

# A STATISTICAL ANALYSIS OF TWENTY POLLEN SPECTRA FROM A SINGLE STRATUM OF AMANDA BOG (OHIO)<sup>1</sup>

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The methodology of pollen analysis is well established. Cain (1944) has enumerated the bases on which the study rests. Erdtman (1943) and others have outlined techniques and have described pollen spectra in connection with bog studies. Erdtman has probably been foremost in outlining the techniques for bog sampling, peat preparation, and statistical analysis. Numerous studies have been made on pollen dissemination, and pollen flotation has been investigated (Cain, 1944; Hopkins, 1951). Attempts have also been made to correlate pollen dissemination with the forest composition of the pollen source (Carroll, 1943).

Bog samplers are used to obtain the samples, which are collected at various depths in the bog. The sampling increment may be one foot or as indicated by Smith (1940) the increment may have to be shorter. The peat is then prepared for microscopic examination. The pollen grains from each sample are identified and counted. The result is computed as a percentage composition for each pollen type. When each pollen spectrum is ascertained, a profile is prepared which shows the change in composition of the spectra with change in depth. From these data it is possible, to some degree, to infer the past forest composition and, therefore, the past climate.

The present study was undertaken to ascertain the statistical relationships between a number of samples from a single stratum.

## METHOD

The peat samples were obtained from Amanda Bog, a relict of Wisconsin age, located one half mile north of Amanda, Ohio. This bog was described by Dachnowski (1912). The stratum from which the samples were collected is the transition between the fibrous and limnic peat. This transition, unmistakable in appearance, lies from nine to twelve feet beneath the present surface. It is strongly defined and its variation in depth can be attributed to the gentle slope of the bog surface. This is a result of the movement of soils from the surrounding hills on to the bog.

Twenty samples were taken, thirty feet apart, in a transect across the bog. A Davis Peat Sampler was used. Samples of uniform size were then treated according to the method of Krauss and Kent (1944), and slides for microscopic examination were prepared. One hundred pollen grains from each sample were counted and identified. To identify the pollen, use was made of pollen reference mounts, as well as drawings (Sears, 1930), and photographs (Brown, 1949). The individual spectra were then compared and analyzed statistically.

Statistical methods were used as the only reliable way of ascertaining whether or not differences found were significant.

Table 1 gives the pollen counts for the different species of pollen in the various samples. If these samples were all drawn from the same population, then the relative number of pollen of each species in a sample would vary only by chance from the true proportion. Therefore, it is assumed that the true proportion would

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TABLE 1  
Observed and Expected Frequencies of Species in Samples.

Species	Sample Numbers																				Total	Mean	S. D.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Abies	24	16	15	13	22	20	24	26	14	20	25	12	25	30	14	31	17	38	24	19	430	21.5	6.63
Quercus	13	23	10	20	21	17	16	16	31	16	15	14	22	13	29	16	11	7	27	14	351	17.5	6.18
Pinus	13	8	24	20	17	28	16	12	9	10	17	24	14	7	6	10	35	17	10	16	313	15.6	7.38
Ulmus	10	11	19	14	5	11	2	8	18	13	5	14	10	9	8	7	6	4	2	7	183	9.1	4.64
Picea	5	3	13	7	5	5	12	12	6	8	8	18	12	16	6	6	15	4	6	7	174	8.7	4.19
Tsuga	10	7	6	9	15	8	6	10	6	10	16	10	8	6	6	2	9	6	8	10	168	8.4	3.12
Unknown	6	6	4	0	2	1	6	5	0	7	8	5	0	7	9	12	2	9	10	10	109	5.4	2.55
Tilia	4	2	1	4	2	3	2	5	7	2	0	1	1	2	6	4	2	2	1	6	57		1.79
Betula	10	7	5	3	1	3	2	0	2	11	2	1	2	6	4	4	1	4	5	6	79		2.82
Juglans	0	0	0	3	1	1	3	0	0	0	0	0	2	0	0	0	0	0	0	0	10		.45
Carya	2	5	0	3	5	3	7	6	3	3	4	1	4	4	5	4	2	7	3	3	74		1.55
Ambrosia	1	8	0	0	1	0	0	0	3	0	0	0	0	0	5	4	0	2	2	2	28		1.58
Compositae	2	1	2	3	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	14		.45
Typha	0	3	1	1	0	0	2	0	0	0	0	0	0	2	0	0	0	0	1	0	10		.44
19*	26	9	17	13	10	18	11	16	16	6	3	9	12	22	16	5	15	12	17	272	13.6		

\*This row is the total of the preceding seven species, which were treated together for the purpose of statistical analysis.

be the mean of the totals of all the samples drawn. Thus, the mean is used as the expected frequency in computing whether the observed deviations from this number were greater than would be expected by chance alone.

The test used to ascertain the significance of the differences was the Chi-square test. (In all cases where the total for a species was less than one hundred, the totals were grouped in order to compute Chi-square.)

In order to reject the hypothesis (that these samples are all drawn from the same population) at the one per cent level of significance, Chi-square should exceed 173.00. The Chi-square computed was 358.46, and hence it is concluded that the samples are not from the same population.

#### CONCLUSIONS

The limitations of this study should be fully understood before any inferences are drawn from it.

Conclusions based on the statistics of this study must be limited to the samples. They cannot be extrapolated to include the bog as a whole. The statistical analysis suggests that the samples come from different populations. It can in no way be extended to the final conclusion that the stratum as a whole contains a heterogenous population.

It can be seen from an examination of the table that the order of magnitude in a large majority of the samples is the same. That is, in almost every case, those counts which are high, are high throughout the table; and those which are low, are low throughout the table.

The many factors which may have contributed to the differences of these samples are not accounted for here. In that respect, these results can not be considered conclusive.

It is, therefore, the opinion of the author that similar studies should be initiated which would embrace more variables and thereby give results which more closely approximate the true situation.

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