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Use of Mosses and Lichens as Biomonitors in the study of Air Pollution Near Mumbai, India

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Abstract. Trace element composition of two mosses namely *Pinnatella alopccuroides* and *Bryum splachnoides* and two lichens *Parmotrema cf. crinitum* and *Leptogium cf. gelatinosum* were compared to that of air in Mahabaleshwar. Using Energy Dispersive X-Ray Fluorescence (EDXRF) and Instrumental Neutron Activation Analysis (INAA), trace element analysis was performed. It was found that the moss *Bryum splachnoides* can be used as effective biomonitor for As, Br, Sb and Zn similarly *Parmotrema cf. crinitum* can be used as a biomonitor for Zn, and *Leptogium cf. gelatinosum* as a suitable biomonitor for Sb, and As.

Keywords. Pinnatella alopccuroides, Parmotrema cf. crinitum, Leptogium cf. gelatinosum, Bryum splachnoides, trace element, bioindicator

INTRODUCTION

Lichens and mosses can be used as biomonitors of air pollution as they are highly dependent on atmospheric sources for nutrients due to their specific capacity for absorbing and accumulating trace levels of pollutants from the air. (Bergamaschi, Rizzio, Valcuvia, Verza, Profumo, & Gallorini 2002)

In this work, we evaluated the use of some lichens and mosses to monitor air pollution in Mahabaleshwar, a remote area in Mumbai, India. The data was analyzed to generate information about the contribution of heavy metals from distant emission sources (Berg and Steinnes 1997). Analyses were performed using Energy Dispersive X-Ray Fluorescence (EDXRF) and Instrumental Neutron Activation Analysis (INAA).

Comparisons between Enrichment Factors (EFs) obtained from air sample analysis and from lichens, helped in determining which moss and lichen species might be effectively used as biomonitors for the study area (Bergamaschi, Rizzio, Giaveri, Profumo, Loppi & Gallorini 2004).

MATERIALS AND METHODS

Study area: The study site, Mahabaleshwar is located at 17.58°N and 73.43°E at 4500 feet (1372m) above sea level in the heart of the Sahyadri Hills in Satara District, Maharastra, in the midst of dense forest. The 1200m sequence of Mahabaleshwar is about 140km South East of Mumbai (Fig. 1). Annual rainfall for this site is 6250 mm. The site is generally free from industry and vehicular activity. The sampling area is located at about 300km away from the main industrial town of Mumbai.

SAMPLING AND SAMPLE PREPARATION

Moss samples namely *Pinnatella alopccuroides* (Hook.) Feisch. and *Bryum splachnoides* (Harv.) Muell.Hal. were collected according to the protocol adopted by the European Heavy Metal Survey (Gerdol, Bragazza, Marchesini & Alber. et al 2000). Moss samples were collected at a distance of at least 500 m from main roads, 200 m from local roads and 1 km from inhabited areas. Samples were taken in forest glades or an open heath to reduce through-fall effects from the forest canopy. Each sample consisted of 5-10 sub samples collected within an area of 50 m^2 (Steinnes, Berg, & Sjobakk 2003). This was done to make each moss sample representative of a reasonably large area (Berg & Steinnes 1995).

Lichen samples of *Parmotrema cf. crinitum* (Arch.) M. Choisy and *Leptogium cf. gelatinosum* (With.) J. R. Laundon were collected from trees at a height of between 1.5 and 2 m, put into clean plastic bags, and transported to the laboratory. Special care was taken in selecting trees of similar age, while avoiding samples from fallen, decayed or young trees (Sloof, J.E 1993).

Samples were sorted to remove extraneous material and washed with distilled water. Samples were then homogenized using a mortar and pestle and freeze dried (Brown 1984). One gram of dried, homogenized powder was mixed with ultra pure cellulose powder and pressed into pellets using a 20 ton hydraulic press. Pellets were then analyzed using an EDXRF model 3600, Jordon Valley using suitable transmission filters to remove primary beam continuation and provide monochromatic target-line excitation sources (Jha & Puranik, 2002). To obtain optimum excitation for low Z elements (like Al, V) a Cu filter was used, while a Mo filter was used to analyze Zn, Pb, Rb, Sr. The details of analytical methodologies are described in Jha et.al (2002).

For INAA analysis, a 30 mg homogenized moss sample was packed in a double sealed polythene bag and sent along with 30 mg of Certified Reference Material lichen 336 IAEA (International Atomic Energy Agency) and 25mg of Standard Reference Material of 1648 NIST (National Institute of Standards And Technology).

They were irradiated in a thermal neutral column at the Apsara Reactor at the Bhabha Atomic Research Centre for 7 hrs with a neutron flux of 10^{12} neutron/cm^2/sec. The counting system consists of an PCA based PHAST card coupled with a HPGe detector of 25% relative efficiency and a resolution of 1.8 kev at 1332 kev. Na, As, and Br, were detected after three days of cooling while other elements like Sr, Sb, Fe, Zn, Cr, Rb were measured after 4 weeks. Quantification was carried out comparing the peak area of a particular element in the sample with peak areas for elements in certified reference standards.

For quality control standard reference materials of CRM lichen 338 from IAEA were simultaneously analyzed.

Airborne particulate matter was collected on Whatman Filter Paper with a high volume air sampler from 5 meters above ground level at a flow rate of 1000 liter per minute for twentyfour hours. Loaded filter papers were stored in air tight bags and a round area of 16 cm^2 was analyzed using EDXRF. A 4x4=16cm^2 was retained for INAA analysis.

RESULTS AND DISCUSSION

The Enrichment Factor (EF) of an element gives information on its anthropomorpic origin and can be calculated using the following equation: EF = Cx/Cn (ambient): Cx/Cn (background) where Cx is the concentration of the X element whose enrichment is to be determined and Cn is the concentration of the normalizing element assumed to be uniquely characteristic of the background.

In our case ambient samples consisted of air particulate matter or lichens while background samples consisted of surrounding soils (Bergamaschi & Rizzio, 2002).

Using aluminum as the reference crustal element for normalization by analysing the air particulate matter and soil samples, the EF values of 18 elements were calculated. In the case of Cl, Fe, and K both mosses contained higher concentrations than air samples. In contrast, concentrations of Pb, Sr, and V in mosses were lower than air samples. Zn, Br, Sc, and Sb levels in *Bryum splachnoides* were comparable to levels in air samples identifying it as a suitable biomonitor. *Pinnatella alopccuroides* proved to be a good biomonitor for Zn. Similarly, *Parmotrema cf. crinitum* can be used as a biomonitor for Zn, and *Leptogium cf. gelatinosum* for Sb and As.

Conclusion

The combined use of biomonitors and nuclear techniques such as EDXRF and INAA is very effective for the evaluation of trace element distribution from atmospheric pollution sources. Pantelica et al. (2002) showed that EFs obtained from the analysis of local soils provide important information for documenting which mosses and lichens are most suitable as biomonitors.

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TABLE 1. Amount of trace elements in the mosses *Pinnatella alopccuroides* and *Bryum splachnoides* from Mahabaleshwar (Results are in mg/kg)

Pinnatella alopccuroides				***Bryum splachnoides***		
Elements	Max.	Min.	Mean value	Max.	Min.	Mean value
Al	1589.65	985.23	1069.99	1145.32	985.23	1045.60
Na	1487.34	769.98	879.76	1569.25	1365.98	1464.21
Ca	18975.00	12658.00	14446.96	16985.69	15369.21	15935.64
Rb	2.36	1.00	2.00	2.56	1.87	1.92
Pb	7.56	4.96	5.83	7.65	4.98	5.55
Sr	12.36	9.65	11.08	13.36	9.65	11.45
Cr	1.09	0.10	0.46	3.69	2.45	2.71
V	6.56	42.98	3.71	6.58	3.98	4.20
Sc	-	-	-	2.12	1.00	1.01
K	3985.23	2896.32	3097.17	3015.36	2659.15	2944.85
Cl	2698.32	2001.32	2508.87	1569.58	1339.65	1426.81
Zn	125.32	98.32	104.59	75.62	65.25	68.57
As	1.98	0.34	0.53	2.25	0.89	0.94
Br	20.43	12.87	15.65	29.65	25.36	27.09
Sb	0.23	0.12	0.14	0.39	0.29	0.33
La	1.89	0.65	0.76	3.12	2.01	2.34
Ce	-	-	-	3.69	3.12	3.45
Fe	4985.23	4756.32	4854.34	4996.32	4236.23	4680.63

TABLE 2. Amount of trace elements in the lichens *Parmotrema* cf. *crinitum* and *Leptogium* cf. *gelatinosum* (Results are in mg/kg)

Parmotrema* cf. *crinitum				***Leptogium* cf. *gelatinosum***		
Elements	Max.	Min.	Mean value	Max.	Min.	Mean value
Al	1896.32	1298.66	1563.65	1025.36	896.32	924.08
Na	1596.26	1498.36	1502.46	1459.36	1256.32	1348.32
Ca	19856.32	14698.25	15641.37	9856.32	9125.36	9084.42
Rb	2.15	1.56	1.67	3.36	1.01	1.50
Pb	5.69	3.25	4.71	5.69	3.49	4.17
Sr	12.23	9.65	10.08	10.65	8.56	9.04
Cr	35.62	30.21	32.06	0.05	0.01	0.03
V	6.59	4.96	5.34	3.56	2.10	2.49
Sc	2.56	0.77	1.27	10.69	8.56	9.91
K	3965.21	3125.12	3627.44	2189.36	2015.36	2185.05
Cl	2659.32	1996.32	2291.68	1320.36	1196.32	1203.79
Zn	59.37	52.32	56.31	76.69	46.32	59.32
As	-	-	-	3.12	1.36	1.90
Br	41.25	36.54	39.39	56.32	42.36	48.48
Sb	0.08	0.026	0.03	1.01	0.10	0.12
La	-	-	-	0.00	0.01	0.01
Ce	2.57	1.54	1.65	6.58	5.12	5.67
Fe	10256.36	7459.32	8096.89	3698.25	2856.23	3344.55

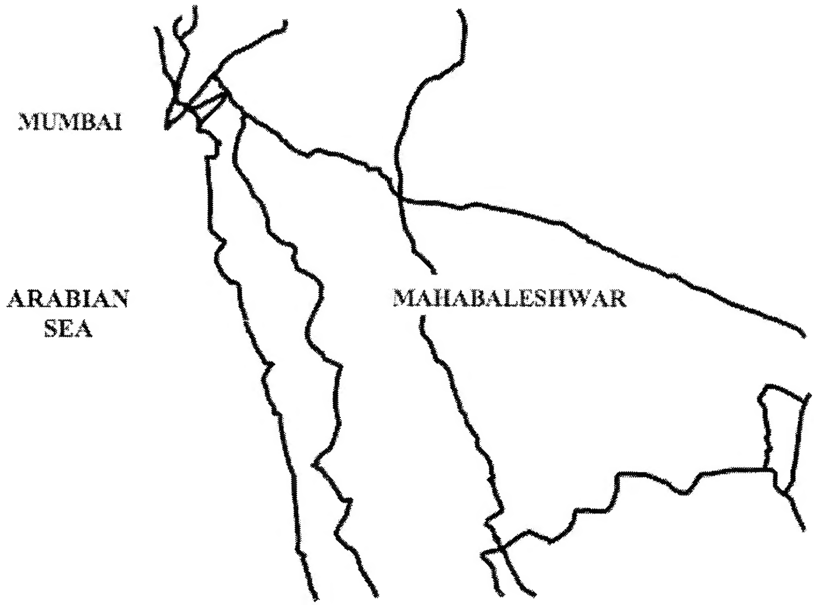

FIGURE 1. Map showing the location of Mahabaleshwar relative to Mumbai

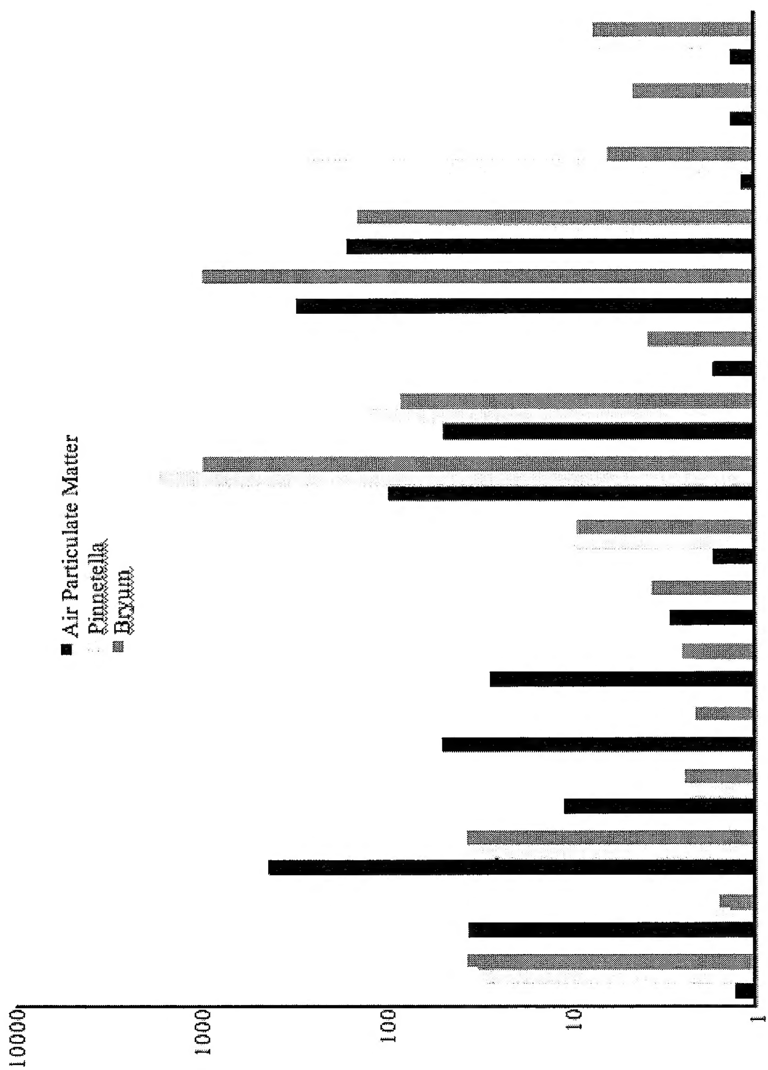

FIGURE 2. Comparison of trace element EF values for air particulates and the two mosses *Pinnatella alopecuroides* and *Bryum splachnoides* from Mahabaleshwar

