A COMPARISON OF POLLEN SPECTRA OF OLD AND YOUNG BOGS IN THE ERIE BASIN

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In the present paper it is proposed to compare pollen spectra of peat deposits of a post glacial bog lying close to the oldest beach line of Lake Erie with those of a young bog lying close to the present shore line.

The first bog in question is located in Huron county near New Haven, Ohio, about fifty miles south of the present shore line of Lake Erie. It is on the edge of the post glacial bogs, consequently a long record is available.

The second is the Curtis bog, in Lucas county, Ohio, between Port Clinton and Toledo. It lies about one mile from the present shore line of Lake Erie, and represents one of the youngest of the post glacial bogs.

A comparison of the pollen spectra of the peat deposits of these two bogs should give clues to dissimilarities or parallels in their development. It may be expected to indicate something of the succession of plant associations in an old bog which had its origin shortly after the glacier began to retreat, in comparison with the succession of associations in a bog which had its origin much later. Pollen analyses of this type also indicate something of the various types of climates which have prevailed since the retreat of the last ice sheet, because the type of vegetation existing at any one time is dependent to some extent upon the climate.

Peat samples from these two bogs were obtained by Dr. Paul B. Sears. Two borings were made in each bog. Each boring extended down into the underlying marl. In the New Haven Bog the samples were taken at 1 foot intervals to a depth of 10 ft. In the Curtis bog the borings reached a depth of 5 ft. and samples were taken at 1 foot intervals. Every possible precaution against contamination was observed. The samples from the New Haven Bog were preserved by thorough drying, while the samples from the Curtis bog were preserved in small tin boxes heavily coated on the inside with carbolated vaseline. Preservation in this manner is believed to be valuable since the peat is preserved in its original condition. This method of preservation is of value only when the material is to be studied soon, as it is manifestly not permanent.

Pollens are more or less extensively preserved in bogs whose reaction is alkaline, because their outer walls are composed in part of lipoid materials (i.e. cutin). Such compounds are not affected by most acids, but are saponified when exposed to the action of alkalies. Pollen grains, for this reason, may be almost indefinitely preserved in acid bogs. Technique reported in a previous paper was used in working up the material from the Curtis bog as well as the New Haven Bog. The principles involved are largely those worked out by previous investigators.

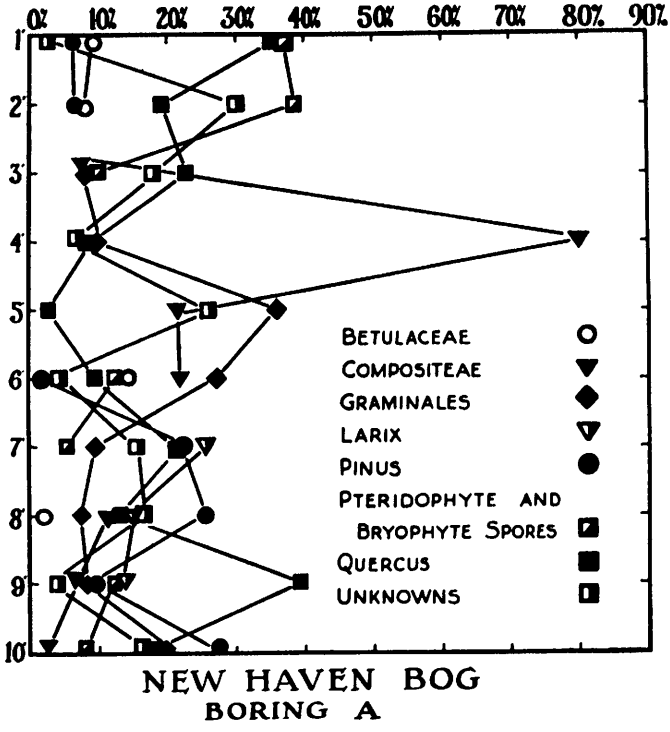
The pollen grains must be freed from masses of fatty and gummy substances in the peat. They apparently act as centers of attraction or nuclei in such masses. The pollen grains may be freed by deflocculating small pieces of the peat with alkalies—full strength ammonium hydroxide or a ten percent solution of potassium hydroxide.

The peat samples from the New Haven Bog yielded only to rather severe

treatment. The general method was to heat the samples in a ten percent KOH solution for periods varying from 8-24 hours at a temperature of 90°. This technique seems not to be in accordance with the fact that the outer wall of pollen grains, being cutinized, is ordinarily destroyed by prolonged action of alkalies. However no etching of the pollen walls has so far been observed.

The pollen from the peat of the Curtis bog was much more easily freed. The peat deflocculated within 10 hours when heated in NH_4OH in water bath at 60°C.

