The infrared spectrum of the acetate of the isolated cortisol after chromatography on a microcolumn of silica gel was identical with cortisol acetate formed under the same conditions (Fig. 1). The acetate was made by treatment of the cortisol with pyridine and acetic anhydride at room temperature for 18 hours.

Preliminary data indicate that the amount of cortisol in myelinated nerve fibers of the lumbosacral plexus was of the order of 2.0 to 6.0 μg per gram of tissue, while the sympathetic chain with dorsal root ganglia showed 0.2 to 0.4 μg per gram of tissue. These figures contrast with amounts of 5 to 15 μg per gram in pathological human adrenal tissues (*2; 3*).

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17 July 1963

Exponential Values for the Species-Area Relation

Abstract. *Data on vegetation types in six 900-m^2 plots in the Midwest reveal that the species-area curves are not logarithmic but more nearly approach an exponential equation of the form $y = kx^z$ for areas less than 100 m^2. For larger areas the curve appears to be sigmoid.*

The relation between the increase in number of plant species as the area sampled increases, termed the species-area relation, has been considered logarithmic (*1*), except for small areas (under about 1 m^2). These studies indicate that new plant species are found in proportion to the logarithm of the area sampled. Recently, the logarithmic relation over large areas (greater than 100 m^2) has been questioned, and it has been suggested that an exponential equation, based on avian data, best describes the species-area relation (*2*). This report gives results obtained from a study designed to clarify this relation more precisely in plant communities.

Data were obtained in the summers of 1960 and 1961 during field work in six undisturbed stands of vegetation in the Midwest, from Illinois to Minnesota. The stands consisted of jack pine woodland, hill prairie, and oak forest. An area of 900 m^2 was sampled in each stand. All vascular plants, bryophytes, and lichens in these plots were recorded and collected. Each plot was subdivided into quadrats of the following sizes, with the number of samples of each size indicated in parentheses: point (900), 1 cm^2 (900), 1 dm^2 (900), 1 m^2 (900), 4 m^2 (225), 25 m^2 (36), 100 m^2 (9), 900 m^2 (1). The large number of samples of quadrats 1 m^2 and smaller, and the similarity of species-number per quadrat, resulted in a standard error of less than 0.2 for quadrats of these sizes in all six stands, and less than 0.9 for the 4-m^2 and 25-m^2 quadrats.

The relationship found among all six stands is similar to that shown in Fig. 1 for jack pine in the plot in Lower Michigan known as Michjap. Inspection reveals that a close fit for the lower and most reliable values is given by the generalized equation

$$y = ke^{m \log x} = kx^z ,$$

where y is the number of species, x is the area, k is a constant equal to the number of species in a 1-m^2 quadrat, and z is a constant equal to 0.43 m. In the plot illustrated this equation becomes

$$y = 7.5x^{0.30}$$

This exponential fit is far superior to a logarithmic one (for example, $y = k \log x$), particularly for the lower values. Construction of equations for the other five stands reveals the following values for y: jack pine in Upper Michigan, 10 $x^{0.28}$; jack pine in Wisconsin, 16 $x^{0.32}$; jack pine in Minnesota, 15.5 $x^{0.33}$; hill prairie in Illinois (in the plot known as Prairie), 12 $x^{0.26}$; and oak forest in Illinois (Oak), 13 $x^{0.43}$. In these equations the size of the exponent is related to the number of species recorded in the plot—the greater the number of species, the larger the exponent. In Oak, described by the equation with the largest exponent, 113 species were noted, while only 66 were recorded in Prairie, the equation represented by the smallest exponent.

It can be seen that the actual y values from Michjap drop below those of the

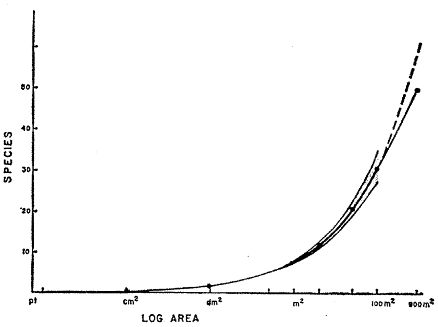

Fig. 1. Graph of the species-log area relation of a jack pine stand (Michjap) in Michigan compared with the equation $y = 7.5\ x^{0.30}$, shown by the dashed line. Lines coincide below 4-m^2 point. The lightly shaded area between the curves is double the standard error either side of the actual curve.

equation at the 900-m^2 point. This tendency occurs in the other five samples as well and indicates that further sampling would reveal the relation to be sigmoid, as suggested earlier (*3*). This is further corroborated by comparing data on the number of vascular plant species recorded from the two-county region where the plot Michjap is located (*4*). This area, 3.07 $\times$ $10^9 m^2$, inserted into the equation gives a value of 5700. This value far exceeds our best estimates of plant species in this area, which contains 1180 vascular species (*4*), 250 to 350 mosses, and 300 to 350 lichens (*5*); a total of 1750 to 1900 species. Similar evidence from other stands makes it clear that the above equation, though very accurate for smaller areas, is not valid for large ones, and that the actual species-log area relation is sigmoid.

The data presented support the view put forth by Preston (*2*) that the species-area relation is exponential, not logarithmic, and appropriate equations have been presented. Elucidation of the species-area relation in larger areas than those sampled in this study and in different types of vegetation requires further analysis (*6*).

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1 August 1963