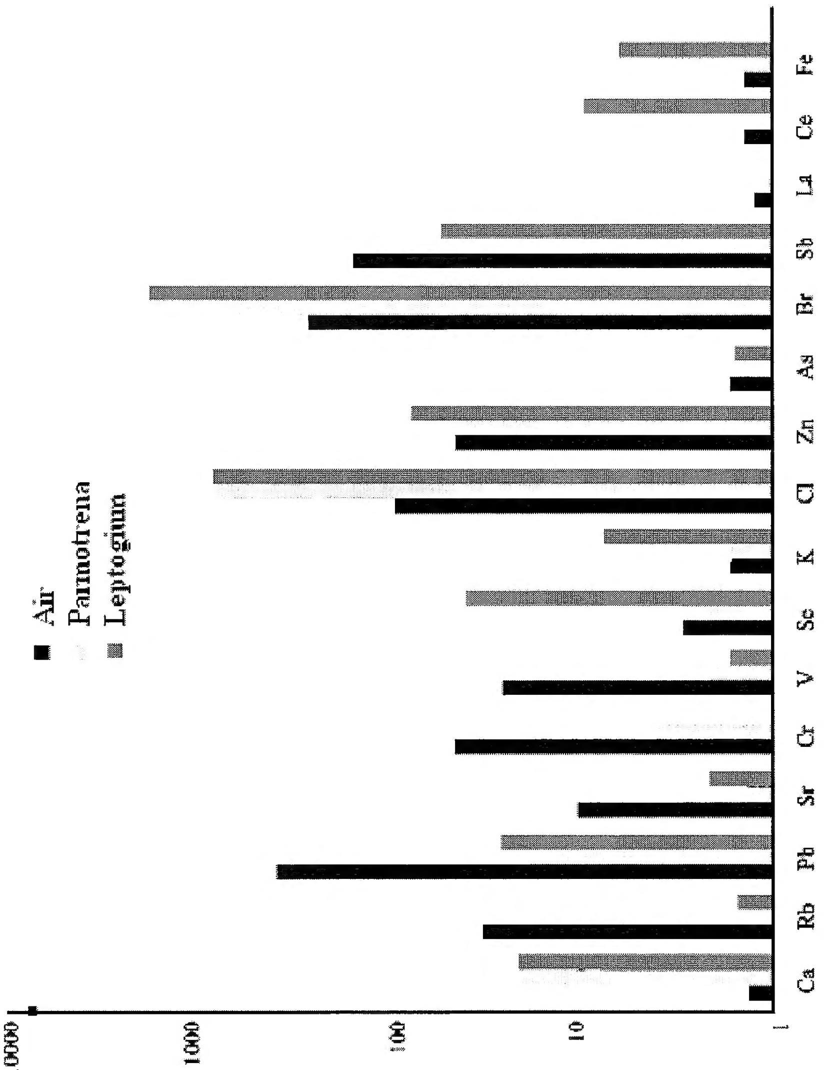

FIGURE 3. Comparison of trace element EF values for air particulates and the two lichens *Parmotrema cf. crinitum* and *Leptogium cf. gelatinosum* from Mahabaleshwar

Acarospora obpallens (Nyl. ex. Hasse) Zahlbr. in the Southeastern United States

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Acarospora obpallens (Nyl. *ex* Hasse) Zahlbr. was thought to be a terricolous lichen endemic to California (Knudsen 2004). Taxonomic studies for the Sonoran flora found that the species was much more common on sandstone and acid rock throughout western North America. Now placed in synonymy are two names applied to saxicolous specimens from Arizona: *Acarospora carnegiei* Zahlbr. and *A. tucsonensis* H. Magn. (Knudsen 2005; Knudsen *in press*)

The dispersed-to-clustered areoles of *A. obpallens* are yellow-brown to dark brown, usually 0.2-0.7 mm in diameter, round with a single brown immersed apothecium. The areoles are epruinose to very heavily pruinose. The upper surface is smooth or rugulose with a distinct foveolate formation of small pits around the disc. These pits are distinctive and are not associated with a primordium and are abundant in most specimens. The simple, hyaline, ellipsoid ascospores are 3.9-5(-7.1) x 1.0-1.9(-2.5) µm. The paraphyses are 1.5-2.4 µm diameter at their base with usually unexpanded apices often with dark caps. The cortex contains gyrophoric acid (major), lecanoric acid (minor), hiascic acid (minor), 3-hydroxygyrophoric acid (trace), and methyl lecanorate (trace) (John A. Elix, *pers com.*) The spot test reaction is best seen on a mounted section with KC and is pink-red. Specimens sometimes test negative but still have same chemistry.

For general identification the small pits around the apothecium, the rounded areoles with a single immersed disc, and the C+/KC+ pink-red reaction of the cortex are sufficient for identification. Currently *A. obpallens* is known from California, Utah, Arizona, and New Mexico, with a single disjunct occurrence of sterile areoles in Washington (hb. McCune). It appears to be most abundant in southern California and from Tucson north to Maricopa County in Arizona.

Until recently, most specimens seen were identified as *A. fuscata* or the C test was not clearly observed and they were identified as various C- species.

The following specimens extend the range of *A. obpallens* into the southeastern United States, with collections from Louisiana, Virginia, and North Carolina. The specimens occurred in small dispersed patches and could easily be overlooked.

USA: Louisiana: Natchitoches Parish: Kisatchie National Forest. On tertiary sandstone outcrops. Shirley Tucker # 17473 (SBBG!)

USA: Virginia: Shenandoah National Park: Skyline Drive. Elev. 2700 ft. On old, low rock wall. (Phyllis Ihrman) Don Flenniken #7422 (hb. Flenniken!)

USA: North Carolina: Transylvania County: Gorges State Park, southwest face of Grassy Ridge, Snake Rock. 35° 05'45" N 82° 57' 25" W. Elev. 3150-3200 ft. James C. Lendermer #4937 & Erin Tripp (hb. Lendermer!)

CONCLUSIONS

The occurrence of *Acarospora obpallens* in the southeastern United States is an exciting range extension. The emerging distribution patterns of Acarosporaceae in North America, many of which are adapted to pioneer rock outcrops in full sun, will add to our understanding of the continental pattern of the distribution of saxicolous crustose lichens.

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An addition to the lichen flora of New Jersey: the Basidiolichen *Multiclavula vernalis* (Schw.) Petersen

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Multiclavula represents one of a small number of lichenized Basidiomycete genera (Oberwinkler 2001). *Multiclavula vernalis* occurs throughout eastern North America (Brodo et al. 2001) and is one of the most widespread of all *Multiclavula* species (Petersen 1967; Petersen & Kantvilas 1986). It is typically found growing over an algal crust on soil, and forms cream to orange basidiocarps (Petersen 1967; Brodo et al. 2001). Because of the ephemeral nature of the basidiocarps, *Multiclavula* species may frequently go unnoticed, and are most likely much more common than reported. A search of the literature, including Lendemer (in press) revealed no previous collections of *Multiclavula vernalis* from New Jersey. This publication reports the first record of this taxon for the state.

Multiclavula vernalis (Schw.) Petersen (Clavariaceae)

NEW JERSEY. Atlantic County: Wharton State Forest, along the Orange/Yellow trail, west of Batsto Village, approximately 39°38'46"N, 74°39'37"W. Found once, growing in an open area on a sandy bank along the trailside in a *Pinus rigida* gap. 20 May 2004, *Nelsen 3985* (WIS).

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Thanks to Susan Will-Wolf and Anne Reis for organization and logistics, and Susan Will-Wolf for reviewing this paper. James Lendemer, Marie Trest and Carrie Andrew provided valuable discussion and Gill Weika and Barry Lilac are thanked for collecting permits.

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Hypnum pratense (Musci: Hypnaceae) New to Missouri

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Shannon County, one of Missouri's largest counties, is located in the southeastern part of the state, on the Salem Plateau of the Interior Highlands of North America. The area is dominated by upland oak-hickory forests, but there are also a number of rich and diverse sites, such as rivers, springs, creeks and fens. The Mark Twain National Forest occupies considerable acreage within the county. Alan Brant and the junior author conducted a botanical survey within the National Forest, primarily searching for herbaceous plants, but also on the alert for any unusual bryophytes.

In the far, northeastern section of Shannon County runs a small creek, Bound Branch, at an elevation of 1,060 feet, in a valley located 200 feet below the surrounding ridges. Several seeps plus a large fen are also located in the valley. Along this creek, the searchers found an unusual moss growing in extensive mats, on partially shaded, moist soil, along a shallow, pooled area of a seep. This moss turned out to be ***Hypnum pretense*** Koch *ex* Spruce, a Missouri state record.

Hypnum pratense Koch *ex* Spruce Shannon County, Missouri, 13 May 2005, *Holmberg & Brant 1027* (MO). Plants bright green to golden, in dense mats, stems prostrate and creeping, with hylodermis and central strand, pseudoparaphyllia narrowly foliose, leaves complanate, erect-spreading in two curving rows, stem leaves 1.7–2.2 x 0.6–0.8 mm, weakly falcate, oblong-lanceolate to lanceolate, concave, rounded at insertion, not or weakly decurrent, apex acute to broadly acuminate, margins serrulate above, plane, costa absent or short and double, median cells smooth, linear, 60–80 x 4–5 mm, alar cells somewhat enlarged in small groups at the inner basal angle. The plants matched very well to material from Grout, *North American Musci Perfecti 349* (MO). ***Hypnum pratense*** is one of the more difficult *Hypnum* species to identify; being dioicious, determinations usually must be based on gametophytic characters. Allen (1996) gives a detailed description of the species and in particular, differences from *Hypnum lindbergii* Mitt.

Hypnum pratense has been reported by Crum & Anderson (1981) from Newfoundland to British Columbia, south to the Great Lakes region, and east to Virginia and North Carolina. The presence of ***H. pratense*** in Missouri represents a southwestern range extension for the species. Other *Hypnum* species reported in Missouri are *H. cupressiforme* Hedw. var. *filiforme* Brid., *H. curvifolium* Hedw., *H. imponens* Hedw., *H. lindbergii* Mitt.and *H. pallescens* (Hedw.) P. Beauv.

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What do we know about Wisconsin lichens?

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Wisconsin is fortunate to have had many lichenologists and a long history of lichenology (Thomson 2003). For example, corticolous communities of lichens were documented thoroughly in northern Wisconsin (Culberson 1955), south-central Wisconsin (Beals 1965) and southern Wisconsin (Hale 1955; Cole 1977) using ecological plot methods. Lichens on sandstone and limestone rock outcrops were studied by Foote (1966). Others are reviewed by Thomson (2003). These ecological surveys focused on frequency and coverage of lichens on their substrates, and their associations. They are applicable to other, similar areas of the state because of the random sampling methods used. However, they suffer from one problem: many rare species are not discovered because the plots used may not be located where rare species occur. The entire lichen flora of an area is found in a variety of habitat types and all of them must be studied using prior knowledge of where to look. Collecting of lichens specifically for documenting the flora (floristic surveys) has been done throughout the state, but the most complete lichen floras for the state are for the Apostle Islands National Lakeshore (Wetmore 1990) and the St. Croix National Scenic Riverway (Wetmore & Bennett 2004). At the county level, Ashland County currently has the highest number of lichen species, 291, because of the work done at Apostle Islands. Kenosha County, however, has only one lichen species recorded, which is obviously wrong – the county has simply not been studied.

The most recent compilation of the lichens of Wisconsin lists 662 species in 164 genera (Thomson 2003, Bennett & Wetmore 2004). This is about 130 species fewer than the neighboring states of Minnesota and Michigan (Bennett & Wetmore 2004), which are ecologically comparable. There are several possible reasons for this discrepancy with neighboring states.

First, the documented number of collected specimens from Wisconsin in Thomson (2003) and other sources (Bennett unpublished) is over 7,320, which is about one fifth the total for Minnesota (Wetmore unpublished) and about half of the number for Michigan (A. Fryday, personal communication). Collecting in Wisconsin has obviously been less than in Michigan and Minnesota. This works out to about 11 specimens per species, with a median value of six. Most species are collected very rarely.

Collecting across the state has been very uneven (Fig. 1 & 2). It is clearly concentrated in the northern tier of counties, along the Wisconsin River valley, and several southwestern counties. Obviously counties that have not been studied very much could have more new species to add to the state list. In addition, the number of species across the state, while not expected to be even (see below), is nevertheless concentrated in the same counties having had the most collecting. Obviously the number of collections and the number of species are very highly correlated ($r = 0.94$, $P < 0.001$).

Other reasons for the deficiency in species numbers for the state include:

- New species are still being discovered. For example, a recent workshop for lichenologists doing five days of field work in three northern counties uncovered 47 new records for Wisconsin (Lay 2004), and I have found several species on limestone in counties along the Mississippi River that are also new state records.
- Crustose life forms are under-collected. An analysis of the life form distribution of the Wisconsin flora shows that 44% of the species are foliose, 32% crustose, 22% fruticose and the remaining 2% squamulose. The distribution of life forms in the lichen genera for North America is 52% crustose, 15% foliose, 11% fruticose, and the rest are either squamulose, lichenicolous fungi, or other types. Assuming the distribution in species is similar to that of genera, the deficiency in crustose species in Wisconsin is evident. Many more crustose species remain to be discovered.
- Many large counties have not been surveyed. A fundamental relationship in ecology is that

the larger the geographic unit, the more species should be found there. In Wisconsin, there is a significant and moderate correlation between lichen diversity and county area ($r = 0.55$, $P < 0.001$, Fig. 3). Given what we know above about collecting and the number of species it is evident that more species will be found, and probably more will be found in the larger counties that are undercollected, e.g. Marathon County.

- A multiple regression model relating lichen species numbers to county area, number of collections, forested acreage, farm acreage, population, housing units, total road mileage, average temperature and precipitation found that only two variables affected lichen species: population and collections (Table 1). Population decreased species while collections increased them. The lack of relationships with the other variables is further evidence the lichen species numbers are incomplete.

In addition to the six extirpated species described earlier (Bennett & Wetmore 2004), there are also 41 species of macrolichens (foliose and fruticose life forms) being considered for protection as rare and endangered species. Almost 60% of the species occur in the northern part of the state. Some of the extinct species occur in the southern part. These species exist(ed) in 43% of the counties and they represent 7% of the total lichen flora of the state. One species was last collected in 1884, but others were collected only recently. There was very little overlap with the rare species in Michigan and Minnesota, leaving 38 species rare only in Wisconsin.

THE FUTURE IS UNCERTAIN

We have a paradox: lichens have been extirpated in Wisconsin, yet new species are discovered periodically. The number of lichen species listed in our floras will surely increase over time as more collecting is done. But this is due to collecting itself, and does not represent lichens that have only recently made Wisconsin their home. The lichens that are being found now have probably been here all along, but we didn't know it. That is why a plot of species over time would show an increase even though we are losing species to extinction. The common species in Wisconsin are well known. Most species that are found now are uncommon or obscure, and are classified as rare species. Unfortunately, these are often also the most vulnerable to extinction. This places the future of lichens in Wisconsin in a precarious position. Rare species will be found but will also go extinct, and eventually the diversity of lichen species will level off, probably somewhere between 750 and 800 species, and then begin a slow decline as no more new species are found. Common, pollution-tolerant, and weedy species will prevail and the flora will gradually become stable numerically, less species-rich and more geographically homogenous.

