

1987

A Taxonomic Re-evaluation of Specimens of the Genus *Caloplaca* in the E.L. Stover Herbarium of Eastern Illinois University

Eric J. Cameron

Eastern Illinois University

This research is a product of the graduate program in [Environmental Biology](#) at Eastern Illinois University. [Find out more](#) about the program.

Recommended Citation

Cameron, Eric J., "A Taxonomic Re-evaluation of Specimens of the Genus *Caloplaca* in the E.L. Stover Herbarium of Eastern Illinois University" (1987). *Masters Theses*. 2579.
<https://thekeep.eiu.edu/theses/2579>

This is brought to you for free and open access by the Student Theses & Publications at The Keep. It has been accepted for inclusion in Masters Theses by an authorized administrator of The Keep. For more information, please contact tabruns@eiu.edu.

A Taxonomic Re-evaluation Of Specimens Of The Genus Caloplaca

In The E.L. Stover Herbarium Of Eastern Illinois University
(TITLE)

BY

Eric J. Cameron

B.S. in Environmental Biology - Botany

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science

Environmental Biology

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1987

YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

DATE

ADVISER

DATE

DEPARTMENT HEAD

THESIS REPRODUCTION CERTIFICATE

TO: Graduate Degree Candidates who have written formal theses.

SUBJECT: Permission to reproduce theses.

The University Library is receiving a number of requests from other institutions asking permission to reproduce dissertations for inclusion in their library holdings. Although no copyright laws are involved, we feel that professional courtesy demands that permission be obtained from the author before we allow theses to be copied.

Please sign one of the following statements:

Booth Library of Eastern Illinois University has my permission to lend my thesis to a reputable college or university for the purpose of copying it for inclusion in that institution's library or research holdings.

Date Author

I respectfully request Booth Library of Eastern Illinois University not allow my thesis be reproduced because _____

Date Author

TABLE OF CONTENTS

ACKNOWLEDGEMENTS page i

ABSTRACT ii

INTRODUCTION 1

MATERIALS AND METHODS 5

RESULTS 7

 TABLE 1 8

 KEY TO THE SPECIES CALOPLACA 9

 LISTING OF CALOPLACA SPECIMENS 12

LITERATURE CITED 16

ACKNOWLEDGMENTS

I wish to thank Dr. Wesley Whiteside for his assistance with the research, writing, and editing of this paper. I would like to thank my wife, Lisa, for her help and patience with the production of this paper.

ABSTRACT

The genus Caloplaca is the largest genus in the family Teloschistaceae. The 103 species in the genus greatly outnumber any other in the family. Lichens of the genus Caloplaca are usually orange to orange-yellow in color, and range from crustose to subfoliose in form. The orange color is due to an anthraquinone, parietin, the location of which is taxonomically important in this genus of lichens. In some species it occurs only in the apothecia, while in others it is found in both the apothecia and thallus. The spores of this genus are polarilocular, and the width of the isthmus is also of great taxonomic importance. These lichens are typically found in dry open areas on rocks, wood, and tree bark. The name Caloplaca was given to this group of organisms in 1860 by Fries (Rudolph, 1955).

This project has been done in an attempt to re-evaluate and re-identify the Caloplaca specimens in the E.L. Stover herbarium of Eastern Illinois University. This re-evaluation and re-identification is necessary because of a lack of access to the literature on this genus until recently. Additionally, specimens were collected over a period of almost twenty years, and each specimen was identified at or near the time of collection. The considerable number of Caloplaca specimens that have been accumulated permit a comparative study at this time.

A total of fifty-seven specimens from the E.L. Stover herbarium were examined. Twenty-two of the specimens were

collected in Illinois, while thirty-one were collected from other states, and two were collected from Puno, Peru. Two specimens from the collection were unidentified. These two specimens lacked apothecia and spores. Since spore characteristics are one of the most important aspects of species determination, no conclusions could be reached for these two specimens. Twenty-three of the fifty-seven specimens were misidentified.

