

Investigating whether there is a correlation between the amount of compact rush and altitude



Juncus conglomeratus



WALT

- describe a method
- collect valid data
- assess the strength of any correlation using statistics

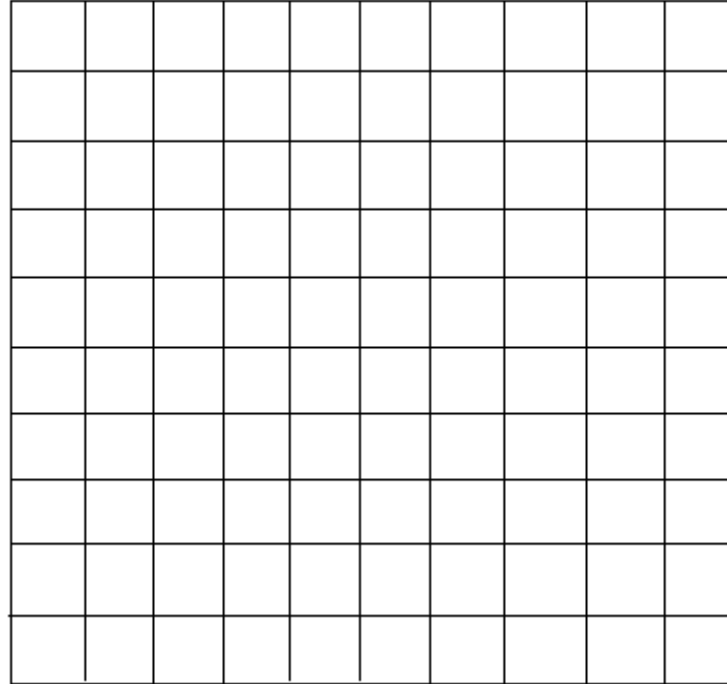
Method

- How can we measure the abundance of rush?

1. Use a quadrat



2. Measure frequency



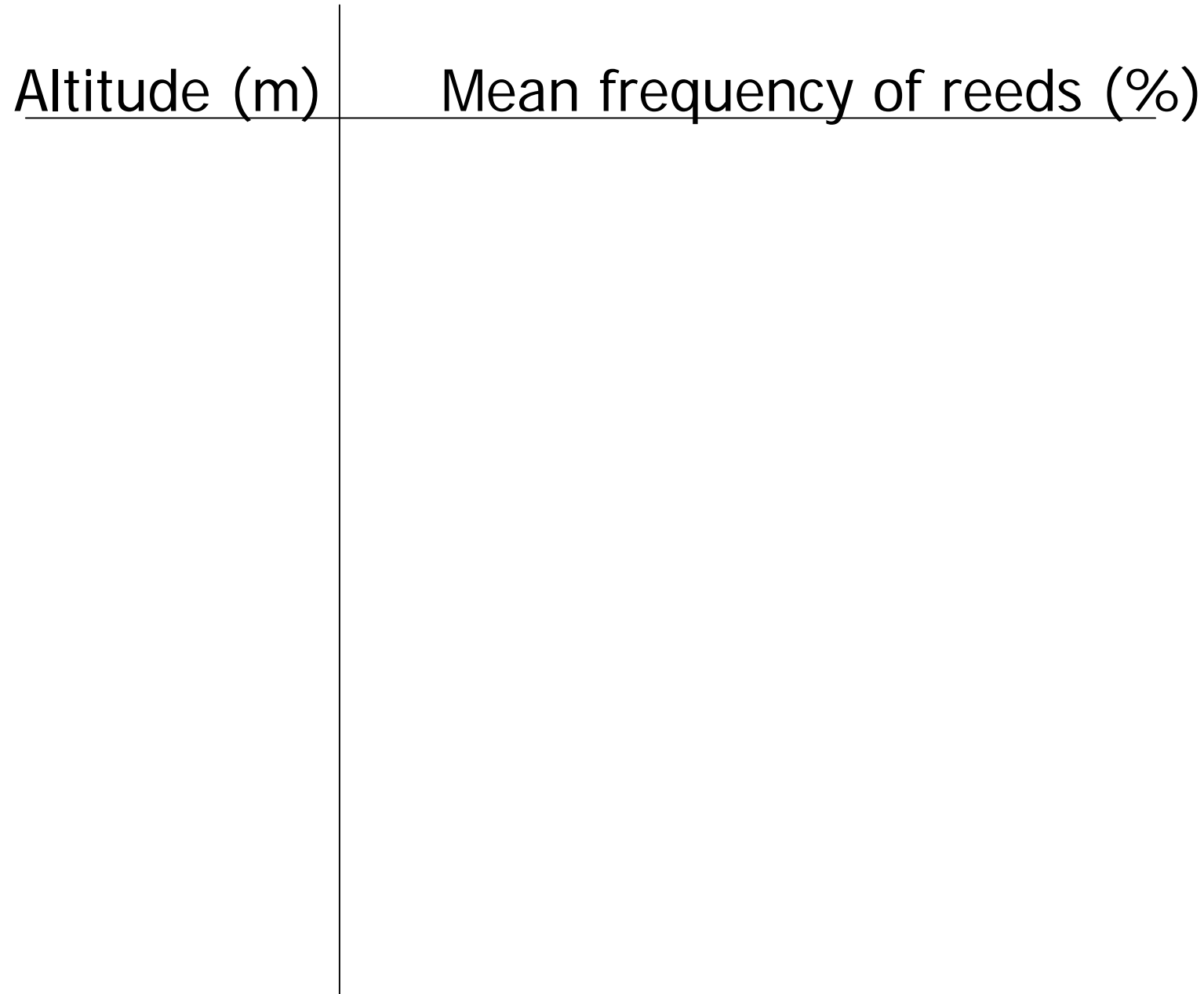
In how many squares is there some rush present?