In addition, Wisconsin may be losing species that we don't even know are here. If surveys are not done, the undiscovered rare species could go extinct without our knowing it. The impression that Wisconsin is a well-studied area for lichens has led to some complacency about the need for surveys. Recently I have been collecting in Wisconsin State Natural Areas in the southwestern part of the state and have discovered new species and county records almost every time I collect. Careful surveying and collecting is still critically needed in many areas of the state.

The future of lichenology in Wisconsin requires building on our current knowledge using a number of approaches. First, a baseline inventory of the entire state would capture a moment in time that would be invaluable for future comparisons. Second, inventory studies are definitely needed in under-collected counties and special areas. Third, surveys for rare lichens should be undertaken by very diligent and thorough searching in special habitats. And fourth, common lichens can be monitored by establishing permanent plots and following them through time. Finally, this information can help direct conservation efforts that are essential for saving species on the edge of extinction.

In conclusion, the lichen picture for Wisconsin is incomplete because collecting has not been performed evenly across the state. The southeastern and west-central portions of the state are the least studied. We are unable to analyze lichen distributions effectively because of these gaps in our knowledge. We do know, however, from the history of air pollution, historical records, and the relationship with human population that lichens are in decline statewide. In the south, few disturbance and air pollution sensitive species are left. In the north, rare species are still found, but increasing risk factors make them vulnerable. More collecting is needed in certain areas, and conservation of threatened species should be fostered.

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Table 1. Multiple regression of number of lichen species against nine variables*

Variable	Coefficient	T	T probability
Constant	-25.784	-0.23	0.819
Area (square miles)	-0.035	-0.913	0.365
Collections	**0.451**	**15.703**	**0.000**
Forest acreage	0.000	0.351	0.727
Road miles	0.027	1.555	0.125
Average temperature	-2.535	-0.984	0.329
Average precipitation	4.527	1.278	0.206
2003 Human population	**-0.001**	**-2.052**	**0.044**
Population density	0.013	0.642	0.523
2003 Housing units	0.002	1.65	0.104

$R^2 = 0.905$, $SE_e = 22.4$, N = 72 counties, variables significant at 0.05 probability in bold font.

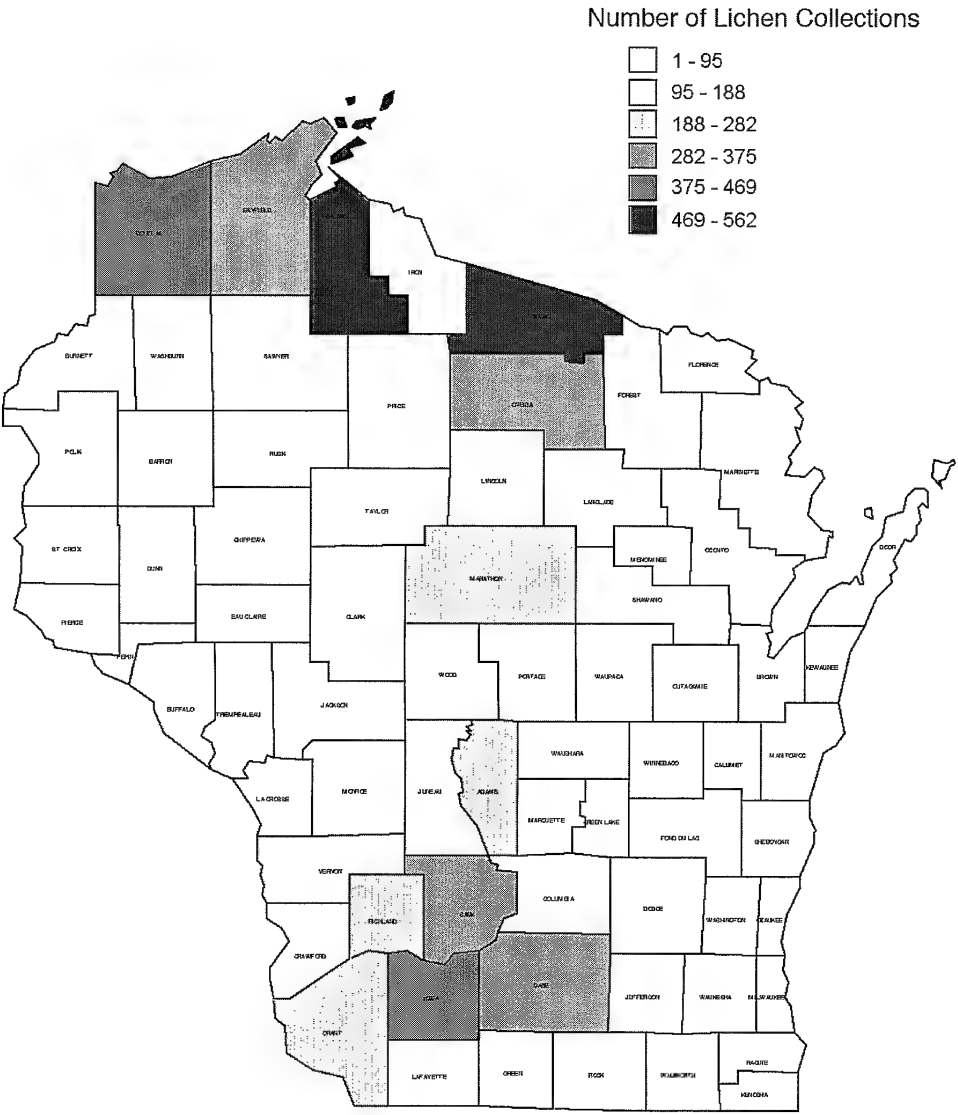

FIGURE 1. Number of lichen collections by county

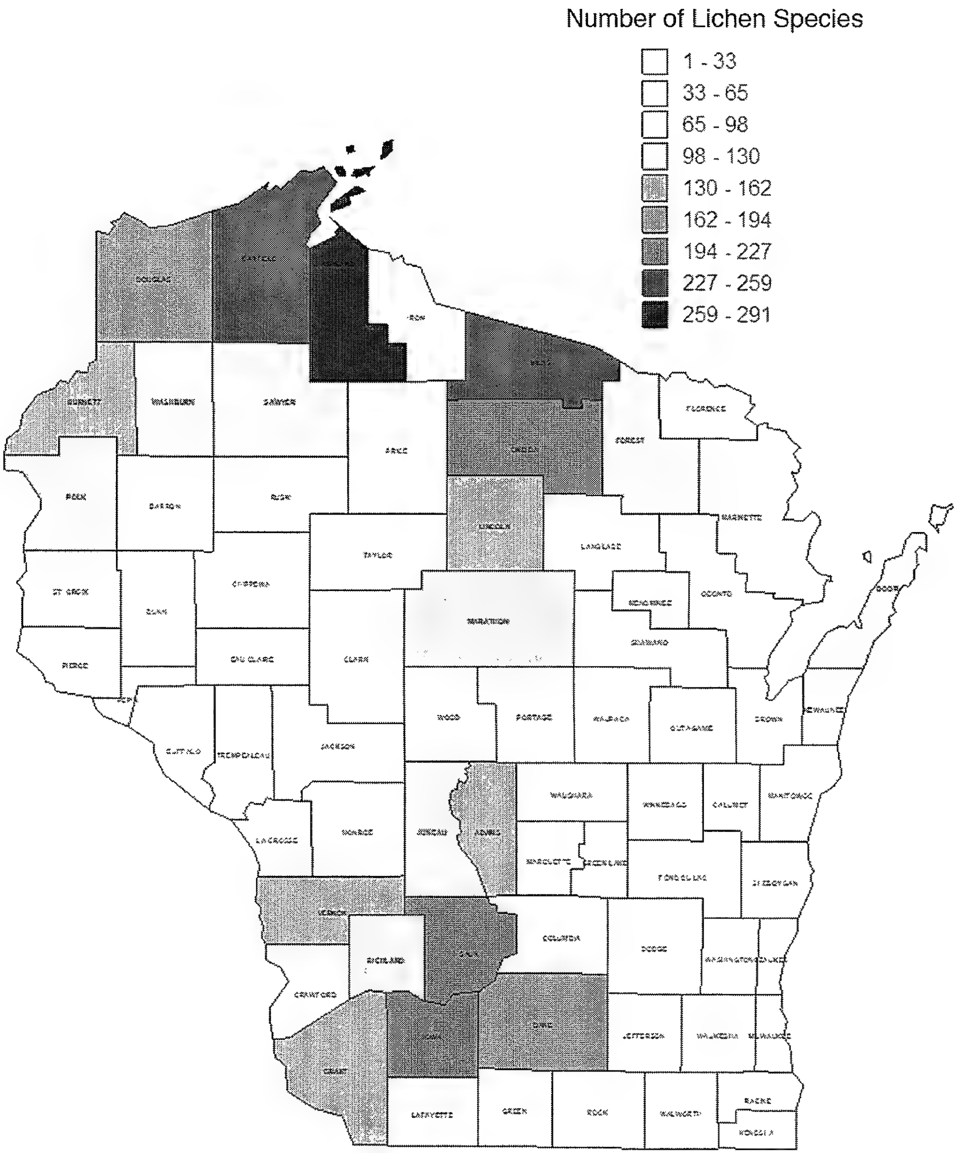

FIGURE 2. Number of lichen species by county

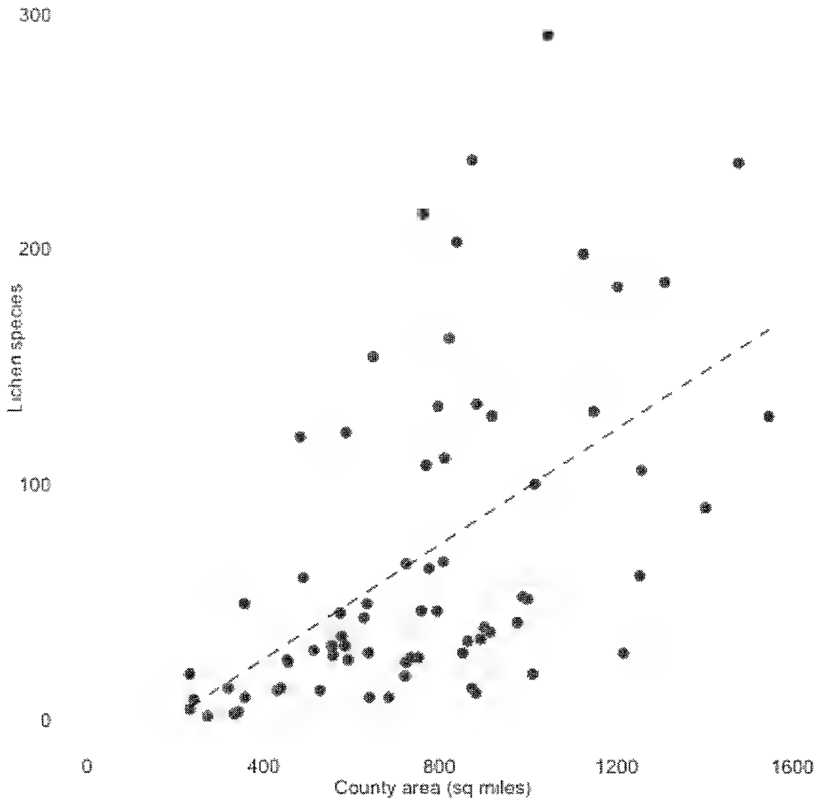

FIGURE 3. Relationship between number of lichen species and county area in Wisconsin*

*Dashed line indicates best fit linear regression (Species = 0.123 * area – 23.7, R = 0.55)

New Records for the Leafy Liverwort *Calypogeia peruviana* Nees et Mont. (Calypogeiaceae) on the Delmarva Peninsula

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Abstract. Calypogeia peruviana *Nees et Mont. is a tropical-subtropical leafy liverwort that has been reported as far north as the southeastern Coastal Plain of North Carolina. This report now extends the range of* C. peruviana *northward along the Atlantic Coastal Plain to the Delmarva Peninsula, with stations in Delaware, Maryland and Virginia.*

INTRODUCTION

Calypogeia peruviana Nees et Mont. (Calypogeiaceae) is a tropical-subtropical leafy liverwort that is widespread in South and Central America and Mexico, and extends eastward through the Gulf Coastal Plain, to as far north as the southeastern Coastal Plain of North Carolina. Westward this species has been reported from the mountains of North and South Carolina, as well as in east Tennessee (Schuster 1969, Hicks 1992). *Calypogeia peruviana* has also recently been reported from the Ouachita Mountain region near Hot Springs, Arkansas (Haley and Marsh 2002). The present report extends the range of *C. peruviana* northward along the Atlantic Coastal Plain to the Delmarva Peninsula.

DISCUSSION

The Delmarva Peninsula lies entirely within the Atlantic Coastal Plain physiographic province of the eastern United States and consists of the Eastern Shore's of Maryland and Virginia, and the majority of the state of Delaware [the northern portion of Delaware lies within the Piedmont Physiographic province (Plank & Schenk 1998)]. In 2003, the first author collected *C. peruviana* from a *Taxodium distichum* Rich. swamp in Worcester Co., Maryland, where it was found growing on hummocks and in hollows with other bryophytes. These include: *Syrrhopodon texanus* Sull. and *Telaranea nematodes* (Gott.) Howe (two other species with more southern or Atlantic Coastal Plain distributions), *Odontoschisma prostratum* (Sw.) Trev., *Pallavicinia lyellii* (Hook.) Carruth., and *Trichocolea tomentella* (Ehrh.) Dum. This record marks a northern range extension for the species and a new addition to the hepatic flora of Delmarva (McAvoy, Biechele, and Knapp, *Annotated Checklist of the Liverworts and Hornworts of the Delmarva Peninsula*, 2006, in prep). This collection (Worcester Co., Maryland, 2003, *McAvoy 622BR*, pers. hb.; ABSH) was confirmed by Dr. Raymond Stotler from Southern Illinois University, where a duplicate specimen has been deposited. This record marks a northern range extension for the species and a new addition to the hepatic flora of Maryland. Subsequent to the 2003 collection, the first author has since discovered this distinctive species with blue-green leaves (the result of blue oil bodies) in the following counties of Delmarva, where it grows primarily on humus and logs in shady, wet swamps, often with Atlantic white cedar [*Chamaecyparis thyoides* (L.) BSP)]: Delaware, Sussex Co., 2005, *McAvoy 825BR*, pers. hb.; Maryland, Dorchester Co., 2004, *McAvoy & Biechele 786BR*. pers. hb.; Virginia, Accomack Co., 2004, *McAvoy 779BR*, pers. hb. The Sussex Co., DE collection marks the northern extreme for the species and is about 300 miles (483 kilometers) north of the

Onslow Co., NC occurrence reported in Hicks (1992).

ACKNOWLEDGEMENTS

We would like to thank Dr. Raymond E. Stotler for verifying our identification of *Calypogeia peruviana*, reviewing this document, and for recognizing the importance of this discovery.