The species represented in the herbarium, after annotation, and the specimen total for each, follows: *Caloplaca aurantiaca* (4), *C.cerina* (6), *C.cinnabarina* (2), *C.citrina* (2), *C.elegans* (6), *C.feracissima* (2), *C.ferruginea* (3), *C.festiva* (2), *C.flavovirescens* (10), *C.fraudans* (1), *C.holocarpa* (2), *C.lactea* var. *americana* (1), *C.lactea* (2), *C.lobulata* (2), *C.microphyllina* (5), *C.murorum* (1), *C.saxicola* (2), *C.sideritis* (2).

INTRODUCTION

The largest genus in the discomycetous lichen family Teloschistaceae is Caloplaca, with 103 accepted species for the continental United States and Canada (Hale and Culberson, 1970). These lichens are typically found in dry open places on rocks, wood, and tree bark. The spores of this genus are described as polarilocular, a term given to spores in which the cytoplasm is divided into two locules. These locules are found at either end of the spore, and the resulting space between the two locules is termed the isthmus. The width of the isthmus varies from species to species, and is of great taxonomic importance. Figure 1. illustrates the difference in isthmus size of two species of Caloplaca.

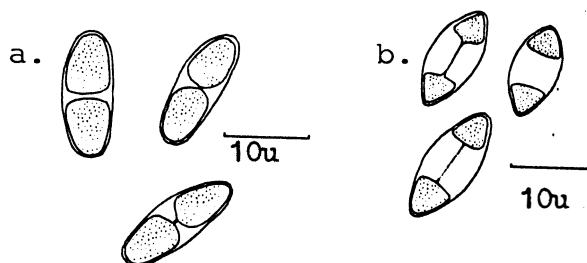


Figure 1. a. C.feracissima, spores showing narrow isthmus.
b. C.holocarpa, spores showing broad isthmus.

There are eight spores per ascus in all species of this genus, and the apothecia have a thalline margin, which means that there are algal cells present in the apothecial rim. Most species of Caloplaca are orange or orange-yellow in color, ranging from crustose to subfoliose, and many of them are frequently overlooked because of their small size. The

orange color is due to an anthraquinone, parietin, and its location is of taxonomic importance. An anthraquinone is a naturally occurring dye. In some species parietin is present only in the apothecia; in others it is present in both the apothecia and thallus.

The name Caloplaca was given to this group of organisms in 1860 by Fries, according to Rudolph (1955). Prior to that time they were treated under the genus Placodium, a name given by Hill in 1751, as reported by Smith (1918), to a variety of lichens now dispersed in several genera. In 1805 the genus Placodium was limited by DeCandolle to species with a squamulose effigurate (lobed) thallus. The genus was further limited in 1853 by Hepp to species with polarilocular spores, and simultaneously extended to species with polarilocular spores having either a crustose thallus or apothecia but no evident thallus (Smith, 1918). Rudolph (1955) split the genus Caloplaca into two separate genera: Pyrenodesmia, for those species with a crustose thallus, and Gasparrinia, for those species with an effigurate to subfoliose thallus. However, most lichenologists do not accept this separation.

Although the distinguished early American lichenologist Tuckerman (1872) put lichens now treated in the genus Caloplaca into the family Lecanorei, covering crustose lichens with a thalline margin to the apothecia, most recent lichenologists have accepted a more restricted family definition. Rudolph (1955) used the family name

Blasteniaceae, in which most species contain parietin and have polarilocular spores. In his monumental work, Revisionary Studies in the Lichen Family Blasteniaceae in North America North of Mexico, Rudolph gives a detailed history of this family. A number of other lichenologists have used the family name Teloschistaceae for the group (Hale, 1970, 1979; Brodo, 1968; Wetmore, 1967; Thomson, 1979; Duncan and James, 1970; and Skorepa, 1973). Fink (1910, 1935), on the other hand, separated the group into two families, the Teloschistaceae for the fruticose and foliose representatives, and the Caloplacaceae for those that were crustose and subfoliose. Currently the Teloschistaceae is regarded as the accepted family name in the Fourth Checklist of the Lichens of the Continental United States and Canada (Hale and Culberson, 1970).