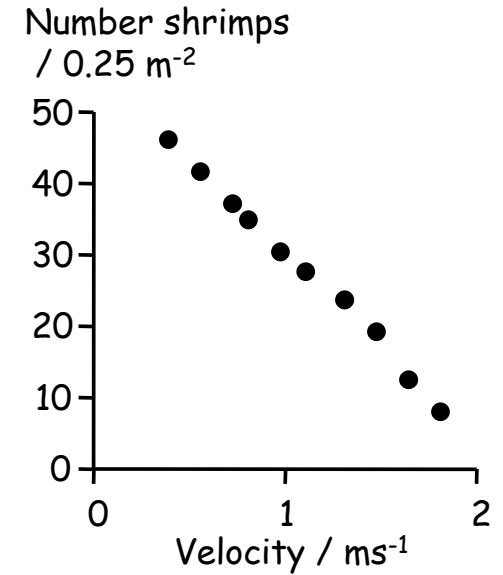
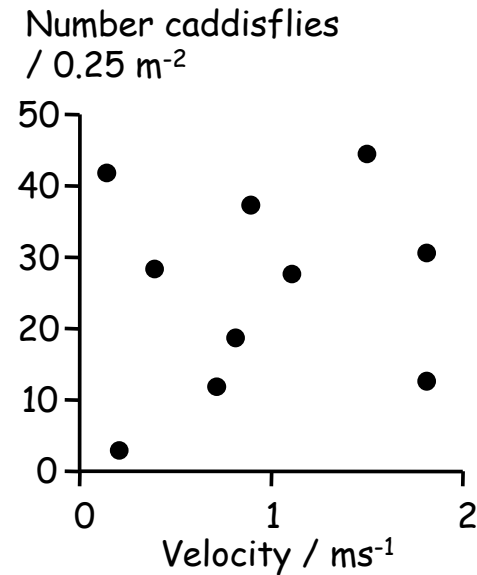
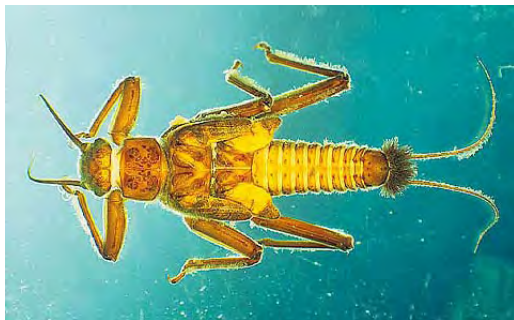
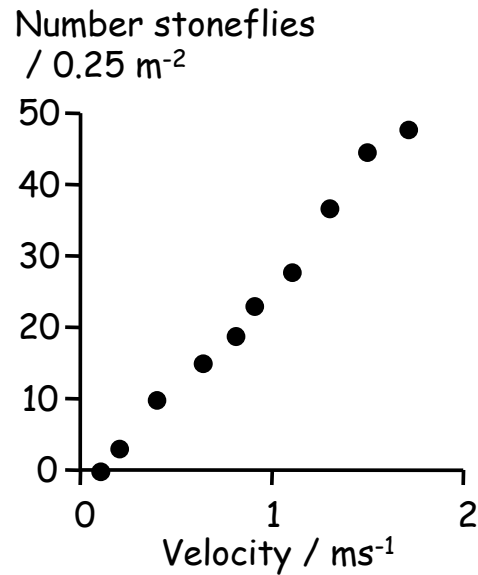
3. Line transect

- samples taken regularly along an environmental gradient



Plot your results on a graph





Describe the relationship between velocity of a stream and the abundance of these species

Statistics can test the strength of a correlation.