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NPLichen Version 3 is Now Available

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March 9, 2006

Since the launch of NPLichen Version 2 in February, 2005, almost 2,200 new records of lichens in national park units were received for entry into the database. This required a significant expansion of the database, and many hours of work to update the tables and summary. This resulted in Version 3, which is available now at www.ies.wisc.edu/nplichen. The new version now contains over 28,300 records, 2,550 taxa (an increase of 157), and 149 parks (5 new parks were added). In addition, 69 parks had data changed or increased, and the number of references were increased by 34 to 487. The number of species that occur only once in the national parks, i.e. in only one park, increased by 81 to 795.

Version 3.0's nomenclature is based on the June 14, 2005 version of Esslinger's checklist (Version 10). This resulted in decreases in the number of misidentified species from 140 to 116, and in the number of taxa not yet in Esslinger from 96 to 76. This is because many of the taxa have now been described or published, and are now included in Esslinger's checklist. In addition, the number of synonyms has decreased, resulting in a few parks with fewer taxa than in Version 2.

Mapping functionality was added to the website later in 2005. When querying for a species distribution in parks, users may select using radio buttons a list of parks where it is found, or a simple map. In addition, a lichen mapper is also available through linked text in the narrative. The lichen mapper adds zooming, printing, querying, and other tools to the mapping function. This service was provided by the U. S. Geological Survey, National Wildlife Health Center, Madison, WI.

The total number of visits to NPLichen from February, 2005 to February, 2006 was 2,446, with an average of 7 visitors/day. The website tracker recorded visits from 69 countries, although the United States led the list.

Many thanks to the individuals who sent in lichen records for inclusion in the database, including Irwin Brodo, Bill Buck, Richard Harris, Katie Glew, Urs Groner, Kerry Knudsen, Scott LaGreca, Hallie Larsen, James Lendemer, Cliff Smith, Mary Stensvold, Cliff Wetmore, and if I left anyone out please let me know. I also thank Kara Jensen for her careful and diligent work on the database.

Announcement Board:

- At the direction of the ABLS Executive Committee we are implementing a two stage upgrade to Evansia. With volume 23 we are upgrading paper quality with a switch to a two column format. We have also instituted an author-solicited peer-review system.

- Effective with issue 22 (1) the senior author of each manuscript published in Evansia receives an electronic copy of their paper as a pdf file.

- Please remember that at least one author on each manuscript must have a current subscription to Evansia.

- We would like to apologize for the mistake in the header numbering in issue 22 (4).

- **Bryology & lichenology** - Eagle Hill seminars 2006
  Seminars at the Humboldt Institute on the coast of Maine!

  Lichens and Lichen Ecology
  May 21 - 27, 2006
  Dr. David Richardson (david.richardson@SMU.CA)
  Dr. Mark Seaward (m.r.d.seaward@bradford.ac.uk)

  Lichens for Naturalists
  July 2 - 8, 2006
  Dr. Fred C. Olday (folday@panax.com)

  Bryophytes for Naturalists
  July 9 - 15, 2006
  Dr. Natalie Laura Cleavitt (nlc4@cornell.edu)

  Crustose Lichens: Identification Using Morphology, Anatomy, and Simple Chemistry July 16 - 22, 2006
  Dr. Irwin M. Brodo (ibrodo@mus-nature.ca)

  Intermediate Bryology: Floristics, Taxonomy, and Ecology
  July 16 - 22, 2006
  Dr. Nancy G. Slack (slacknan@aol.com)

  Taxonomy and Ecology of the Genus Hypnum and Similar Genera
  July 23 - 29, 2006
  W.B. Schofield (Wilf) (wilfs@unixg.ubc.ca)

  The Fruticose Lichen Genus Usnea in New England
  September 3 - 9, 2006
  Dr. Philippe Clerc (philippe.clerc@cjb.ville-ge.ch)

  Syllabi are available

  For more information, please contact the Humboldt Institute, PO Box 9, Steuben, ME 04680-0009. 207-546-2821. Fax 207-546-3042
  E-mail: mailto:office@eaglehill.us
  Online registration and information: http://www.eaglehill.us

- **Lichen Inventory of Woodstock Farm in Bellingham, WA**

  When: April 15, 2006 9-4pm
  Where: Woodstock Farm, Bellingham
  Limit: 12 persons (Call Fred to see if there's still space available)
  Contact: Dr. Fred Rhoades 360 (733-9149)
  Bring:Lunch, Lichen keys, microscopes, chemicals if you have them.
  Highlights: Low tide beside Puget Sound waters with old oak tree.

  Join North Puget Sound Lichen Study Group: npslichens@yahoogroups.com

- **Editors' note:** Several subscribers have inquired about "herbarium supplies" for cryptogams. In response to this inquiry Bruce McCune prepared the following information.

  Cotton Padding:
  I use padding underneath specimens more often than on top; particularly, substrate free specimens. I am currently using Kendall Webril (R) Undercast Padding, Regular Finish, 4 in x 4 yd (10 cm x 3.6 m) roll (non-sterile, plastic bag of 12 rolls, 100% cotton. Ref.: 3175). It is available from medical supply companies, though they may be hesitant to sell you small quantities. Unfortunately it is UV+, but specimens are not attached to it, so this is not a problem.

Specimen Mounting Cards:
In the past I have often used scraps of mat board, obtained from a friend who was self-employed as an artist. This is mostly archival quality. Recently I purchased some archival card stock from The Archival Company (800-442-7576) and am very happy with it. I bought two weights and use the lighter weight for things like bark fragments, and the heavier weight for collages of rock fragments. Both weights are Kensington 100% rag, museum quality buffered mounting board. It is UV- or UV+ very dark reddish. It comes in 32 x 40 inch sheets, 25 sheets per package. I have our university print shop cut these up into cards, about 120 cards per sheet. Of course they charge for this, but it isn't much. The specs are:
-*Heavier stock*: 700-3245, 4-ply, soft white (2X as expensive as 2-ply)
-*Lighter stock*: 700-3246, 2-ply, antique white
-*Cost for materials* worked out to about 3.6 cents/card for the lighter stock and 7.2 cents/card for the heavier stock.
-For backing behind cast padding I use regular index card stock cut to size. Index cards are inexpensive but not archival quality; however, it is not against the specimen, so perhaps that's not an issue.

Specimen Packets:
For packets I use 24 lb acid free paper. Our printing department buys this, then they do a letter fold on a machine, then we hand fold the sides, using a jig design that I borrowed from UBC Vancouver. I have posted a diagram of this on the NW Lichenologists website (http://www.proaxis.com/~mccune/Curation.htm).

Packet Labels:
For labels I am currently using Boise Cascade 100% Cotton Laser Paper, white, 24 lb, acid free. This paper comes in boxes of 500 sheets.

Small Cardboard Boxes and 3-D Support:
I use Ward's Specimen Trays. They are great for soil crusts and calicioid lichens. According to Ward's website (wardsci.com), these are "Made of strong pasteboard, the trays are finished outside in black glazed paper and lined with white." They are open-topped shallow boxes. They all fit in a standard lichen packet. They are fairly warp resistant when using PVA (Elmers) glue, even in large amounts. Unfortunately they are UV+ blue white.
-*I use three sizes*:
3 x 4 x 5/8 inch – These are bit smaller than a typical lichen packet.
2 x 3 x 5/8 inch – This is the size I generally us.
2 x 1 x 5/8 inch – These are useful for small specimens.
-*However; they are not cheap*: current list price (2005) about 50 cents each for the larger sizes and 40 cents for the smaller two sizes. Used judiciously, they are a great solution. They come in boxes of 100.

Bruce McCune

Guide to contributors to *EVANSIA*

The aim of *Evansia* is to provide a vehicle for the presentation and exchange of useful information on North American bryophytes and lichens. Articles are frequently popular in nature rather than technical and are intended to teach and inform both amateurs and professionals. The articles include, but are not restricted to, announcements of and reports on forays and meetings, presentations of techniques and aids for studying and curating lichens, bryophytes, and hepatics; and reports on local floras. Checklists and papers documenting new regional, state, or county records must include voucher specimens (collector and collection numbers) and an indication of where the specimens are deposited or a literature reference. Occasionally, articles of broad interest from locations other than North America may be included.

Evansia is published with the aid of desktop publishing software. Manuscripts must be submitted as Microsoft Word documents (Times New Roman, size 10 font) attached to an email and sent directly to the editor.

After a manuscript has been received it will be acknowledged by e-mail. Images can usually be transmitted as email attachments; however, a good quality copy of any illustration should also be mailed.

IMPORTANT: Authors should not spend time elaborately formatting their manuscript and should avoid numerous font changes, using footnotes, or other special features. When the manuscript is formatted for *Evansia* most of this work will have to be removed. Note that *Italics*, **bolding** and underlining must be included where appropriate. See recent copies of *Evansia* to resolve questions about style and format.

EFFECTIVE WITH THIS VOLUME: An author-solicited review of all manuscripts is required. When the senior author submits a manuscript for review they should also request that the reviewer forward a copy of all review documentation to the editor.

"Announcement Board". Please submit information about Bryological or Lichenological fieldtrips, seminars, meetings; or comments about curatorial techniques. Please include dates, locations and contact information for meetings or fieldtrips. Deadlines for announcements will be March 1st (issue 1), June 1st (issue 2), September 1st (issue 3), and December 1st (issue 4).

Manuscripts, as email MS Word attachments, should be sent to the Editor:

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Lichen flora of the southwestern Mojave Desert: Eureka Peak, Joshua Tree National Park, Riverside and San Bernardino County, California, USA

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Abstract. Thirty-five species in 25 genera are reported from the Eureka Peak area of Joshua Tree National Park in the southwestern Mojave Desert of California. Currently, our working checklist for Joshua Tree National Park has over 70 species, twelve of which are only known from Eureka Peak. Two lichenicolous fungi, *Stigmidium fuscatae* (Arnold) R. Sant. and *Lichenostigma subradians* Hafellner, are reported on a new host, *Acarospora obnubila* H. Magn. *Lichenostigma subradians* is reported new to California.

Keywords. Joshua Tree National Park, lichen flora of California, Little San Bernardino Mountains, Mojave Desert, lichenicolous fungi

INTRODUCTION

The southwestern edge of the Mojave Desert terminates in the Little San Bernardino Mountains above the northern most extension of the Sonoran Desert along the San Andreas Fault. Eureka Peak is the second highest summit of this range and is located at the northwest end of Joshua Tree National Park. Eureka Peak provides a panoramic view of San Jacinto Peak in the San Jacinto Mountains, San Gorgonio Peak in the San Bernardino Mountains, and the Granite Mountains. The vascular flora is unique due to the chaparral and cismontane influence of the Transverse and Peninsular ranges of southern California. Eureka Peak was selected to better understand the montane elements of the lichen flora in Joshua Tree National Park. This work is part of on-going research of the lichen flora of the area.

Study Area

Eureka Peak is located in the Little San Bernardino Mountains within Joshua Tree National Park (34° 01' 57"N, 116° 21' 01"W, elev. 1677 m). The boundary between San Bernardino and Riverside Counties bisects the north side of the peak on an east-west axis. Specifically, we collected on all sides of the peak, where accessible, to approximately 66 meters below the summit (1611 m). The terrain is quite steep and difficult to traverse making comprehensive sampling difficult. The local geology of this area consists of mainly granitic rock from the Mesozoic Era. The metamorphic rock of the Little San Bernardino Mountains is more exposed than in other areas of the Park due to greater uplift and erosion (Barth et al 2004). Rainfall is bimodal, however winter rains are more consistent for this area then summer rains. Winter temperatures often result in light snowfall on the higher peaks in the Park, including Eureka Peak.

Vascular Plants

The vegetation surrounding Eureka Peak can be characterized as a Single-leaf Pinyon and California Juniper woodland mixed with Muller Oak and Joshua Tree woodlands (Sawyer and Keeler-Wolf 1995; Holland 1986). The dominant vegetation consists of *Pinus monophylla*, *Quercus cornelius-mulleri*, *Juniperus californica*, *Yucca brevifolia*, *Y. schidigera*, *Coleogyne ramosissima*, and *Ephedra nevadensis*. In addition, this area has potential habitat for several rare plants, including *Hulsea vestita* var. *parryi*, *H. vestita* var. *callicarpha*, *Galium angustifolium* ssp. *gracillimum*, *G. munzii*, *Arabis dispar*, and *Erigeron parishii*. There are several populations of *Hulsea vestita* var. *parryi* on the open slopes below the peak, as well as some nearby populations of *Erigeron parishii*, a federally threatened species (CNPS 2001).

Methods and Materials

Kerry Knudsen conducted field surveys with Tasha La Doux or Liz Knudsen, with assistance from Jeff Galvin, Jean Lee, Melissa Litman, and Rolf Muertter on various days. Approximately 12 hours were spent on the survey on three separate field days in 2005 and 2006. The investigation was qualitative and intuitive. Unless otherwise noted, Kerry Knudsen determined specimens using standard lichen keys, usually the Sonoran lichen flora (Nash et al. 2002, 2004, and *in prep.*) TLC was performed as needed by James C. Lendemer. Only lichenicolous fungi determined to species are reported.

All species were vouchered and the specimens deposited at the UCR herbarium in Riverside, California. Duplicates forming a synoptic collection are deposited at the Joshua Tree National Park herbarium in Twentynine Palms, California. The numbers for the collections are K. Knudsen's. A species list follows; relative abundance and rarity of species is based on the subjective observations of K. Knudsen. The following abundance categories are used: Rare = 1 or 2 encounters; Common = 3-9 encounters; Abundant = 10 or more observations.

Taxonomic Checklist

Acarospora bullata Anzi - 3564, 5253. Common on granite.

Acarospora obnubila H. Magn. - 3584, 5184, 5210.2, 5235.1, 5237, 5249, 5252.1, 5252.2, 5752. Abundant on granite.

Acarospora socialis H. Magn. - 3576, 5772, 5773. Abundant on granite.

Acarospora strigata (Nyl.) Jatta - 3572, 5185.2, 5211, 5751. Common on granite.

Aspicilia sp. - 5241.1, 5751, 5754. Fertile, abundant on granite. Sterile thalli were also commonly infected with an undetermined fungus (5241.2). The species is common in montane habitats, but we do not know its correct identity. No secondary metabolites were observed (TLC).

Buellia punctata (Hoffm.) A. Massal. - 5247, 5750. Rare on wood of *Purshia tridentata* var. *glandulosa* and on unknown wood.

Buellia dispersa A. Massal. - 5192, 5756. Common on granite.

Caloplaca albovarigata (de Lesd.) Wetmore - 3587, 5190, 5228, 3579, 5741, 5774. Abundant on granite, highly competitive with other lichens but no sign of actual parasitism.

Caloplaca epithallina Lynge – 5197. Common on lichens on granite.

Caloplaca nashii Nav.-Ros., Gaya & Hladún - 5244. Common on granite in drainages.

Candelariella aurella (Hoffm.) Zahlbr. – 5230. Abundant on granite.

Cyphelium pinicola Tibel – 5248. Rare on wood of Purshia tridentata var. glandulosa.

Dermatocarpon americanum Vain. - 3528.2. Abundant on granite in drainages.