Specimens of Caloplaca are usually readily separated from other genera in the Teloschistaceae. Fulgensia, with only two North American species, differs in that the spores are unicellular, while Protoblastenia, with four North American species, differs in that the apothecia have a proper margin (no algal cells present in the apothecial rim). Caloplaca specimens are most easily distinguished from the five North American species of Teloschistes and the eight North American species of Xanthoria by the fact that Caloplaca is crustose, while Teloschistes is fruticose and Xanthoria is foliose.

The present study is an attempt to re-evaluate and re-identify the specimens of the genus Caloplaca in the E.L.

Stover herbarium of Eastern Illinois University. This re-evaluation is necessary for two reasons: 1) until recently there has been a lack of access to the literature on this genus and, 2) the collection of the Caloplaca specimens has been spaced over a period of almost twenty years, with each specimen identified at or near the time of collection. This project gives the researcher an opportunity for a comparative study of these specimens, enabling a more accurate determination.

MATERIALS AND METHODS

Dried lichen specimens of the genus Caloplaca from the E.L. Stover herbarium of Eastern Illinois University were studied in detail for characteristics of physical appearance such as apothecia size, presence or absence of soredia, or whether the thallus was areolate, verrucose, or continuous. Observations were made under a Bausch & Lomb dissecting scope with a magnification of 10-30X.

For a study of the spores, the specimens were soaked in tap water for 10-15 minutes. This was done to facilitate the extraction of the apothecia from the specimens. Once the apothecia were removed, they were placed in a drop of distilled water on a microscope slide with a cover slip. The apothecia were then crushed to release the spores for measurement. A Zeiss binocular compound microscope was used for measuring the length, width, and isthmus size of the spores. Measurements were expressed in microns and made by means of a micrometer disc inserted in the 10X ocular of the microscope calibrated for the various objectives. As many spores as could be located were measured, except in specimens where spores were abundant. In those cases, eight to ten spores were measured. Measurements of spores were taken at their longest and broadest points.

The presence of parietin was determined through the use of the chemical reagent potassium hydroxide (KOH), by means of spot tests. These tests are known in the literature

simply as K tests. Potassium hydroxide reacts with a deep red to purple color when parietin is present. A single apothecium or small fragment of thallus was tested by applying a droplet of concentrated potassium hydroxide solution with a dissecting needle. The reactions were observed through a dissecting scope. A deep red to purple color was recorded as positive (K+), while no color change was recorded as negative (K-). This reagent is caustic to skin, clothing, and paper; therefore, special care was used in performing the spot tests.

Several identification keys were employed. Brodo (1981), Skorepa (1973), Wetmore (1967), and Hale (1979) were used in making preliminary identifications. However, the key in Rudolph (1955) was regarded as definitive because of its complete coverage of the genus in North America north of Mexico. All specimens were annotated.

RESULTS

A total of fifty-seven specimens from the E.L. Stover herbarium at Eastern Illinois University were examined. A listing of these specimens by species, according to my determinations, is found on page 12. If any of these specimens had been previously misidentified, this has been noted.

A summary of the findings of this work is given in Table 1. Of the fifty-seven specimens, twenty-two were collected in Illinois, while thirty-one were collected from other states, and two from Puno, Peru. The two specimens collected in Peru closely resembled the species *C.saxicola*; however, being from South America, it is possible they are a related species not found in North America. Two specimens from the collection were unidentified. Both lacked apothecia and, therefore, spores. Since spore characteristics are one of the most significant aspects of identification to species, no conclusion could be reached.

Twenty-three of the fifty-seven specimens were misidentified. Similarity in physical appearance, but disparity in spore morphology is frequent in the genus, and this is perhaps a partial explanation for the misidentifications. For example, *C.holocarpa* and *C.cerina* are very similar in physical appearance; however, the isthmus of *C.holocarpa* spores is small (2-4u), while the isthmus of *C.cerina* spores is larger (4-6.5u). Based on the

Table 1: *Caloplaca* species in the E.L. Stover Herbarium of Eastern Illinois University.

