SOME FOLIOSE AND FRUTICOSE LICHENS FOUND IN THE TENNESSEE CEDAR GLADES

A Research Paper

Presented to

the Graduate Council of

Austin Peay State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in Education

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by

Cleo Algia Holt

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To the Graduate Council:

I am submitting herewith a Research Paper written by Cleo Algia Holt entitled "Some Foliose and Fruticose Lichens Found in the Tennessee Cedar Glades." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Biology.

Haskell C. Phillips
Major Professor

Accepted for the Council:

Wayne E. Stamper
Dean of the Graduate School

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CHAPTER I

INTRODUCTION

Lichens consist of an alga and a fungus living together in a symbiotic relationship and with few exceptions are perennial aerial plants. They exist almost everywhere from the sea shore to the top of loftiest mountains. The only land habitats where they are not found are in the area of perpetual snow and ice. Lichens are quite sensitive to air pollution; therefore, their numbers are greatly reduced around large cities.

Statement of the problem. The purpose of this study was to survey the foliose and fruticose lichens in the cedar glades of Tennessee.

Delimitations. This study was limited to nine selected areas in the cedar glades of Tennessee.

Review of related literature. Lichen investigation in Tennessee had been limited to a few species or to definite regions until 1963. Calkins (1890) published notes on forty taxa that he considered rare or unknown in the United States. Degelius (1941) collected for two weeks in the area of the Great Smoky Mountains National Park. He listed 206 species from the park area of Tennessee and North Carolina. Mozingo (1961) collected Cladoniae over a period of one year in eastern Tennessee. He listed 45 species of the genus Cladonia that occur in east Tennessee and the Great Smoky Mountains. Phillips (1963) collected extensively over the state excluding the Great Smoky Mountains and

listed 125 foliose and fruticose species that occur.

There had been an abundance of studies made recently concerning the ecology of the Tennessee cedar glades. Freeman (1933) studied air and soil temperatures, soil water, hydrogen ion concentration, and evaporation. Quarterman (1950) reported on the plant communities of the cedar glades. Baskin, Quarterman, and Caudle (1968) listed 279 species of herbaceous vascular plants that occur in the cedar glades. Although no organized study of lichens in the cedar glades has been reported, Quarterman (1948) listed Cladonia turgida, C. furcata, Cladonia sp., Dermatocarpon hepaticum, and D. miniatum as occuring in the cedar glades and theorized that the lichens probably followed the algae in plant succession.

CHAPTER II

DESCRIPTION OF THE STUDY AREA

The cedar glades of Tennessee are located in the Central Basin that occupies 5,450 square miles of the middle part of the state. This is an oval lowland about 400 feet below the surrounding Highland Rim and about 600 feet above sea level with an average elevation of 600 to 700 feet (Killebrew, 1898). The dome of the Central Basin is due to the cherty limestones, Ft. Payne and higher, which once covered it. This dome was thinned when the Cumberland River reduced the level to its present surroundings.

A characteristic habit of weathering has resulted in the "glades" which are areas of bare or nearly bare rock. The cedar glades occur on platy Lebanon limestone which rise a little above the plains developed on the Ridley limestone. This latter rock has its own glades more or less covered with hardwood trees. The cedar glades alone occupy fully one fourth of Rutherford County, the most central and typical county of the Basin (Fenneman, 1938).

The cedar glades cover about 5 per cent of the Central Basin of Middle Tennessee. The soil is thin and rocky and moisture conditions are extreme. The soil is saturated with water and water may seep out of the rocks much of the time from December to May, the period of greatest precipitation. The rest of the year is characterized by decreasing amounts of water resulting in droughts in the months of July and August which are usually the driest months of the year. These

extremes, thin soil, water extremes, and temperature extremes have resulted in the typical plant community dominated by the red cedar, Juniperus virginiana, L. and is a region quite unique (Quarterman, 1948).

CHAPTER III

METHODS AND MATERIALS

Lichens are very easily collected and require little equipment. They may be collected at any time during the year but are more easily found during the winter and spring while the deciduous forests are bare. No special care needs to be given to the lichens. They can be stored indefinitely in a dry condition in a dry place.

Selection of survey areas. It was decided to divide the cedar glades into three geographical regions. The first region, the most northern, included the glades found in Sumner and Trousdale Counties. The second region, the middle area, included the glades of Davidson, Wilson, Rutherford, and Cannon Counties. The third region, the most southern, included the glades found in Maury and Marshall Counties.