Lecanora garovaglii (Körb.) Zahlbr. – 3589. Rare on granite on north slope.
Lecanora laxa (Śliwa & Wetmore) Printzen - 5218.2, 5246, 5749. Common on bark and wood of *Pinus monophylla* and *Purshia tridentata* var. *glandulosa* (TLC: usnic acid.)
Lecidea laboriosa Müll Arg. - 5198, 5201, 5236.2. Abundant on granite (TLC: 4-o- demthylplanaic acid.) The morphologically similiar *L. hassei* Zahlbr. with schizopeltic acid has been collected nearby above Key's View (3595, UCR).
Lecidella stigmatea (Ach.) Hertel & Leuckert - 5251, 5187. Abundant on granite.
Leptogium arsenei Sierk – 5238. Rare in drainage on north slope.
Lepraria sp.- 5745. Rare in crevices and on other lichens on north slope. P+ yellow. The correct placement of this taxon is currently under study.
Lobothallia alphoplaca (Wahlenb. ex Ach.) Hafellner – 3586. Abundant on granite.
Lobothallia praeradiosa (Nyl.) Hafellner - 5196. Rare on granite on east slope.
Melanohalea subolivacea (Nyl.) O. Blanco et al. – 5218. Uncommon on the bark of *Pinus monophylla.*
Phaeophyscia orbicularis (Neck.) Moberg - 5243.2. Rare on granite in drainage.
Phaeophyscia sciastra (Ach.) Moberg - 5203. Common on granite.
Physcia biziana (A. Massal.) Zahlbr. – 5241. Abundant in drainages on granite on north slope. Small amount observed on bark of *Pinus monophylla.*
Physcia dimidiata (Arnold) Nyl. - 5746. Rare, mixed with *P. biziana* on granite on north slope.
Polysporina lapponica (Ach. ex Schaer.) Degel. - 5189, 5185. Abundant on lichens and free-living on granite.
Psora luridella (Tuck.) Fink - 3567, 5243.1. Abundant on granite and soil over rock.
Rhizoplaca subdiscrepans (Nyl.) R. Sant. – 3577. Rare, occurring on one north-facing outcrop near summit. (TLC: usnic acid, placodiolic acid) Det. by J.C. Lendemer.
Rhizocarpon disporum (Nägeli ex Hepp) Müll. Arg. - 5232.2. Rare in drainage on north slope.
Staurothele monicae (Zahlbr.) Wetmore - 3578, 5239, 5245. Common in drainages.
Toninia rugulosa ssp. *rugulosa* (Tuck.) Herre - 3591, 5185. Common, mixed with mosses on north and east slopes.
Umbilicaria phaea Tuck. – 3582. Abundant on granite.
Verrucaria fuscoatroides Servít - 5235.2. Rare on north slope.
Xanthoparmelia mexicana (Gyeln.) Hale - 3580, 5240. Abundant on granite.
Xanthoria elegans (Link) Th. Fr. - 5191, 5233, 5200. Abundant on granite.

LICHENICOLOUS FUNGI

Stigmidium fuscatae (Arnold) R. Sant. – 5209. Rare on thallus on *Acarospora obnubila.*
Lichenostigma subradians Hafellner - 5186, 5188. Common on thallus of *Acarospora obnubila,* which lacks secondary metabolites, but was not collected on the yellow *A. socialis* at this site, a common host at other sites.

CONCLUSIONS

The working species checklist for Joshua Tree National Park currently includes over 70 species, twelve of which are unique to Eureka Peak (Knudsen and LaDoux 2005). No terricolous species are reported, perhaps due to the loose, coarse-grained soil found in this area. Two species of lichenicolous fungi are reported. *Stigmidum fuscatae* is reported from a new host, *Acarospora obnubila* H. Magn. *Lichenostigma subradians* is reported new to California as well as from a new host, *A. obnubila.*

Montane species are not well represented in the lichen flora of Eureka Peak , however the following species were found: *Aspicilia* sp., *Buellia punctata, Cyphelium pinicola, Physcia biziana, Physcia dimidiata, Lecanora garovaglii, L. laxa, Lecidella stigmatea, Melanohalea subolivacea, and Toninia rugulosa* ssp. *rugulosa.* These species are often found in higher elevations and more temperate habitats. The strong winds and high summer temperatures probably keep this area from being colonized by many montane lichen species. The few lichens found on wood in this flora represent montane species and were generally rare. In general, lichens found on bark or wood are rare in the Mojave Desert.

Many of the common species found in the Mojave Desert were also found in the Eureka Peak area, including *Acarospora socialis, A. strigata,* *Buellia dispera*, *Lobothallia alphoplaca*, *L. praeradiosa*, *Phaeophyscia sciastra*, *Polysporina lapponica*, and *Psora luridella*. Interestingly, *P. lapponica* was abundant while *P. simplex* was absent; this seems to be a trend in Joshua Tree National Park. In addition, many typical lichens of drainages such as *Caloplaca nashii*, *Dermatocarpon americanum*, as well as *Verrucaria* and *Staurothele* spp. were abundant in the Eureka Peak flora.

Two species, *Caloplaca albovarigata* and *Acarospora obnubila,* which are usually locally rare to common in widely scattered locations throughout southern California, were abundant in this area. *Acarospora obnubila* was documented as parasitic on the *Aspicilia sp*., emerging from the host's thalli. A similar phenomenom has been documented in a collection of *A. obnubila* parasitic on an *Aspicilia* species from the White Mountains (hb. Robertson) (Knudsen *in prep*.). An unusual find was *Rhizoplaca subdiscrepans* concentrated on a large boulder on the north slope of the peak.

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New or Overlooked Wisconsin Lichen Records

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Abstract. Fifty-eight new species and 12 new genera are reported as either new to Wisconsin or not reported in Thomson's *Lichens of Wisconsin* (2003). These records are the result of new collections, being published elsewhere but overlooked, or collections found in several herbaria. This brings the total number of species for the state to 726 and the total number of genera to 180.

INTRODUCTION

In 2003 the Wisconsin State Herbarium published John Thomson's *Lichens of Wisconsin* (Thomson 2003), the culmination of Thomson's lifetime of collecting lichens in the state. The book contains keys and descriptions of 615 species, not including 47 species (listed in an appendix) discovered during the 2002 Tuckerman Lichen Workshop in northern Wisconsin, and presented in more detail by Lay (2004). Analyzing the data in the book, I have noted elsewhere (Bennett 2006) that the collecting in the state was not uniform, and was concentrated in certain areas. This stimulated me to collect in lesser known areas, and to look for other collections unknown to Thomson. Since 2003 I have been collecting on calcareous substrates in the southwestern part of the state, a habitat rich in lichens that has not been well studied. In addition, I knew that C. Wetmore of the University of Minnesota had collected in various parts of Wisconsin and had a lot of Wisconsin specimens, and that some of these specimens were not included in Thomson (2003). I was also aware there were numerous Wisconsin collections in the Michigan State University Herbarium.

Therefore I obtained the lichen specimen records for Wisconsin from the University of Minnesota Herbarium (MIN) and also the Michigan State University Herbarium (MSC) and compared them with Thomson (2003). It was evident there were species in those herbaria that were not treated in the book. In addition, I studied Thomson's two books on arctic lichens (Thomson 1984, 1997) and discovered there were dots present in Wisconsin on the distribution maps for species that were not treated in the Wisconsin book. This meant that Thomson overlooked some species for which he already had specimens. I looked for the specimens in WIS to determine their validities for Wisconsin and identities.

In 1998, the publication of Thomson's *American Arctic Lichens 2. The Microlichens* was occasioned by a ceremony in Madison, WI attended by many lichenologists. Some of them were able to take part in a small collecting trip to Sauk Co., resulting in some new state records collected by R. Harris and W. Buck. Duplicates of these specimens were deposited in WIS but were not included in the Wisconsin book. I located these specimens and have recorded the information for this study.

I was recently made aware of a type locality of a species of *Xanthoparmelia* in Wisconsin (Hale 1990) and have included this record because it was not in Thomson's Wisconsin book.

There are therefore four sources of information of new and unreported Wisconsin lichen collections: the specimens in MIN and MSC, the 1998 Sauk Co. specimens (NY), the Hale book, and my own new state records. Putting these all together resulted in a list of 58 species not treated in Thomson's book. This was significant enough to warrant publication.

The following list of lichens contains names that have been updated using Esslinger (1997) and Fryday (2005). Synonyms for these were checked in the herbaria as well. Thomson's 1984 and 1997 arctic lichen books are coded as AAL1 and AAL2. Evidence of occurrences in Wisconsin in AAL1 and AAL2 was determined from specimen dots in the distribution maps and are referred to by page numbers. For some specimens I have listed the collector, collection number and herbarium where the specimen is deposited. My own collections reside in my private herbarium. Localities are noted when given on the label. Localities listed for the Apostle Islands refer to the Apostle Islands National Lakeshore. Listed species are considered either new to the state (indicated by *) or previously known either from a publication or herbarium but not reported in Thomson's book.

LIST OF SPECIES

Acarospora schleicheri (Ach.) A. Massal.
Six collections from Columbia, Dane, Iowa, and Vernon counties and one unknown locality, dating from 1894 to 2003 are in WIS. Some of these may be the dots on p. 33 of AAL2. Wetmore also collected this species at Rush Creek State Natural Area in Crawford Co. in 2003 (*Wetmore 90267*, MIN). This species is easily overlooked.

Acarospora smaragdula (Wahlenb.) A. Massal.
There is one collection from 1968 from near Mount Horeb in Dane Co. by Thomson in WIS, which is probably the dot on the map on p. 34 of AAL2.

Adelolecia kolaensis (Nyl.) Hertel & Rambold
Thomson notes one collection in Bayfield Co. in AAL2 (p. 338), but there are two collections by Foote from 1905 from Juneau and Monroe Counties (*Foote 62719, 62454*, WIS).

*****Agonimia opuntiella*** (Buschardt & Poelt) Vezda
I have collected this four times at Limery Ridge and Hogback Prairie State Natural Areas, Crawford Co.; Dewey Heights State Natural Area, Grant Co.; and Mount Pisgah Hemlock-Hardwoods State Natural Area, Vernon Co. in 2003 and 2004 (*Bennett 657, 658, 659, 660*). It is a very tiny lichen that is easily overlooked. It grows on mosses over calcareous rocks, and may occur elsewhere in the state.

Arthonia diffusella Fink
Wetmore collected a specimen of this species at Patterson Hemlocks State Natural Area in Oneida Co. in 2002 during the Tuckerman Workshop, but this was omitted from the list in the Appendix in Thomson because Wetmore hadn't worked up his collections by the time the appendix was written (*Wetmore 87663A*, MIN).

Arthonia glebosa Tuck.
Brodo collected a specimen of this at Mill Creek Bluff west of Arena in Iowa Co. in 1965 (*Brodo 5671*, MSC).

*****Arthonia rubella*** (Fée) Nyl.
I have collected this once in Walking Iron County Park in Dane Co. in 2004 (*Bennett 661*). This is a southern species that may have extended northwards into Wisconsin. It is easily overlooked.

Arthopyrenia punctiformis (Stizenb.) R.C. Harris
Wetmore collected a specimen of this on Raspberry Island in the Apostle Islands, Bayfield Co. in 1987 (*Wetmore 61064*, MIN).

Bryoria fuscescens (Gyelnik) Brodo & D. Hawksw.
Two specimens of this species were collected in 1976 by Malachowski on Sand and York Islands in the Apostle Islands, Bayfield Co. (*Malachowski 1952, 2321A*, MSC). Alan Fryday recently confirmed the identity of these specimens in order to make sure they were not misidentified *B. trichodes*. It has also been collected in northern Minnesota and Michigan, although not recently (Fryday, et al. 2001;Wetmore 2005 and personal communication).

*****Buellia nigra*** (Fink) Sheard
I have collected this once in 2003 at Rush Creek State Natural Area, Crawford Co. (*Bennett 662*).

Buellia spuria (Schaerer) Anzi
I have collected this once at Limery Ridge State Natural Area in Crawford Co. in 2003. Thomson indicates its presence in the southwestern part of the state with a dot in AAL2, p. 139, but the specimen could not be located in WIS.

Caloplaca ahtii Søchting
Wetmore collected a specimen of this near Prescott in the St. Croix National Scenic Riverway, Pierce Co., in 1988 (*Wetmore 63058*, MIN).

Caloplaca parvula Wetmore
Wetmore collected a specimen of this in Bayfield Co. in 2004 near the Rainbow Lake Wilderness, Chequamegon-Nicolet National Forest (*Wetmore 90641*, MIN).

Caloplaca subsoluta (Nyl.) Zahlbr.
Both Thomson and Wetmore have collected this species near Barneveld in Iowa Co. and near Taylors Falls in Polk Co. in 1992 and 1988, respectively (*Thomson 24309, Wetmore 63102*, both in MIN).

Catillaria lenticularis (Ach.) Th. Fr.
Wetmore collected this species at Copper Falls State Park, Ashland Co. in 1965 (*Wetmore 13317*, MIN).

Cetraria ericetorum Opiz
Four records of this species occur scattered over the state on p. 79 of AAL1, but no Wisconsin specimens were found in MIN, MSC or WIS, even under *C. crispa* or *C. islandica*.

Chaenotheca phaeocephala (Turner) Th. Fr.
A dot in Douglas Co. in AAL2 indicates its' presence in the state, and a specimen from the Brule River, Douglas Co., collected in 1946 is in WIS (*Thomson 33*).

Cladonia borealis S. Stenroos
Wetmore collected a specimen of this species in the St. Croix National Scenic Riverway, Bayfield Co. in 1990 (*Wetmore 66326*, MIN).

Cladonia symphycarpia (Flörke) Fr.
Thomson indicates a dot for this species in the southwestern part of the state in AA1. Wetmore found a specimen in the St. Croix National Scenic Riverway, St. Croix Co. in 1988 (*Wetmore 62880*, MIN), and Imshaug found one in Iowa Co. in 1956 (*Imshaug 19199*, MSC). It is possible the Imshaug collection is the one on Thomson's dot map, but there is a specimen of *C. subcariosa* annotated as *C. symphycarpa* [sic] by Thomson in WIS that might suggest a fourth specimen. This species is probably quite rare and may be extirpated in the state.

Fuscopannaria praetermissa (Nyl.) P. M. Jørg.
A specimen of this species was collected by Malachowski in 1976 on York Island in the Apostle Islands, Bayfield Co. (*Malachowski 2483*,MSC).

Ionaspis lacustris (With.) Lutzoni
Wetmore collected a specimen of this species in 1992 in the Rainbow Lake Wilderness, Bayfield Co. (*Wetmore 70995*, MIN).

Lecanora argentea Oksner & Volkova
Two dots in Douglas and Bayfield counties on p. 281 of AAL2 (as *L. fuliginosa*) indicate it is present in the state, but no Wisconsin specimens were located in MIN, MSC or WIS.

Lecanora cadubriae (A. Massal.) Hedl.
Two specimens in WIS from Florence Co. collected by Jesberger (*319, 323*) in 1905 are probably the dot on p. 271 of AAL2.