When the peat is sufficiently broken up the mixture is cleared by the addition of a clearing solution composed of glycerine, phenol and lactic



NEW HAVEN BOG
BORING A

acid. Besides clearing the grains the clearing solution stops the action of the alkali.

Slides were made from each successive level of both bogs and comparative counts of the pollens from each level were tabulated. The number of pollen grains in each slide varied tremendously, as many of 300 pollen grains being found in a single slide, and as few as 20.

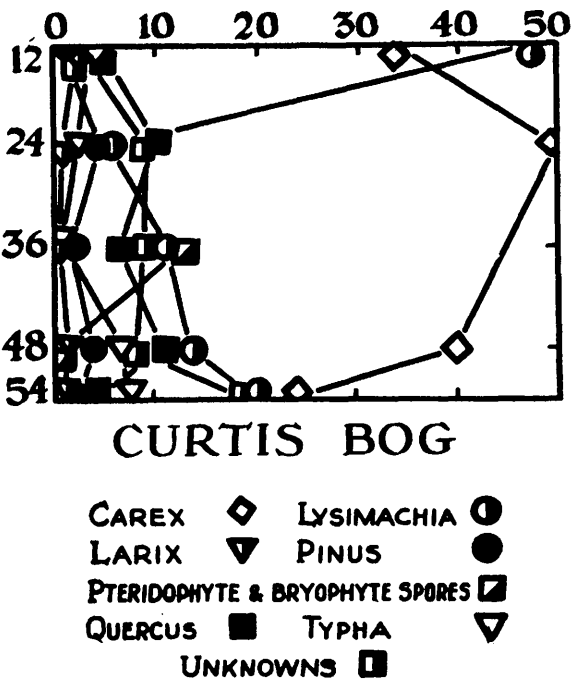
The pollen spectra of Boring A. of the New Haven bog may be divided into three definite phases. (1) First a period when trees are abundant,

(2) a period when trees are absent and composites and sedges are dominant, and (3) a period when trees are again present.

In the lower levels the percentages of grasses and herbaceous plants are very low. They reach their minimum in the 7 ft. level when the conifers are at their climax. Trees are the dominant plants of this phase. Pines occur in greatest abundance in the lowest level. Larix appears in the 9 ft. level. The conifers, considered as a whole, reach a climax in the 7 ft. level when the percentage of conifers totals nearly half of the entire number of grains.

Ferns are present in small numbers in the upper and lower limits of this period.

In this phase plants other than those mentioned occur in very small



numbers. Among the trees are Tilia, Salix, Populus, Ulmus, Fraximus, Ilex, Betula, Acer, and Fagus.

Above the layer derived from a period when trees were comparatively well developed is a layer from which tree pollens are almost entirely absent. The great bulk of the pollen grains is made up of composites and grasses. A pollen profile has been tabulated from a second boring in this bog. A similar layer is found at the same levels where Carex reaches a decided climax and trees are few in number. This is thought to be another expression of the same treeless phase. Below it is a layer where tree pollens are abundant and above it is a layer where tree pollens are again in the

majority. In their broad outlines the results tabulated from the second boring are very like those of boring A which is being considered in detail in this paper.

The upper levels of the New Haven bog represent a second period when grasses and other herbaceous plants are at a minimum and trees are the dominant plants.

Pines are present in small numbers in the two upper levels. Larch does not appear in these levels. Oaks are the dominant trees. Ferns are abundant. It should be noted that counts from the upper level of any bog are of questionable value because of the chance for oxidation by drainage or by burning.

The Curtis bog is much younger than the one just considered. In its development trees never reach a climax although they are present in small numbers in all levels. Oaks occur in greatest numbers. There seems to be no relation between the decrease and increase of oaks and pines as there is in the New Haven bog. Aside from oaks and pines, Larix, Fagus and Maple occur in small numbers in most levels.

The plants which seem to have played the greatest role in the development of this bog are Carex and plants such as Lysimachia. Carex reaches its climax in the second layer from the top and thereafter decreases considerably. Lysimachia reaches one climax in the lowest layer and is at a minimum when Carex is the dominant plant. It increases from less than ten percent in the second level to fifty percent in the uppermost level. Typha is present in every level in appreciable numbers.

The Curtis bog has developed along the lines of a typical reed swamp. It probably had its origin in fresh flowing water or in stagnant more or less acid water. Carex has been the plant most important in its development; with Typha and plants of the Lysimachia type generally present.

In its first period of development the New Haven bog developed toward a conifer climax. Before it reached the climax condition, however, a reed or sedge swamp, which has developed until the present, was initiated. In its latest stage it is well on the way to a mixed mesophytic condition. What sort of a change took place which caused the course of the bog's development to change so radically is not clear. It may have been a flooding of the bog by waters from the nearby lake which changed the reaction of the waters of the bog so that further development of the sub-conifer climax was impossible. The resulting conditions in any case were such that they favored the development of a reed swamp.