The locations that were selected as collection areas were located by driving the roads in known glade regions. No areas were selected that did not have red cedar as the dominant vegetation. The areas collected in that were not a part of parks were or had been used for pasture. Grazing animals may have influenced the type and abundance of species of ground lichens found.

Collecting. Collecting began in August 1968 and ended in July 1969. A total of nine areas were surveyed. Collecting areas were coded using two numbers. The first number represented the geographical region and the second represented the area surveyed in the region.

The locations of the collecting areas are:

Area	Location
1-1	one mile south of the intersection of U. S. highway 231 and state highway 25 in Trousdale County
1-2	adjacent to the Gallatin Steam Plant about eight miles south of Gallatin in Sumner County
2-1	Cedars of Lebanon State Park in Wilson County
2-2	one mile east of Percy Priest Dam in Davidson County
2-3	one mile east of the intersection of interstate highway 40 and state highway 109 in Wilson County
2-4	one mile east of Woodbury on U. S. highway 70 in Cannon County
2-5	one-half mile south of the intersection of Old Hickory Boulevard and Brick Church Pike in Davidson County
3-1	three miles north of Lewisburg on U. S. highway 31 in Marshall County
3-2	two miles east of the intersection of interstate highway 65 and state highway 99 in Maury County

The lichens were selected using the naked eye and placed in paper bags. The area surveyed, the substrate, and the collecting date were noted on the bags. Only one specimen was placed in each bag.

At first an effort was made to avoid duplication of lichens collected from an area using memory and field identification. After the first two collecting trips, no real effort was made to avoid

duplications. This method was more satisfactory and resulted in a greater number of species collected.

Identification. The plants were identified in the laboratory using a ten X, dissecting microscope. The chemical reagents, "C", "K", and "P", were used as outlined in Hale (1961). The specimens were keyed to species using Hale's key (1961). Pictures from Thomson (1963) and Kurokawa (1962) as well as Hale (1961) were used as further aids. Classification followed that outlined by Hale and Culberson (1966).

CHAPTER IV

RESULTS

The results of this survey indicate that the foliose and fruticose lichens of the cedar glades of Tennessee consist of at least eight families, fifteen genera, and sixty-six species. The following specimens are stored in the Biology Department at Austin Peay State University. This listing is quite tentative and undoubtedly others will be added to the list. The numbers in parenthesis following the species name are the code numbers used to identify the location from which this species was collected. The word "All" indicates a species was found in all collecting areas.

CLASS ASCOMYCETES

SUBCLASS ASCOMYCETIDAE

ORDER LECANORALES

COLLEMATACEAE

Collema Wigg.

sp. (3-2)

Leptogium S. Gray

cyanescens (Pers.) Korb. (1-2), (2-2), (3-1), (3-2)

lichenoides (L.) Zahlbr. (1-2)

saturninum (Dicks.) Nyl. (3-2)

PELTIGERACEAE

Peltigera Willd.

canina (L.) Willd. (2-4), (3-1), (3-2), (1-2)

CLADONIACEAE

Cladonia Wigg.

apodocarpa Robb. (3-1)

bacillaris (Ach.) Nyl. (3-2)

capitata (Michx.) Spreng. (All)

cariosa (Ach.) Spreng. (3-2)

coniocraea (Florke) Spreng. (2-2)

cristatella Tuck. (2-2), (2-3), (2-4), (2-5), (3-2)

cylindrica (Evans) Evans (2-1), (3-2)

decorticata (Florke) Spreng. (3-2)

furcata (Huds.) Schrad. (All)

grayi Merr. (2-2)

pyxidata (L.) Hoffm. (2-1), (3-2)

rangiferina (Wigg.) Vain. (2-1), (2-4), (3-2)

ravenelii Tuck. (3-2)

strepsilis (Ach.) Vain (2-4), (2-2), (2-3), (3-2)

subtenuis (Abb.) Evans (2-1), (2-4)

venticillata (Hoffm.) Schaer. (2-1)

PARMELIACEAE

Candelaria Mass.

concolor (Dicks.) B. Stein (2-5)

fibrosa (Fr.) Mull. Arg. (2-4)

Parmelia Ach.