Lecanora cateilea (Ach.) A. Massal.
Wetmore collected a specimen of this species on Devils Island in the Apostle Islands, Ashland Co. in 1987 (*Wetmore 60767*, MIN).

Lecanora expallens Ach.
Four dots in the southwestern part of the state on p. 280 of AAL2 are probably specimens collected by Cole, Nee and Thomson in Portage, Richland and Vernon counties in 1965, 1972 and 1974. The species is mentioned in the narrative for *L. thysanophora* in Thomson but it is not treated as present in the state. It was also collected by Malachowski in 1976 on Rocky and Raspberry Islands in the Apostle Islands, Ashland and Bayfield Counties (*Malachowski 2048, 2396*, MSC).

Lecanora fuscescens (Sommerf.) Nyl.
Brodo collected a specimen of this species in 1965 near Raspberry Bay in Bayfield Co. (*Brodo 5758A*, MSC).

****Lecanora invadens*** Magn.
This is a newly recognized species that was collected by Wetmore in 2001 on North Twin Island in the Apostle Islands, Ashland Co. (*Wetmore 87059*, MIN). This is the first published report for this species in North America. There is also a specimen from Isle Royale National Park, Michigan at MSC (*Wetmore 2621*).

Lecidea delincta Nyl.
Both Wetmore and Brodo collected specimens of this species at Copper Falls State Park in Ashland Co. in 1965 (*Wetmore 13302*, MIN; *Brodo 5724*, MSC).

****Lecidea symmictella*** Nyl.
Wetmore collected this species on Devils Island in the Apostle Islands, Ashland Co. in 1987 (*Wetmore 60705*, MIN). This is the first report for this species in North America.

Lecidella asema (Nyl.) Knoph & Hertel
Wetmore collected this species on Basswood Island in the Apostle Islands, Ashland Co. in 1987 (*Wetmore 59990*, MIN).

****Lempholemma polyanthes*** (Bernh.) Malme
I have collected this species at Hixon Forest Arboretum in La Crosse Co. in 2002 (*Bennett 296, 663*). It grows on moss over limestone and is easily mistaken for a *Collema* or *Leptogium*, but the muriform spores make it distinctive.

Lepraria cacuminum (A. Massal.) Lohtander
Harris collected a specimen of this species in 1998 at Hemlock Draw Preserve, Baraboo Hills

in Sauk Co. (*Harris 42203*, NY, duplicate in WIS).

Leptogium burnetiae C. W. Dodge
This species has been found at four localities along the St. Croix National Scenic River in Bayfield, Sawyer and Washburn counties by Wetmore in 1990 (*Wetmore 66354, 66381, 66504B, 66827*, MIN).

*****Lichinella cribellifera*** (Nyl.) Moreno & Egea
I have collected this species at Battle Bluff Prairie State Natural Area, Vernon Co. in 2003 (*Bennett 664*).

Megalospora porphyritis (Tuck.) R. C. Harris
Wetmore collected this species at Copper Falls State Park, Ashland Co. in 1965 (*Wetmore 13273*, MIN).

Melanelixia fuliginosa (Fr. ex Duby) O. Blanco et al.
Two dots appear at localities in northern WI on p. 303 of AAL1 (as *Parmelia glabratula*), but no Wisconsin specimens were found in MIN, MSC or WIS.

Micarea misella (Nyl.) Hedl.
This species was recently collected in 2004 by Wetmore in the Rainbow Lake Wilderness, Bayfield Co. (*Wetmore 90536*, MIN).

Multiclavula vernalis (Schwein.) R. Petersen
This species was collected three times along the St. Croix National Scenic River in Bayfield, Polk and Washburn counties by Wetmore in 2003 (*Wetmore 88968, 89048, 89234*, MIN).

Mycomicrothelia wallrothii (Hepp) D. Hawksw.
This lichenicolous fungus species was collected by Wetmore in 1965 at Copper Falls State Park, Ashland Co. (*Wetmore 13272*, MIN).

Peltigera neckeri Hepp ex Müll. Arg.
Six specimens (all at MIN) of this species have been collected by Wetmore in 1990 and 1992 at Rainbow Lake Wilderness, Bayfield Co. and St. Croix National Scenic River, Washburn Co.

Phacopsis oxyspora (Tul.) Triebel & Rambold
Wetmore collected this lichenicolous fungus species on Ironwood Island in the Apostle Islands, Ashland Co. in 2001 (*Wetmore 87122*, MIN).

Phaeocalicium compressulum (Nyl. ex Szatala) A. F. W. Schmidt
Wetmore collected this species on Ironwood Island in the Apostle Islands, Ashland Co. in 2001 (*Wetmore 87104*, MIN).

Placynthiella dasaea (Stirt.) Tønsberg
Wetmore has collected seven specimens (all at MIN) of this species in 1987, 1992, 2001, 2003 and 2004 in the Apostle Islands, Ashland Co., Rainbow Lake Wilderness, Bayfield Co., and St. Croix National Scenic Riverway, Burnett Co.

*****Pleopsidium flavum*** (Bellardi) Körber
I have collected this species in 2003 at Hixon Forest Arboretum, La Crosse Co. and Battle Bluff Prairie State Natural Area, Vernon Co. (*Bennett 665, 666*).

Porpidia contraponenda (Arnold) Knoph & Hertel
Wetmore has collected two specimens of this species on Bear and North Twin Islands in the Apostle Islands, Ashland Co. in 2001 (*Wetmore 86991, 87062*, MIN).

Porpidia speirea (Ach.) Kremp.
Thomson indicates this is present in the southwestern part of the state with a dot on p. 497 of AAL2, but no Wisconsin specimen was found in MIN, MSC or WIS.

Rhizocarpon petraeum (Wulfen) A. Massal.
Wetmore has collected this species on Devils Island in the Apostle Islands, Ashland Co. in 1987 (*Wetmore 60750*, MIN).

Rinodina adirondackii H. Magn.
Wetmore collected this species in the Northern Highlands State Forest, Vilas Co. in 2002 during the Tuckerman Workshop, but this was not listed in the appendix in Thomson's book (*Wetmore 87586*, MIN).

Rinodina vezdae Mayrhofer
This species has been collected by Wetmore in the St. Croix National Scenic Riverway, Polk Co. in 1990 (*Wetmore 67787, 67812*, MIN) and by Brodo in Copper Falls State Park, Ashland Co. in 1965 (*Brodo 5680B*, MSC).

Spilonema revertens Nyl.
Thomson mentions this in passing in the description of *Psorula rufonigra*, but does not say it is present in the state. The three *Psorula* specimens in WIS all have *Spilonema* present, placing it in Adams and Dane counties in 1949, 1971 and 1974 (*Thomson 16569, 18382, 24602* respectively). In addition, Wetmore made two collections of it in the St. Croix National Scenic Riverway, Bayfield and Polk counties in 1988 and 1990 (*Wetmore 63108, 66332*, MIN).

Staurothele monicae (Zahlbr.) Wetmore

Brodo collected a specimen of this species along the Brule River, Douglas Co. in 1946 (*Brodo 2469*, MSC).

Strangospora pinicola (A. Massal.) Körb.
Wetmore collected a specimen of this species in the St. Croix National Scenic Riverway in St. Croix Co. in 1988 (*Wetmore 63247*, MIN).

Umbilicaria vellea (L.) Hoffm.
Thomson shows two dots for this species in northwestern Wisconsin in AAL1, p. 460, but there were no Wisconsin specimens in WIS. The dots correspond almost, however, with two specimens in MIN from Ashland and St. Croix counties collected by Fassett and Moyle in 1927 and 1937, respectively (no collection numbers). The Fassett collection is correctly identified, but the Moyle collection appears to be *U. americana*. This species has not been seen since and may possibly be extirpated in the state.

Usnea substerilis Mot.
Thomson shows two dots for this species in northern Wisconsin on p. 470 of AAL1, but no specimens were found in MIN, MSC or WIS. The specimens may be out on loan.

Verrucaria rupestris Schrader
Thomson shows five dots for this species, four in southwestern Wisconsin and one in the northern part on p. 643 of AAL2 and these are matched by five specimens collected by Thomson collected in 1965 and 1971 in Ashland, Adams and Vernon counties. In addition, Brodo collected this species near Arena in Iowa Co. in 1965 (*Brodo 5663*, MSC).

Xanthoparmelia norhypopsila Hale
Hale (1990) notes the type for this species collected in 1963 is from Mill Bluff Roadside Park, Juneau Co. (*Hale 23106*, US). Thomson included this species in his *Xanthoparmelia* key (1993), but it was left out of the Wisconsin book.

Xanthoria candelaria (L.) Th. Fr.
Thomson shows two dots for this species in southwestern Wisconsin on p. 483 of AAL2, but no specimens for those localities were present in WIS. Instead, there is one collection from 1974 from Long Island, Apostle Islands, Ashland Co. that Thomson determined as new to the state in 2003 (*Koch 9145B*, WIS). This species has a predominately northern and western distribution in North America (Lindblom 1997) but has been reported from Ontario and Michigan.

Xylographa opegraphella Nyl. ex Rothr.
This species has been collected by Wetmore on Michigan and Outer Islands in the Apostle Islands, Ashland Co. in 1987 and 2001 (*Wetmore 60928, 86889*, MIN and one duplicate in MSC).

SECOND OCCURRENCES

Caloplaca saxicola (Hoffm.) Nordin
I have collected the second and third occurrences (*Bennett 668, 669*) of this species at Limery Ridge State Natural Area in Crawford Co. and at Brady's Bluff Prairie State Natural Area in Trempealeau Co. in 2003, one county south and two counties north of the Vernon Co. record given in Thomson.

Chrysothrix candelaris (L.) J. R. Laundon
I have collected the second occurrence of this species in Vernon Co. at Pisgah Hemlock-Hardwoods SNA in 2004 (*Bennett 667*). It was previously found in 2002 in Oneida Co. during the Tuckerman Workshop.

EXCLUDED SPECIES

Two species of *Caloplaca* were shown to be in Wisconsin in AAL2 that are now thought to be misidentified species for North America. *C. crenularia* (With.) Laundon (AAL2 p. 157) is misidentified for North America according to Wetmore (1996) and *C. fraudans* (Th. Fr.) H. Olivier (AAL2 p. 162) is misidentified for Wisconsin because this species is only found in maritime eastern North America according to Arup (1995). No Wisconsin specimens for these species were found in MIN, MSC or WIS so it is not possible to determine their correct identities.

DISCUSSION

The 2002 Tuckerman Workshop appendix in Thomson (2003) lists 47 species of lichens and lichenicolous fungi that are new to Wisconsin, and the three counties in which they were found. The information on the collectors, their collection numbers, and localities are given by Lay (2004). John Thomson never saw these specimens, and was not able to incorporate them into the text, keys or maps. They could be included in the taxonomic treatments (text and keys) in a revision, and their localities mapped after including the data from Lay (2004).

There are two collections of lichen species from Wisconsin that have not yet been described, and are therefore new to science. One is a *Rinodina* collected by Wetmore in the Apostle Islands in 1987 (*Wetmore 60067*, MIN), and the other is an undescribed genus, *Pachyphysis*, collected by Harris in Sauk Co. in 1998 (*Harris 42181*, NY, duplicate in WIS). After these are published they will be added to the state list.

Five of the listed species are reported in Thomson's arctic lichen books, but no specimens were found in the three herbaria consulted in this study. A careful check was done for these species under old synonyms but no specimens were located that way either. The specimens for these species may be in other herbaria that were not contacted for this study. Until specimens are located for these species their presence in the state is based on the dot maps in the arctic lichen books, and verifications are needed.

A recent count of Wisconsin lichens based on Thomson (2003) resulted in 662 species and 164 genera, including the species in the Tuckerman Workshop appendix (Bennett and Wetmore 2004). With the publication of the workshop lists (Lay 2004), 6 new species and 4 new genera were added to the total. This report now adds 58 more species and 12 new genera, bringing the grand total up to 726 species and 180 genera. These totals now compare much more favorably with those of Michigan and Minnesota (Bennett & Wetmore 2004). These totals do not include the two undescribed species mentioned above and the second occurrences.

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Notes on *Botryolepraria lesdainii* in North America

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Abstract. Botryolepraria lesdainii is reported new to Canada from British Columbia, to southern U.S.A. from the Greater Sonoran Desert Region, Arizona, in the west, and from Great Smoky Mountains National Park, North Carolina and Tennessee, in the east. *Botryolepraria lesdainii* is a rarely collected lichen species in North America. It was first reported in Egan's checklist of 1987, but the first paper with direct reference to North American material was apparently that of Kümmerling & Leuckert (1993) who cited 2 specimens from New York. More recently, the species has been reported from Alaska (Tønsberg 2002) and from Pennsylvania (Harris & Lendemer 2005). In the present note we report the species from some southern U.S.A. areas, and treat the Pacific Northwest population as well. The species is widely distributed in Europe (e.g. Kümmerling & Leuckert 1993, Canals et al. 1997, Tønsberg 2002) and is also known from Africa (the Canary Islands; Hafellner 1995), and Asia (Japan; Tønsberg 2002).

Botryolepraria lesdainii (Hue) Canals, Hernández-Mariné, Gómez-Bolea & Llimona Lichenologist 29: 339-345 (1997). *Lepraria lesdainii* (Hue) R.C. Harris, Bryologist 90: 163 (1987). *Crocynia lesdainii* Hue, Bull. Soc. bot. Fr. 71: 350 (1924).

The diagnostic characters of *Botryolepraria lesdainiii* are discussed by Canals et al. (1997). The species is usually easy to identify, even in the field, but sometimes it may be confused with *Lepraria lobificans* which may occur in the same habitat. These two species are easily separated by their reaction to PD, which is orange in *L. lobificans* (stictic acid), and negative in *Botryolepraria lesdainii* (terpenoids only). In North America *B. lesdainii* has been found in shaded and sheltered rock microhabitats such as under overhangs and in caves. It is a species of niches not wetted by direct rain. It occurs on limestone as well as on silicious rocks, both on bare rock, and over saxicolous mosses and on rock with a layer of soil. With the material cited below the distribution area of *B. lesdainii* in North America has been extended considerably to the south to include Great Smoky Mountains National Park in the Southern Appalachians, and the Greater Sonoran Desert Region in the southwest. It's vertical distribution ranges from about sea-level (Alaska) to 1335 m (Arizona). Details on local distributions are given below.

The Great Smoky Mountains National Park
Saxicolous/muscicolous/terricolous in cavities in limestone cliffs, on a shaded overhanging rock wall, and over mosses on a shaded, vertical bridge foundation (built of rocks). The vertical elevation ranging from 280 to 610-620 m. Apparently not a rare species in the park at lower elevations. *Botryoleparia lesdainii* is here reported as new to the park as well as to North Carolina and Tennessee.