Species	# Collected in Illinois	# Collected out of state	Total Collected	Previously Misidentified
1. <i>C.aurantiaca</i>	0	4	4	0
2. <i>C.cerina</i>	2	4	6	4
3. <i>C.cinnabarina</i>	1	1	2	0
4. <i>C.citrina</i>	0	2	2	0
5. <i>C.elegans</i>	0	6	6	2
6. <i>C.feracissima</i>	1	1	2	1
7. <i>C.ferruginea</i>	2	1	3	3
8. <i>C.festiva</i>	2	0	2	2
9. <i>C.flavovirescens</i>	7	3	10	3
10. <i>C.fraudans</i>	0	1	1	1
11. <i>C.holocarpa</i>	1	1	2	1
12. <i>C.lactea*</i>	1	0	1	1
13. <i>C.laetea</i>	1	1	2	2
14. <i>C.lobulata</i>	0	2	2	0
15. <i>C.microphyllina</i>	3	2	5	0
16. <i>C.murorum</i>	0	1	1	0
17. <i>C.saxicola**</i>			2	0
18. <i>C.sideritis</i>	1	1	2	1
19. unidentified***			2	
Totals	22	31	57	23

*var. americana

**collected in Peru

***No apothecia or spores

representation in the herbarium, the most common saxicolous species of *Caloplaca* is *C. flavovirescens*, while the most common corticolous species is *C. microphyllina*.

The following key to the species of *Caloplaca* has been prepared using the specimens found in the E.L. Stover herbarium of Eastern Illinois University.

KEY TO THE SPECIES CALOPLACA

- | | | |
|--|-------|-------------------------------|
| 1. Thallus crustose | ----- | 2 |
| 1. Thallus effigurate to sub-foliose | ----- | 20 |
| 2. Thallus cream color, yellow, or orange, K+;
apothecia yellow or orange | ----- | 16 |
| 2. Thallus whitish, ashy, or buff, sometimes entirely
lacking, K-; apothecia yellow or orange | ----- | 3 |
| 3. Thallus usually lacking; apothecia orange to
red | ----- | 4 |
| 3. Thallus usually present, whitish to gray; apothecia
yellow, orange or brown | ----- | 6 |
| 4. Apothecia red-orange; spores 15-17u x 6.5-7u,
isthmus about 2u wide | ----- | <i>C. laetea</i> |
| 4. Apothecia more yellowish orange | ----- | 5 |
| 5. Spores over 15-17u x 6-7u, isthmus 3u or
less | ----- | <i>C. lactea</i> |
| 5. Spores 11-13.5u x 5-7u, isthmus about 3u
wide | ----- | <i>C. lactea v. americana</i> |
| 6. Thallus whitish to gray or darkening; apothecia
rust colored or darkening; spores narrow,
usually 8u or less wide | ----- | 7 |
| 6. Thallus gray to dark olive; apothecia yellow to
orange or orange brown; spores variable mostly over
8u wide | ----- | 14 |
| 7. On bark or wood | ----- | 8 |
| 7. On rocks | ----- | 11 |
| 8. Thallus buff color; spores narrow 4-6u,
isthmus 2-3u wide | ----- | <i>C. fraudans</i> |
| 8. Thallus ashy gray; spores wider 5-9u wide,
isthmus 4-7u | ----- | 9 |

