is a number between 0 and 1, so perhaps a logit transformation might work

Logit(y)= log(y/(1-y))