The Greater Sonoran Desert Region
It is only know from one site in Arizona, Gila Co. at Tonto Natural Bridge State Park. The park has a deep canyon with a creek and a natural bridge and is a moist desert oasis in an otherwise very dry area. On a recent trip we found small patches of *Botryolepraria lesdainii* near the bottom of the canyon, in several shallow cavities in a N-facing rock wall at the southern entrance to the moist and cool passage under the natural bridge. The altitude was 1335 m and the northern latitude 34°19'. This is apparently the first discovery of this species in southwestern North America and the locality is also the most southerly

and the highest above sea-level known so far on this continent.

The Pacific Northwest

Saxicolous and on saxicolous mosses on a wall in shaded cave near the sea (Queen Charlotte Islands), saxicolous in sheltered rock crevices at the upper edge of the beach (Coronation Island), terricolous in crevices under N-facing overhang near the bank of a creek (Prince of Wales Island). Pacific northwest specimens are all from below 50 m altitude, and the Coronation Island specimen grew only a few m above sea-level. *Botryoleparia lesdainii* is here reported new to Canada from Queen Charlotte Islands, British Columbia.

SPECIMENS SEEN (BG, IF NOT OTHERWISE STATED):

Canada. *British Columbia*, Queen Charlotte Islands, St. James Island, 2003, Tønsberg 32173a (with T. Goward; BG, UBC), 32173b (with T. Goward).

U.S.A. *Alaska*. Coronation Island, Windy Bay, 2003, Tønsberg 32535 (BG, WTU). Prince of Wales Island, near Sarkar Rapids, 2001, Tønsberg 30035. *Arizona*, Gila Co., NW of Payson, off Hwy 87, Tonto Natural Bridge State Park, 2005, Tønsberg 36422 & Hopkins (BG, ASU). *North Carolina*, Swain Co., Great Smoky Mountains National Park, just W of Ocanoluftee River, SSE of Ocanoluftee Ranger Station, foundation of Blue Ridge Parkway bridge, 2004, Tønsberg 34083 (BG, ASU, DUKE, GSMNP). *Tennessee*, Blount Co., Great Smoky Mountains Nat. Park, along Foothills Parkway, E of Hwy 321, just E of and along Little River, just upstream from bridge, 2003, Tønsberg 33669, 33670, 33671; along road to Cades Cove, bank of West Creek, at the tunnel, 2003, Tønsberg 33691.

ACKNOWLEDGEMENTS

We thank the staff at Tonto Natural Bridge State Park for giving us permission (spontaneously and with great enthusiasm), at our request on the day of our visit, to sample a specimen of *Botryolepraria lesdainii*. For field work in the Great Smoky Mountains National Park and in Arizona, Tønsberg has been financially supported by grants from "Discover Life In America, Inc./All Taxa Biodiversity Inventory." and from the Grolle Olsen fund, University of Bergen, respectively. Thomas H. Nash III, Tempe, is thanked for comments on the manuscript.

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Notes on *Dacryophyllum falcifolium* Ireland

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Abstract. Seven new locations for the recently described moss *Dacryophyllum falcifolium* are provided. Populations are restricted to a narrow band of suitable forest habitat with metamorphosed rocks rich in calcium. A distance of 130 km separates the northern and southernmost occurrences of this monospecific genus. Additional insights on the species habitat requirements are offered including the addition of wood as a substrate and speculation is made regarding the importance of asexual reproduction in *Dacryophyllum* since sporophytes remain unknown. The family placement of *Dacryophyllum* remains uncertain.

INTRODUCTION

Dacryophyllum falcifolium was recently described by Ireland (2004) as an endemic genus with a single species confined to the central coast of California. This plant is distinguished by its small size, strictly complanate stems, scalpel shaped leaves with costae either absent or only weakly double, and prorate cells at the leaf insertion. At the time of its description, only three small populations along the central California coast were known: two in Santa Cruz County, and one in Monterey County, California. All three collections were from calcareous rock substrates in coast redwood (*Sequoia sempervirens* (D. Don) Endlicher) forest, somewhat near flowing water but never inundated or splashed.

OBSERVATIONS

Recent collecting trips in 2005 to the coastal portion of the Santa Lucia Mountains of Monterey County have resulted in the discovery of several new locations for this moss. The basic ecological parameters as published in Ireland (2004) have remained constant; however, one collection was made from the side of a rotting redwood log, thereby expanding the list of substrates to both wood and calcareous rock.

Dacryophyllum falcifolium is now known to be a regularly occurring plant along the central coast of Monterey County, where many of the streams are so strongly calcareous that tufa deposits on rocks and logs are very common. It is often found on vertical surfaces, but it is especially fond of small soil benches in the middle and at the base of rock walls. An almost constant associate is *Bryolawtonia vancouveriensis* (Kindberg) Norris & Enroth, which is quite abundant. Although *Bryolawtonia* is generally found on the trunks of *Umbellularia californica* (Hooker & Arnott) Nuttall and *Acer macrophyllum* Pursh, it is also common on boulders and rock walls in this portion of its range. *Bryolawtonia* resembles *Dacryophyllum* with its complanate stems and the formation of thin mats. It is likely that the superficial similarity of these two mosses is the reason that *Dacryophyllum* was overlooked by other bryologists who have collected in the area. Under a hand lens however, the two plants can be easily separated since *Dacryophyllum* has asymmetric leaves. *Dacryophyllum* is also a much shinier plant, a feature seen even in the shade of a redwood forest. Other common associates are *Metaneckera menziesii* (Drummond) W. C. Steere, *Porotrichum bigelovii* (Sullivant) Kindberg, a robust, pinnately branched form of *Isothecium myosuroides* Bridel, and at some locations, *Bestia longipes* (Sullivant & Lesquereux) Brotherus.

Based on our fieldwork, *Dacryophyllum* requires the mesic, cool air and shade that defines the coast redwood forests. Coast redwood requires marine fog to survive, and in Monterey County it is restricted to narrow bands along the canyons draining the Santa Lucia Mountains. This fog brings the relative humidity to near 100% during the summer months when virtually no rain falls in California. It is important to note that *Dacryophyllum* has not yet been found where there is any possibility of flooding from swollen winter streams, nor has it been found on moist or wet soil or rock. Even the wood substrates were dry at the time of collection. Thus, the moisture requirements of *Dacryophyllum* are apparently quite narrow: high atmospheric humidity without constant or long periods of wetting.

An interesting observation about the distribution of *Dacryophyllum* is that it occurs along the southern third of the range of the coast redwood. This forest type covers considerably larger landscapes as one travels northward towards the Oregon border. Both total rainfall and the length of the rainy season increase to the north as well. As a result the bryophyte biomass is significantly higher in the northern portions of the range of the coast redwood than it is in Santa Cruz and Monterey Counties. *Dacryophyllum* is a colonizing moss that grows only in very thin mats and does not compete well with more robust plants like *Isothecium* or *Pterogonium* that form thick carpets. Our hypothesis is that the narrow moisture requirements and the increased competition from other bryophytes prevent *Dacryophyllum* from occurring north of San Francisco. Furthermore, we do not believe that *Dacryophyllum* will be found in habitats with less atmospheric humidity, such as the live oak (*Quercus agrifolia* Nee) forest that is common away from the narrow coastal canyons.

Collections of *Dacryophyllum* in Grimes Canyon illustrate the requirement for a substrate rich in calcium. Grimes Canyon, like most of the other streams draining the coastal watersheds of the Santa Lucia Mountains, is a very steep canyon. Highway 1 crosses the creek approximately 1 kilometer from the Pacific Ocean. Interestingly, the roadway also marks a change in the exposed bedrock along the creek. Upstream of the highway, the rock is metamorphosed limestone, and *Dacryophyllum* is relatively common. Downstream, the rocks are all granitic, and *Dacryophyllum* is absent, in spite of the calcareous stream flowing through the redwood forest.

The new collections have shed no further light on sexual reproduction in *Dacryophyllum falcifolium.* Sporophytes and even perichaetia and perigonia are still unknown. Thus, *Dacryophyllum* must rely on asexual reproduction. A probable method can be hypothesized after looking at any collection of the plant in an herbarium packet. Usually the bottom of the packet is filled with small branches that have broken off of the plants. Furthermore, the thin mats of *Dacryophyllum* are easily removed from the substrate. Thus *Dacryophyllum* is an especially portable moss, easily moved from place to place by small animals or even the strong winds that blow off of the Pacific Ocean.

FAMILY PLACEMENT

Dacryophyllum was originally assigned to the Hypnaceae by Ireland (2004) where he considered it to be morphologically close to *Taxiphyllum.* However, this was rather speculative at the time of publication, and was based on the relationship to *Taxiphyllum*, and on a DNA analysis of a single chloroplast gene by A. J. Shaw. In Shaw's communication to Ireland (Ireland 2004), Shaw expressed doubt on the reliability of such an analysis in the Hypnales. Shaw's test showed closest alliance to *Hypnum pallescens* (Hedwig) P. Beauvois , causing Shaw to comment "...gives some support to the Hypnaceae idea". Ireland (2004) was quick to point out that *Dacryophyllum* bears little morphological resemblance to *Hypnum pallescens*, or any other species of *Hypnum.* With this inconclusive and confusing evidence, it is impossible to avoid the conclusion that neither Ireland nor Shaw was totally convinced that *Dacryophyllum* belonged in the Hypnaceae.

We favor another possible placement, the Neckeraceae. This was the initial position held by Bill Buck when he excluded this plant from *Taxiphyllum* (Ireland 2004). Our position is based on the gestalt of the plant as observed in the field and its close association with and resemblance to *Bryolawtonia.*

In California, the Neckeraceae is a small moss family primarily restricted to a narrow coastal belt that receives marine fog in the summer. *Metaneckera menziesii, Bryolawtonia vancouveriensis, Neckera douglasii* Hooker, and *Porotrichum bigelovii* are all neckeraceous plants relatively common along the coast of California. As the climate of California has changed through time, many moss families that are more common in subtropical climates are now either absent from California today or confined to these restricted coastal habitats. *Hookeria lucens* (Hedwig) J. E. Smith is a good example of the only California representative of the Hookeriaceae, and is confined to coast redwood forests north of San Francisco. However, subtropical affinity to the Hypnaceae is also affirmed by the presence of *Pseudotaxiphyllum elegans* (Bridel) Iwatsuki in coastal California. So even though the Neckeraceae is more densely represented in coastal California than the Hypnaceae, ancestral relationships of the latter family cannot be ruled out. We have provided several bryologists with fresh material of *Dacryophyllum* in the hope that more extensive genetic analyses will be forthcoming to provide additional insight into the family placement of this beautiful little moss.

Additional Collections

We provide the following new occurrences for *Dacryophyllum falcifolium* to supplement the citations in Ireland (2004). Since we located several large populations of *Dacryophyllum*, we felt comfortable providing duplicates to several herbaria beyond our home institution. All collections are presented from north to south. Latitude/longitude are referenced as NAD 27.

Monterey County, California. Along Juan Higuera Creek upstream of Highway 1 between Andrew Molera State Park and Pfeiffer Big Sur State Park. On diffusely lit calcareous rock in coast redwood forest on the banks of the creek ca. 1.3 m above waterline. R1E, T19S, Section 24, 36°15'51"N, 121°47'57"W, elevation 70 m, 6 Jan 2006, *Kellman 4951* (CAS). Along Grimes Creek upstream of Highway 1 between Pfeiffer Big Sur State Park and Julia Pfeiffer Burns State Park. On dry metamorphic rock in full shade in coast redwood forest above the creek. R2E, T20S, section 10, 36°12'31"N, 121°44'04"W, elevation 175 m, 20 Nov 2005, *Kellman & Shevock 4824* (CAS), *Shevock & Kellman 27738* (CAS, MO, NY, UC). Julia Pfeiffer Burns State Park: on dry metamorphic rock and soil over metamorphic rock paralleling Partington Creek upstream from Highway 1 in coast redwood forest. R2E, T20S, section 24, 36°10'40"N, 121°41'35"W, elevation 70 m, 20 Nov 2005, *Kellman & Shevock 4856* (CAS), *Shevock & Kellman 27747* (CAS, E, H, KRAM, MO, NICH, NY, UC). Along McWay Creek on moist, diffusely lit calcareous rock in coast redwood forest above the immediate banks of the creek. R9E, T20S, Section 29, 36°09'41"N, 121°40'00"W, elevation 100 m, 6 Jan 2006, *Kellman 4944* (CAS). University of California Landels-Hill Big Creek Reserve: on metamorphic rock in coast redwood forest in Devils Canyon just upstream from confluence with Big Creek, R3E, T21S, Section 25, 36°04'37"N, 121°35'30"W, elevation 60 m, 11 Dec 2005, *Kellman & Shevock 4906* (CAS), *Shevock & Kellman 27757* (CAS, DUKE, MO, NY, UC). Limekiln State Park: common on soil over metamorphic rock near Limekiln and Hare Creeks in coast redwood forest. *Kellman & Shevock 4701, 4706,* (CAS) and ca. 100 m. below Limekiln Falls, R4E,T22S, section 15, 36°00'50"N, 121°31'00"W, elevation 80 m, 2 Jul 2005, *Shevock & Kellman 27464* (CAS, H, KRAM, MO, NY, UC); Hare Creek trail, on thin soil on the side of rotting log in coast redwood forest and on upturned root burl of coast redwood forest. R4E, T22S section 15, 36°00'40"N, 121°30'50"W, elevation 75 m., *Kellman & Shevock 4708* (CAS) and *Shevock and Kellman 27466* (CAS, H, KRAM, MO, NY, UBC, UC).

Rarity and Conservation Implications

On a global scale, *Dacryophyllum* is indeed a rare and highly localized endemic. Populations are not extensive in the area where it occurs, although at these sites, plants are quite healthy and in dense mats. The limited size of these populations is directly related to the amount of available habitat. We anticipate that additional populations of *Dacryophyllum* will be located in the near future as more of the Santa Lucia Range along the Monterey Coast is explored. Fortunately, with these recent discoveries, *Dacryophyllum falcifolium* is now documented to occur on lands managed in the public domain, including three units of the California State Park System and one from the Natural Reserve System, University of California. From a conservation perspective, the long-term prognosis for species protection is considerably enhanced since the original discovery of the moss. We also predict that populations of *Dacryophyllum* are highly likely to be documented to occur in the Los Padres National Forest since several of the populations cited above are less than 1 kilometer from the forest boundary. If new populations of *Dacryophyllum* are found on National Forest System lands then this species would likely meet the criteria for addition to the Forest Service sensitive species program. Such an action would supplement long-term conservation and management of this remarkable genus.

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We would like to thank the Los Padres National Forest, The California Department of Parks and Recreation, and the University of California Natural Reserve System for research permits to collect bryophytes on lands under their jurisdiction. Comments provided by Dr. Lloyd Stark as part of the review process improved the final product.