9. Thallus thin or lacking; spores usually under 8u wide; apothecia small, under .5mm ----- *C.ferruginea*
9. Thallus thin or lacking; spores usually under 8u wide; apothecia larger reaching 1.7mm ---- 10
10. Spores 10.5-14u x 5-9.5u, isthmus 2-4u ----- *C.holocarpa*
10. Spores 10.5-14.5u x 5-8u, isthmus 4-6.5u ----- *C.cerina*
11. Spore isthmus less than 3u ----- 12
11. Spore isthmus over 3u wide ----- 13
12. Thallus buff color; apothecia small, less than .5mm ----- *C.fraudans*
12. Thallus ashy; apothecia larger, reaching 1.7mm ----- *C.holocarpa*
13. Apothecia small, less than .5mm ----- *C.festiva*
13. Apothecia larger, reaching 1.7mm ----- *C.cerina*
14. Growing on trees ----- 15
14. Growing on rocks; thallus dark, areolate; apothecia brown or darker; spore isthmus usually about 6u wide ----- *C.sideritis*
15. Apothecia usually large, reaching 1.7mm across; spores with large isthmus, 4u or more ----- *C.cerina*
15. Apothecia usually smaller, less than .8mm; spores with isthmus less than 4u ----- *C.holocarpa*
16. Thallus areolate ----- 17
16. Thallus squamulose ----- 18
17. Thallus cream or cream buff, closely areolate; spores large, 9.5-17.5 x 5-10.5u, isthmus 4-7u ----- *C.aurantiaca*
17. Thallus areolate, thin, continuous; spores 8.5-10.5 x 3.5-6.0u, isthmus 2.5-3.5u ----- *C.cinnabarina*
18. Thallus thin, lemon yellow, effuse granular ----- *C.citrina*
18. Thallus not as above ----- 19
19. Thallus orange, sometimes yellowing, thin to thickish; apothecia orange, margin lighter than the disc; spores 11-14 x 5-7u, isthmus 3-4u wide ----- *C.flavovirescens*
19. Thallus orange; apothecia orange, margin lighter than the disc; spores 10.5-17.4 x 4.5-7.0u, isthmus 1u or less ----- *C.feracissima*

20. On wood; thallus sorediate; apothecia small;
 spores 9.5-14 x 4.5-7u, isthmus 2-3u
 wide ----- *C. microphyllina*
20. Thallus not sorediate ----- 21
21. Thallus not lobed, bright yellow, upper
 cortex fibrous; spores 10.5-14 x 5-7u,
 isthmus moderate 2.5-3.5u ----- *C. murorum*
21. Thallus lobed at margin ----- 22
22. Lobes elongate, thick, loosely attached;
 spores 8.5-14 x 4.5-8u, isthmus 3-4u
 wide ----- *C. elegans*
22. Lobes very short, thin, closely attached;
 spores 10-14 x 5-7u, isthmus moderate
 2.5-3.5u wide ----- *C. lobulata*

LISTING OF CALOPLACA SPECIMENS
IN THE E.L. STOVER HERBARIUM
OF EASTERN ILLINOIS UNIVERSITY

C.aurantiaca (Lightf.) Th. Fr.

Devils Lake, North Dakota; Collected in open wooded hillside on bark; May, 1975; E. Matzka.

Devils Lake, North Dakota; Collected on bark; May, 1975; E. Matzka. (Misidentified as C.cerina (Ehrh) Th. Fr.).

Smoky Mountains, near Gatlinburg, Tennessee; Collected on bark; September 28, 1974; W. Whiteside.

Texas; Collected on bark; Spring, 1973; S. Barlow.

C.cerina (Ehrh.) Th. Fr.

Coles County, Illinois, The Rocks; Collected on rock; September 7, 1974; W. Whiteside.

Spooner, Wisconsin; Collected on rock; April 17, 1973; B. Carson. (Misidentified as C.holocarpa (Hoffm.) Wade).

South Dakota, Beaver Creek National Park; Collected on Aspen bark; August 21, 1972; L. Decker. (Misidentified as C.holocarpa (Hoffm.) Wade).

Mariposa County, California; Collected on tree bark at 5000 ft. + elevation; June 30, 1973; J. Bell. (Misidentified as C.holocarpa (Hoffm.) Wade).

Coles County, Illinois; Collected on cement bridge on Walkers Ford Road; February 21, 1975; W. Whiteside. (Misidentified as C.holocarpa (Hoffm.) Wade).

Davis Mountains, Texas; Collected on bark; March 25, 1975; D. Brussels.

C.cinnabarina (Ach.) Zahlbr.

North of East Alton, IL; Collected on Limestone Bluff at 790 ft. elevation; April 12, 1974; D. Brussels.

East Grandy, Connecticut; Collected on rock; March 28, 1975; A. Parker.

C.citrina (Hoffm.) Th. Fr.

Smoky Mountains; Collected on rock; May 30, 1970; W. Whiteside.

Wilson County, Tennessee; Collected on limestone cliff along the Cumberland River; July 1, 1984; L. Phillippe.

C.elegans (Link) Th. Fr.

