



Statistical skills: Spearman's rank answers

1. Data would have been collected using a quadrat in the sample area. Sites would have been chosen randomly e.g. over the site a sampling area would have been marked out with tape measures. A random number generator or table would be used to obtain co-ordinates and then these used to locate the position of the quadrat within the sampling area. The percentage cover for each species would be recorded.
2. Counts are difficult to take in such areas. It is sometimes hard to establish which each individual plant is. Counts also take longer so if time is limited these can be hard to do. Measurements allow for different statistical tests than counts. Preference of statistical test may therefore dictate which is collected.

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3.

Quadrat ID	Calluna vulgaris	Rank 1	Vaccinium myrtillus	Rank 2	d	d ²
JP001	30	20	5	12	8	64
JP003	0	8	40	23.5	-15.5	240.25
JP004	50	22	50	25	-3	9
JP005	50	22	5	12	10	100
JP006	70	25	10	14.5	10.5	110.25
JP007	0	8	25	19.5	-11.5	132.25
JP007b	50	22	0	3	19	361
JP008	60	24	4	9.5	14.5	210.25
JP009	71	26	0	3	23	529
JP010	0	8	0	3	5	25
JP011	0	8	10	14.5	-6.5	42.25
JP012	0.5	16	2	7.5	8.5	72.25
JP013	0	8	35	22	-14	196
JP014	0	8	20	18	-10	100
JP015	0	8	0	3	5	25
JP016	0	8	15	16.5	-8.5	72.25
JP017	0	8	0	3	5	25
JP018	2	17.5	75	26	-8.5	72.25
JP019	0	8	4	9.5	-1.5	2.25
JP020b	2	17.5	2	7.5	10	100
JP021	0	8	30	21	-13	169
JP022	0	8	15	16.5	-8.5	72.25
JP023	15	19	5	12	7	49
JP024	0	8	25	19.5	-11.5	132.25
JP025	0	8	40	23.5	-15.5	240.25
JP026	0	8	0.25	6	2	4
$\sum d^2 = 3155$						

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Hypothesis: *Calluna vulgaris* and *Vaccinium myrtillus* are negatively associated with one another

Null hypothesis: There is no association between *Calluna vulgaris* and *Vaccinium myrtillus*.

$$\text{Rank (R)} = 1 - \frac{6\sum d^2}{n(n^2-1)}$$

$$R = 1 - \frac{6 \times 3155}{26(676-1)}$$

$$R = 1 - \frac{18930}{17550}$$

$$R = 1 - 1.0786$$

$$R = -0.0786$$

$$\text{Degrees of freedom} = 26 - 2 = 24$$

Degrees of Freedom	Significance level	
	0.05	0.01
4	1.000	
5	0.900	1.000
6	0.829	0.943
7	0.714	0.893
8	0.643	0.833
9	0.600	0.783
10	0.564	0.745
11	0.523	0.736
12	0.497	0.703
13	0.475	0.673
14	0.457	0.646
15	0.441	0.623
16	0.425	0.601
17	0.301	0.582
18	0.399	0.564
19	0.388	0.549
20	0.377	0.534

Even though there is not a column for 24 degrees of freedom in the chart it is clear that the rank is no way near the critical value for 20 degrees of freedom and therefore we must accept our null hypothesis, the two plants have no association with one another. There is more than a 5% probability that any associations were due to chance alone. They are neither in competition with one another nor benefit from the presence of the other.

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4. To test if enough data have been collected a running mean could be calculated whilst in the process of data collection. Once the running mean has plateaued out for three consecutive samples, two more samples should be taken and then sampling may cease.
5. All the data should be collected on the same or similar dates to ensure accurate and reliable sampling. If some data sets were collected weeks or months later the plants could be at a different growth stage in their life-cycle and this would alter percentage cover figures greatly and therefore influence the results.

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