Species Associations

Introduction

The associations between two species can be assessed via a number of different research methods:

- Laboratory experiments can be conducted determine the impact of a single independent variable
- Field manipulation may involve the removal of one species to determine the impact on another
- Field observations involve random sampling (using quadrats) to measure distributions of species

If data has been collected via quadrat sampling, a chi-squared test can be performed to determine if there is a statistically significant association between the distribution of two species. If both species are typically found within the same habitat, they show a positive association (predator-prey dynamic). If two species are not found together, they show a negative association (competition). If the species do not interact, there will be no association between them (the distribution of each is independent).

Aim

To use the chi-squared test to determine the association between two species (via quadrat sampling)

Method

1. Find an area that contains carpet in a patchwork pattern (each patch represents a single quadrat)
2. Randomly place chocolates (in sealed packs) representing two species within this defined area
   - E.g. Use Freddo frogs and Caramello koalas to test for association between frogs and koalas
3. Count the number of quadrats containing either both species, no species or one of the species
4. Perform the chi-squared test to determine if there is a significant association between the species
5. If an appropriate site is not available, use the dummy data on the following page (worms / beetles)

Chi-Squared Formula

$$\chi^2 = \sum (O - E)^2 \div E$$

O = Observed data

E = Expected data

Results

1. Propose a suitable null and alternative hypothesis for the experiment

H_0	
H_A	

2. Collect **observed** data (either from the field or by using the dummy sample on the following page)

		Species 2		
		Present	Absent	Total
Species 1	Present			
	Absent			
	Total			

3. Collect **expected** data (row total × column total ÷ overall total)

	Observed	Expected	$(O - E)^2 \div E$
Species 1 only			
Species 2 only			
Both species			
Neither species			

4. Calculate the chi-squared value and determine significance using the distribution table below

χ^2	

Distribution table for chi-squared test

	Critical chi-squared threshold for statistical significance (p value)		
df	$p < 0.1$	$p < 0.05$	$p < 0.01$
1	2.71	3.84	6.63
2	4.61	5.99	9.21
3	6.25	7.81	11.34

Dummy Data: Use the indentations on the sides of the box to measure out 50 quadrats