Dubuque, Iowa, Eagle Point Park; Collected on rock; May 25, 1976; W. McClain.

Wilderness State Park, Michigan, Waugoshanci Point; Collected on a boulder in marsh; October 11, 1981; C. Cunningham. (Misidentified as C.saxicola (Hoffm.) Nordin).

Southwest Wyoming; Collected on bark; November, 1969;

F. Hedges. (Misidentified as *C.cinnabarina*
(Ach.) Zahlbr.).

Flag Staff, Arizona, Grand Canyon; Collected on bark;
August 27, 1972; W. Pichon.

Wind Cave National Park, South Dakota; Collected on rock;
August 21, 1972; L. Decker.

Santa Cruz County, Arizona, Nogales; Collected on rock;
January, 1973; J. Bell.

C.feracissima Magn.

Dubuque, Iowa, Eagle Point Park; Collected on rock;
May 25, 1976; W. McClain.

Clark County, Illinois, Rocky Hollow; Collected on rock;
June 17, 1969; J. Wiedman. (Misidentified as *C.cerina*
(Ehrh.) Th. Fr.).

C.ferruginea (Huds.) Th. Fr.

Coles County, Illinois; Collected on tree bark on Walkers
Ford Road; April 4, 1975; W. Whiteside. (Misidentified
as *C.holocarpa* (Hoffm.) Wade).

Walker County, Texas; Collected on tree bark; January 3,
1976; J. Macuzek. (Misidentified as *C.holocarpa*
(Hoffm.) Wade).

Starved Rock, Illinois; Collected on tree bark; August 10,
1976; M. Zaloudek. (Misidentified as *C.aurantiaca*
(Lightf.) Th. Fr.).

C.festiva (Ach.) Zw.

Pierre Marquette State Park, Illinois; September 28, 1974;
W. Whiteside. (Misidentified as *C.holocarpa*
(Hoffm.) Wade).

Macoupin County, Illinois; Collected on limestone; 1976; W.
McClain; (Misidentified as *C.holocarpa* (Hoffm.) Wade).

C.flavovirescens (wulf.) Dalla Torre and Sarnth.

Peaks of Otter Natural Area, Virginia, Sharp Top Mountain
(Area VIII); Collected on rock; June 1976; M. Slaughter.

Peaks of Otter Natural Area, Virginia, Johnson Farm
(Area II); Collected on rock; June, 1976; M. Slaughter.

Peaks of Otter National Area, Virginia, Purgatory Mountain
Overlook (Area IV); June, 1976; M. Slaughter.

Dubuque, Iowa, Eagle Point Park; Collected on rock; May 25,
1976; W. McClain. (Misidentified as *C.cinnabarina*
(Ach.) Zahlbr.).

Dekalb County, Tennessee, Center Hill Dam; Collected on
rock; December 27, 1982; L. Phillippe.

Bowling Green, Kentucky; Collected on rock; April 13,
1972; W. Whiteside. (Misidentified as *C.cinnabarina*
(Ach.) Zahlbr.).

Macoupin County, Illinois, Scottville ("Rockhouse");
Collected on rock; 1977; W. McClain.

Macoupin County, Illinois; Collected on sandstone; 1976;
W. McClain.

Pine Hills, Illinois; Collected in seep spring at base of
cliff next to LaRue Swamp; May 20, 1978; R. Hintz.

(Misidentified as *C. cinnabarina* (Ach.) Zahlbr.).
Williamson County, Tennessee; Collected on rock; July 10,
1984; L. Phillippe.

C. fraudans (Th. Fr.) Oliv.

Lake Fullerton, Louisiana; Collected on tree bark;
January 1, 1981; P. Lock. (Misidentified as
C. holocarpa (Hoffm.) Wade).

C. holocarpa (Hoffm.) Wade

Turkey Run, Indiana; Collected on concrete rubble in
shaded woods; October 15, 1971; Mertz. (Misidentified
as *C. aurantiaca* (Lightf.) Th. Fr.).

Vermilion County, Illinois, Kinnecc C. Park; Collected on
rock; July, 1975; W. Whiteside.