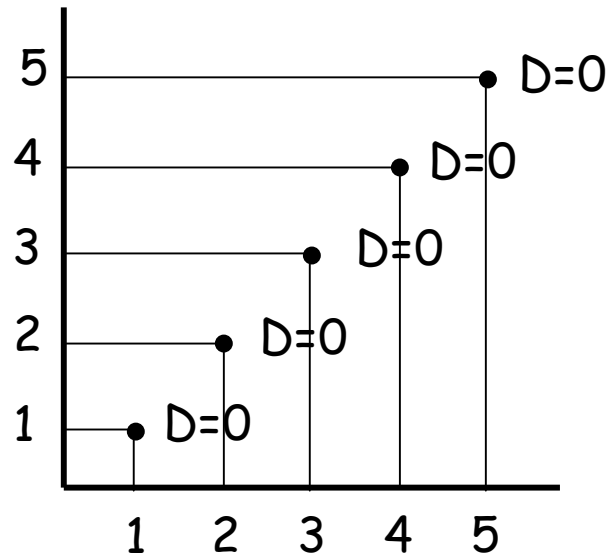
Use the Spearman Rank test

Spearman Rank test

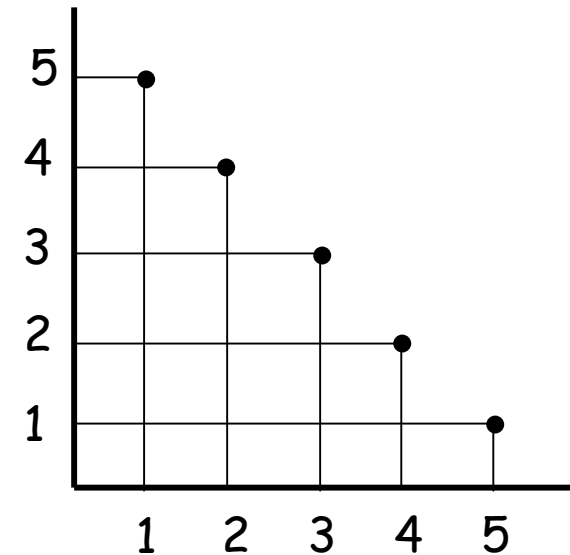
If ranks of both variables are the same there is a perfect positive correlation.

We calculate the deviation from this perfect correlation.

Spearman Rank Correlation Test



Perfect +ve
correlation - Ranks
agree perfectly
so all **Differences**
will be 0



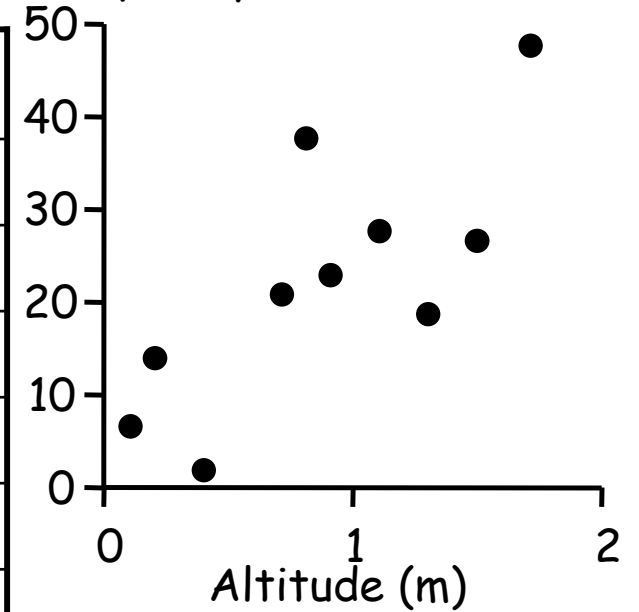
Perfect -ve
correlation - Ranks
dis-agree perfectly
so **Differences** will
be as large as
possible

Null hypothesis:

Data analysis table

Altitude	Rank	Frequency of rushes	Rank	Diff.	Diff ²
0	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				

Rush frequency



Spearman Rank Correlation Test

Step 1: rank the independent variable

Altitude	Rank	Frequency of rushes	Rank	Diff.	Diff ²
0	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				

Spearman Rank Correlation Test

Step 2: rank the dependent variable

Altitude	Rank	Frequency of rushes	Rank	Diff.	Diff ²
0	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				

Step 3: Square the differences and sum them

Altitude	Rank	Frequency of rushes	Rank	Diff.	Diff ²
0	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				

$$\Sigma D^2 =$$

Step 4: Calculate the Spearman Rank coefficient

$$r_s = 1 - \frac{6 \sum d^2}{n^3 - n}$$

$$r_s = 1 - \frac{6 \times 44}{10^3 - 10}$$

$$r_s = 0.73$$

**Step 5: Look up the critical value for your data
(depends on sample size)**

r_s must be larger than the critical value for your correlation to be statistically significant and not due to chance alone.