amazonica Nyl. (3-2)

aurulenta Tuck. (1-2), (2-4), (2-5), (3-2)

austrosinensis Zahlbr. (2-2), (2-4), (2-5)

borreri (Sm.) Turn. (1-1), (2-3), (2-5), (3-1)

caperata (L.) Ach. (All)

crinita Ach. (1-2), (3-1), (3-2)

crozalsiana B. de Lesd. (2-3), (3-1)

dissecta Nyl. (3-2)

galbina Ach. (1-1), (2-3), (2-4), (3-1), (3-2)

hypotropa Nyl. (1-1), (1-2), (2-4), (3-1), (3-2)

livida Tayl. (3-1)

michauxiana Zahlbr. (2-2), (3-2)

perforata (Jacq.) Ach. (1-1), (1-2), (2-2), (2-4), (3-1), (3-2)

reticulata Tayl. (1-1), (1-2), (2-3), (2-5), (3-1), (3-2)

rudecta Ach. (All)

saxatilis (L.) Ach. (3-2)

subcrinita Nyl. (1-1), (2-4), (3-1)

subtinctoria Zahlbr. (1-1), (3-1)

tinctorum Nyl. (3-1), (3-2)

USNEACEAE

Ramalina Ach.

fastigiata (Pers.) Ach. (1-1), (2-2), (2-4), (3-1)

Usnea P. Br.

comosa (Ach.) Ach. (3-2)

dasypoga (Ach.) Rohl. (3-2)

rubicunda Stirt. (3-2)

strigosa (Ach.) A. Eat. (1-1), (2-4), (3-2)

PHYSCIACEAE

Anaptychia Korb.

palmatula (Michx.) Vain. (3-2)

Heterodermia

domingensis (Ach.) Mass. (2-3), (2-4), (2-5)

echinata (Tayl.) Kurok. (3-2)

hypoleuca (Muhl.) Mass. (2-4), (3-1), (3-2)

obscurata (Nyl.) Vain. (1-1), (2-4), (3-2)

tremulans (Wulf.) Mass. (1-1), (1-2), (2-3), (2-4), (3-1), (3-2)

Physcia (Schreb.) DC.

aipolia (Ehrh.) Hampe (2-2), (2-3), (2-4), (3-2)

ciliata (Hoffm.) Du Rietz (2-2)

millegrana Degel. (2-2), (2-5)

orbicularis (Neck.) Poetsch (1-1), (1-2), (2-3), (3-1), (3-2)

pulverulenta (Schreb.) Hampe (2-3), (2-4), (3-2)

stellaris (L.) Nyl. (2-3), (3-1), (3-2)

tribacoides Nyl. (1-2), (2-3), (2-5), (3-2)

Pyxine Fr.

sorediata (Ach.) Mont. (2-2), (2-3), (2-4), (2-5), (3-1)

TELOSCHISTACEAE

Teloschistes Norm.

exilis (Michx.) Vain. (3-2)

Xanthoria (Fr.) Th. Fr.

candelaria (L.) Th. Fr. (2-3)

ORDER SPHAERIALES

VERRUCARIACEAE

Dermatocarpon Eschw.

hepaticum (Ach.) Th. Fr. (1-1), (1-2)

miniatum (L.) Mann (1-1), (2-2), (2-5), (3-1), (3-2)

tuckermanii (Rav.) Zahlbr. (1-2)

CHAPTER V

DISCUSSION

The skill of this investigator improved with experience. Therefore the first areas visited were the poorest surveyed. Considering the above weakness, the following observations are made. The southern part of the glades was the richest in numbers of species and in abundance of plants. The northern region was least prolific of the areas sampled.

Of the 125 lichen species listed for Tennessee by Phillips (1963), Fifty-seven were found to be present in the cedar glades. Nine species were found in the cedar glades that were not listed by Phillips (1963). The new species are Candelaria concolor, Cladonia cariosa, C. decorticata, C. ravenelii, C. strepsilis, Parmelia amazonica, P. crozalsiana, P. subtinctoria, and Usnea comosa.

The most abundant and widespread of the lichens collected were Parmelia rudecta, P. caperata, Cladonia capitata, and C. furcata. The first two were described by Phillips (1963) as the most abundant and widespread of lichen species found in Tennessee. A large number of species of lichens collected were found in only one collecting area, but the rarest of the species collected were Heterodermia echinata, Cladonia venticillata, and Teloschistes exilis.

The cedar glades are unique geological and ecological units. Yet the lichen flora present in the cedar glades is similar to what would be expected in any small local area in Tennessee. It seems

logical to assume that any small area in the state should and would have fewer species than found statewide and that those found would be distributed in the local area similar to their statewide distribution. This is true, at least, for the cedar glades.

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