C. lactea var. *americana* (Mass.) Zahlbr.

Pierre Marquette State Park, Illinois; Collected on
limestone; September 28, 1972; W. Whiteside.
(Misidentified as *C. laetea* Magn.).

C. laetea Magn.

Prescott, Arizona; Collected by Lynx Lake on rock; Summer,
1976; R. Smith. (Misidentified as *C. holocarpa*
(Hoffm.) Wade).

Clark County, Illinois; Collected on concrete five miles
west of Clarksville; March 6, 1975; W. Whiteside.
(Misidentified as *C. feracissima* Magn.).

C. lobulata (Florke) Hellb.

Peaks of Otter Natural Area, Virginia, Johnson Farm
(Area II); Collected on rock; June, 1976; M. Slaughter.
Wyoming; Collected on rock on Highway 80 at 8 ft.
elevation; R. Smith.

C. microphyllina (Tuck.) Hasse

East Nogales, Arizona; Collected on Mesquito tree;
January 22, 1973; J. Bell

Coles County, Illinois; Collected on tree bark on
Walkers Ford Road; February, 1970; W. Whiteside.

Clark County, Illinois; Collected on tree north of
Clarksville; March 6, 1975; W. Whiteside.

Coles County, Illinois; Collected on fence post on
Walkers Ford Road; February 26, 1975; W. Whiteside.

Santa Cruz County, Arizona, Nogales; Collected on tree
bark; January, 1973; J. Bell.

C. murorum (Hoffm.) Th. Fr.

Santa Cruz County, Arizona, Nogales; Collected on rock;
January, 1973; J. Bell.

C. saxicola (Hoffm.) Nordin

Puno, Peru; Collected on rock of Inca Ruins at +-14,000
ft elevation; December 31, 1980; M. Klopmeier.

20 miles south of Puno, Peru; Collected on rock +-13,000

ft elevation; January 5, 1981; S. Tomasino.

C. sideritis (Tuck.) Zahlbr.

Starved Rock, Illinois; Collected on rock; August 10, 1974; M. Zaloudek.

Turkey Run, Indiana; Collected from covered bridge #1 on sandstone boulder; November 5, 1971; Mertz.
(Misidentified as *C. aurantiaca* (Lightf.) Th. Fr.).

LITERATURE CITED

- Brodo, I.M. 1981. Lichens of the Ottawa Region. National Museum of Natural Sciences, National Museums of Canada.
- Brodo, I.M. 1968. The Lichens of Long Island, New York: A Vegetational and Floristic Analysis. New York State Mus. Sci. Serv. Bull. 410.
- Duncan, U.S. and P.W. James. 1970. Introduction to British Lichens. T. Buncle and Co. Arbroath, England.
- Fink, B. 1910. The Lichens of Minnesota. Government Printing Office. Washington D.C.
- Fink, B. 1935. The Lichen Flora of the United States. University of Michigan Press. Ann Arbor, Michigan.
- Hale, M.E. and W.L. Culberson. 1970. A Fourth Checklist of the Lichens of the Continental U.S. and Canada. Reprinted from The Bryologist. Vol. 73, No. 3. pp. 449-543.
- Hale, M.E. 1979. How to Know the Lichens. 2nd ed. William Brown Co., Dubuque, Iowa.
- Rudolph, E.D. 1955. Revisionary Studies in the Lichen Family Blasteniaceae in North America North of Mexico. Ph.D. dissertation, Washington University (St. Louis, MO). 220pp.
- Skorepa, A.C. 1973. Taxonomic and Ecological Studies on the Lichens of Southern Illinois. Ph.D. dissertation, University of Tennessee. 248pp.
- Smith, A.L. 1918. A Monograph of the British Lichens. Part I 2nd ed. British Museum (Natural History). London, England.
- Thompson, J.W. 1979. Lichens of the Alaskan Arctic Slope. University of Toronto Press. Toronto, Canada.
- Tuckerman, E. 1872. Genera Lichenum: An Arrangement of the North American Lichens. Journal Steam Press. Lewiston, Maine.
- Wetmore, C.M. 1967. Lichens of the Black Hills of South Dakota and Wyoming. Stone Printing Company. Lansing, Michigan.