If r_s is bigger than the critical value we reject the null hypothesis and are 95% certain that that it is wrong.

Figures bigger than the critical value are what you would expect to get by chance only 5% of the time, if the null hypothesis were true.

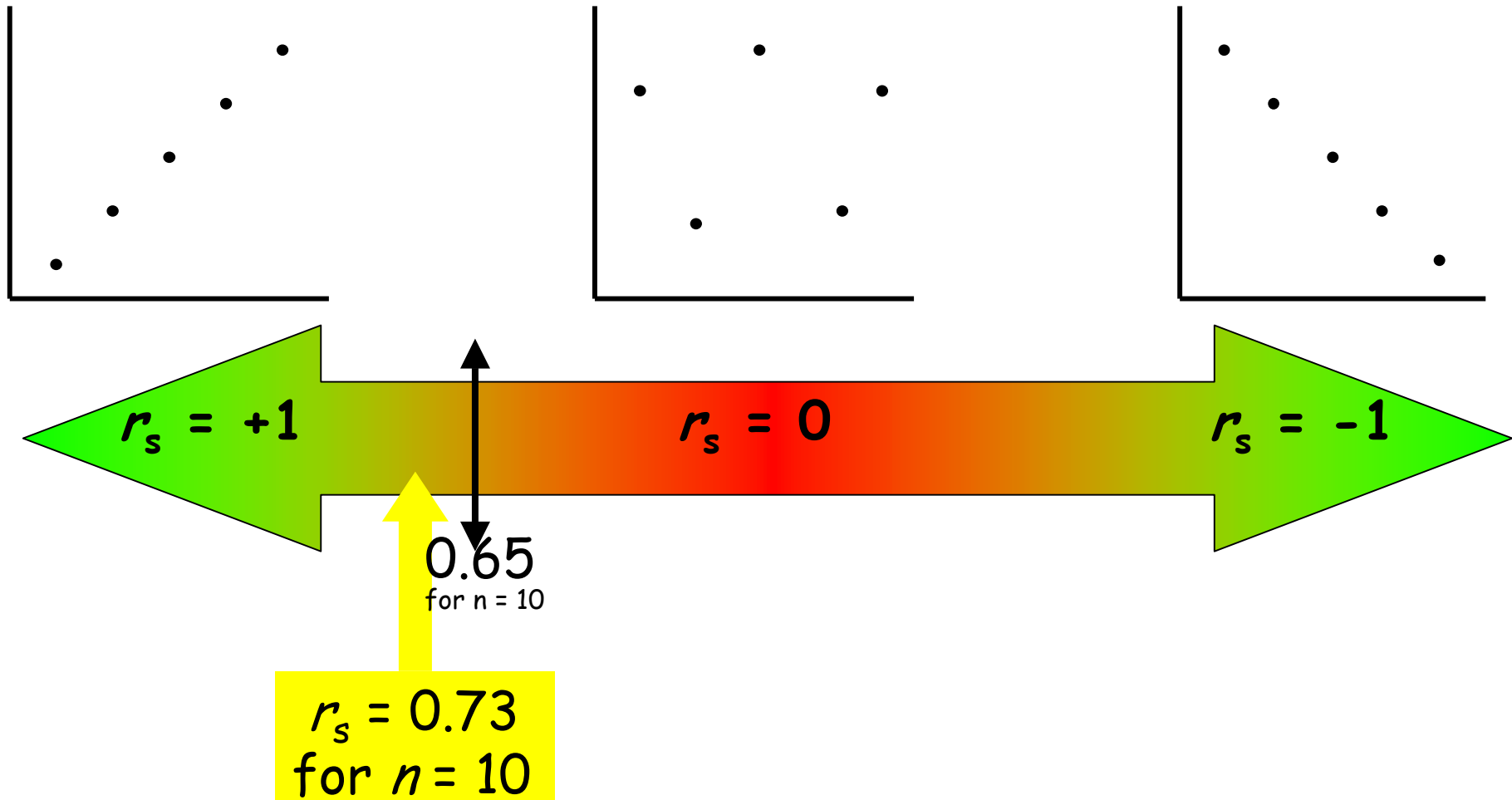
Critical values for Spearman Rank

N (the number of
pairs of scores):

0.05

5	1
6	0.886
7	0.786
8	0.738
9	0.683
10	0.648
12	0.591
14	0.544
16	0.506
18	0.475
20	0.45
22	0.428
24	0.409
26	0.392
28	0.377
30	0.364

Critical values



There is sufficient evidence to reject the null hypothesis and accept the alternative hypothesis.

What's your conclusion?

Does correlation equal causation?

Does increasing height cause a reduction in rush abundance?

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