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New To New York State: *Philonotis yezoana* (Musci: Bartramiaceae)

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Philonotis yezoana Besch. & Card. *in* Card was originally described from Japan where it is presently considered a variety of *Philonotis fontana* (Hedw.) Brid. (Noguchi 1989). As noted by Zales (1973), however, the taxon is best treated as a species because of its short median leaf cells, centrally placed leaf cell papillae, singly serrate leaf margins, and elongate marginal leaf cells. In western North America *P. yezoana* is known from Montana, California, Washington, and British Columbia. There are also two stations for the species in eastern North America: Newfoundland (Woodstock, on seepage crack of rock cliff, 1976, *Brassard 11287,* NY) and Vermont (Mt. Mansfield, on dripping rocks, 1892, *sin. coll.*, NY, specimen ID 464057). At the 2004 Andrew's Foray, held in the Adirondacks of New York, the species was discovered for the third time in eastern North America. (Fig. 1)

New York. Town of Keene. Adirondack Mountain Reserve, Ausable Club, on West Trail of the East Branch of the Ausable River, 44° 09'N, 73° 47'W, elev. 400m. *Kekes 1001.* (herb. KEKES, MO, NY).

The New York collection of *Philonotis yezoana* was made less than a mile from the sign-in shack on the West Trail of the Adirondack Mountain Reserve Club. The Ausable River at the site is lined with large rocks which are free of all bryophytes, and appear to be regularly scoured by flowing ice and high water during the spring melt-off. But above those "clean" rocks there are areas with trees, generally hardwood and hemlock, whose roots are entangled with acid rocks. Organic detritus forms a layer over the roots and rocks. *Philonotis yezoana* was found at the base of a tree in this sort of area. The sporophytes of *P. yezoana* are unknown in North America and, as one would expect, the plants had no capsules. Crum and Anderson (1981) report the species sometimes has leafy bulbils in its leaf axils, but the New York plants did not have any leafy bulbils.

As noted above, *Philonotis yezoana* differs from all other North American *Philonotis* species in the position of its papillae. The leaf cells on one or both sides, (especially on the median leaf cells) bear a massive, single, centrally placed papilla. The plants of *P. yezoana* are somewhat darker green than is typical for *P. fontana*. Its leaves are more or less imbricate when dry, though when moist they are erect-spreading. The leaves are broadly ovate-lanceolate and abruptly narrowed to a short acumen. The leaf margins are recurved only at the base, and they are singly serrate. The leaf cells are rectangular at the apex, and become short rectangular to subquadrate as one progresses down the leaf. Curiously, some of the upper leaf cells have papillae here and there positioned over the upper part of the cells. (Fig. 2)

ACKNOWLEDGEMENTS

I thank William R. Buck for verifying the identities of the New York, Labrador, and Vermont collections of *Philonotis yezoana*, and Bruce Allen for providing the illustrations as well as help with the manuscript.

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FIGURE 1. The known distribution of Philonotis yezoana in eastern North America.

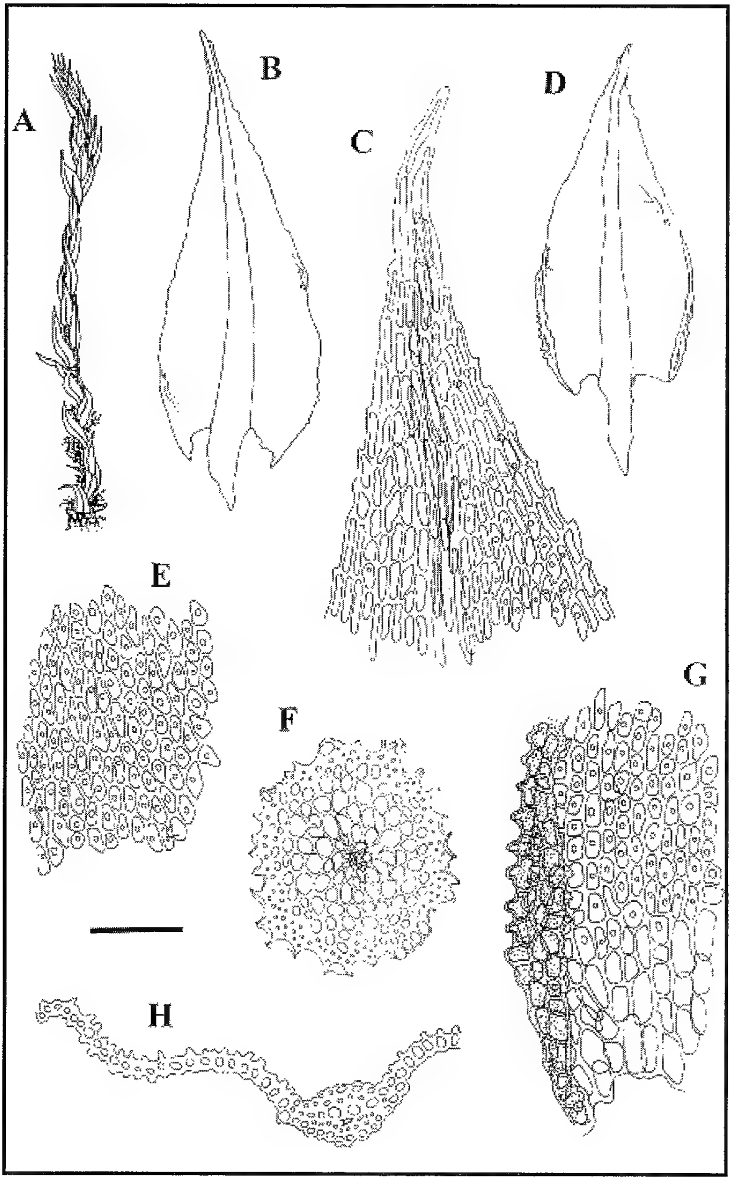

FIGURE 2. *Philonotis yezoana.* A. Habit. B. & D. Stem leaves. C. Stem leaf apex. E. Median laminal cells. F. Stem in cross section. G. Stem leaf basal margin. H. lower part of stem leaf in cross section. Scale in mm: 0.06 (C,E,G,H), bar = 0.28 (B,D), bar = 1.56 (A). All figures from *Kekes 1001* (MO).

The ABLS Lichen Exchange: History and Procedure

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The 'Lichen Department' was established in 1902 as part of the Sullivant Moss Society (now known as the American Bryological and Lichenological Society). Since its inception the 'Lichen Department' maintained a collection of lichens that, due to the activities of society members, effectively functioned as a lichen exchange. Early department leaders and caretakers of the lichen collection included C. Harris, G.K. Merrill, C. Pitt, B. Fink and C.W. Dodge (Brodo 2000). It wasn't until June of 1974, however, that the Lichen Exchange was formally established at the ABLS annual meeting, which took place that year in Tempe, Arizona (Anon. 1974, Anon. 1975). Claire K. Schmitt served as the first official director of the exchange, which was based at the New York State Museum (NYS). After 20 years of able service, Dr. Schmitt relinquished her position to Dr. T.H. Nash III in March of 1994 (Anon. 1994, Nash 1996). The exchange specimens then took up residence in the Arizona State University Lichen Herbarium (ASU). Since that time, 10,171 specimens have changed hands in the Lichen Exchange. Currently, 692 entries are included in the exchange list, representing 384 taxa. These total 2946 packets held at ASU, which are currently available for exchange. In all, the exchange includes 45 participants representing 9 countries and 18 herbaria.

Participation in the Lichen Exchange is extended to any person with an interest in lichens (ABLS membership is encouraged but not required). One exchange credit is given to participants for each packet that they contribute to the exchange. Contributions should ideally include 10-15 duplicates for each specimen submitted; however, further credit is not awarded for sets that include over 15 packets for a given collection number. One specimen from each set of duplicates that is submitted to the exchange is accessioned into the ASU Lichen Herbarium in consideration of the service provided. Participants are encouraged to contribute a variety of species and should avoid emphasizing those that are commonly encountered. A list of available exchange specimens is compiled from contributions and distributed to participants twice a year (late fall and spring). Upon receiving the list, participants mark the specimens that they desire (keeping in mind the amount of credit that they have accumulated) and return their requests to the Lichen Exchange manager. Once received, requests are granted on a first-come, first-serve basis (according to postmark date in order to afford some degree of fairness for over-seas participants).

Specimens that are submitted to the exchange should be fully identified as unidentified or partially identified material will be returned to the sender. The identification of specimens submitted to the exchange are generally not checked for accuracy; therefore, it is suggested that participants who are new to the field should consult more advanced lichenologists in order to insure proper identification of material. Packet dimensions of roughly 4" X 6" (10 X 15 cm) are recommended and specimens should be of sufficient size to fill the majority of the packet. Each packet should include a label (printed on 100% rag/acid-free paper) citing collection locality (major and local political units), latitude/longitude, substrate, habitat, collector(s), collection number, date of collection and determinator. Labels should **not** be glued to packets as newly acquired exchange specimens are normally placed in new packets by participants according to their preferred herbarium packet style. Please consult publications such as *Lichens of North America* (Brodo et al. 2001) for additional information regarding collecting and curating lichen specimens.

More information about the ABLS Lichen Exchange can be obtained online through the ASU Lichen Herbarium website (http://ces.asu.edu/ASULichens/abls/abls.jsp). Correspondence should be directed to Dr. T.H. Nash III, c/o ASU Lichen Herbarium, School of Life Sciences, PO Box 874501, Tempe, AZ 85287-4501 (or tom.nash@asu.edu).

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The American Bryological and Lichenological Society Moss and Hepatic Exchanges

Welcome New Participants

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One benefit of ABLS membership is voluntary participation in an exchange of bryophyte and lichen specimens. The Executive Committee of the Society appoints directors to administer the exchanges, and at present they are operated at no cost to participants. Currently Norton Miller and Lori Leonardi (New York State Museum [NYS]) serve as co-Directors of the Moss Exchange, and Paul Davison (University of North Alabama [UNAF]) is in charge of the Hepatic Exchange. Tom Nash (Arizona State University [ASU]) serves in the same capacity for lichens (Bates, 2006). Here we provide a brief history of the moss and hepatic exchanges, a summary of how they work, and some instructions for new participants, especially ones with taxonomic and floristic interests, which we hope this notice will recruit.

The two ABLS bryophyte exchanges have existed in their present formats for over 70 years, although antecedents of both moss and hepatic exchanges can be traced back almost to the beginning of the Society in 1898 when a section of the Fern Bulletin named Moss Department was established (Conard, 1947). From that modest start, the Sullivant Moss Society emerged, and from the SMS the American Bryological and Lichenological Society arose. Directors of the Hepatic Exchange have been Theodore C. Frye (1934–1941), Aaron J. Sharp (1941–1943), Paul M. Patterson (1943–1952), Ronald L. McGregor (1952–1956), Leo F. Koch (1956–1960), Paul L. Redfearn, Jr. (1960–1971), Barbara Crandall-Stotler (1972–1982), Raymond M. Stotler (1982–2003), and Paul G. Davison (2003–). The following have served as Moss Exchange directors: Inez M. Haring (1935–1941), Richard T. Wareham (1941–1950), Henry A. Gleason, Jr. (1951-1954), James Kucyniak (1954-1956); Edwin H. Ketchledge (1956–1960), Ronald A. Pursell (1960–1974), Paul L. Redfearn, Jr. (1974–1978), Jerry A. Snider (1978–1984), Patricia M. Eckel (1984–1991), Gary Merrill (1991–1999), Bruce H. Allen (1999–2004), and Norton G. Miller and Lorinda Leonardi (2005–).

Specimens distributed by the ABLS bryophyte exchanges are useful in many ways, but most often they serve as reference specimens against which unknowns can be compared. Such comparisons often trump the information in keys, descriptions, and illustrations, because a plant sample observed directly is usually better than a description or an illustration, which in some degree are abstractions. ABLS exchanges typically include plants from diverse geographic areas, which provide a way to evaluate variation in the expression of morphological characters. Moreover, exchange specimens can include collections from places a participant may not ever visit.

At present there are 37 members of the Moss Exchange, and many represent institutional herbaria. Participants reside in seven countries, with the USA best represented (21 members). Other members are in Canada, Italy, Germany, Japan, Spain, and the United Kingdom. The Moss Exchange distributed 166 specimen sets (1043 packets) in 2005. The Hepatic Exchange includes 28 members, 17 in the USA and the remaining in Canada, Germany, Hungary, and Japan. Exchange lists are prepared and mailed four times a year, usually in January, April, July, and October. The moss list is sent first class (North American addresses) and by airmail (Europe and elsewhere). The hepatic list is sent by e-mail, or, if requested, by surface or air mail.

Rules governing the bryophyte exchanges are found on the Society's website at

<www.unomaha.edu/~abls/MossExchangeRules.htm> and <www.unomaha.edu/~abls/exhepatic.html>.

We encourage current and prospective members to read these guidelines.

A short summary of some rules may be helpful to anyone considering membership in either of the bryophyte exchanges. Specimens are submitted in sets of duplicate specimens, each set representing one gathering from the same habitat and population. Therefore, each duplicate in a set bears the same collector's number. Duplicate sets may consist of up to 16 packets for uncommon or unusual species and 11 for common ones, the latter under the assumption that many personal and institutional herbaria may already have ample specimens of more common bryophytes. In fact, however, there is room to apply some discretion here, because beginners joining an exchange may welcome samples of common species, and common mosses and hepatics from exotic regions may also be desirable. Moreover, common species with sporophytes, sexual structures, or vegetative propagules may also be wanted. Participants should submit no fewer than six duplicates of each number. An exception to the six duplicate minimum is allowed for those species that are rarely if ever found in sizeable quantity at any one location. In addition, participants should always be wary of over collecting and submitting specimens of protected or rare species.

Each specimen of a duplicate series should be in a separate packet folded from paper that produces a specimen jacket about 6" × 4" (10 cm × 15 cm). Each packet must have a label of acid-free or some other kind of archival quality paper placed inside the packet and not glued to it. Appropriate specimen size varies depending on plant size, but a sample 5 cm × 5 cm is adequate for most mosses and liverworts. Well-prepared specimens can have some substratum, especially when it may contain bulbils and other structures of taxonomic interest. Members receive credit on the basis of the number of specimens submitted. For example, a duplicate series of ten specimens would earn the member nine credits, with one specimen retained for the Director's institutional herbarium as a 'thank you' for operating the exchange. A participant's credit is redeemed on a one credit for one specimen basis by selecting specimens from the quarterly exchange lists. For those members maintaining a positive balance of specimens, selections from the specimen lists are allocated using a priority system based on the first letter of member's last name and the series, a–d(priority for list 1), e–j (list 2), k–r (list 3), and s–z (list 4).

Label preparation is very important. Necessary elements on a label include: name of the bryophyte (including name[s] of authors); country, province or state; county or district; precise location (site) of collection; altitude; a concise description of habitat; date the plants were collected; and name of the collector and the number assigned to the collection in a personal record book. If someone other than the collector identified the specimen, the identifier's name should be given. Morphological notations are also helpful. Some parts of the world have special grid systems, and appropriate data from these can be included. A label containing all this information insures that a specimen will be useful far into the future. Exchange members inexperienced in label preparation will benefit from reading a short paper by Edward Voss (1999), who explains the importance of complete information on specimen labels.

Many contemporary collectors use handheld global position recorders to obtain location data in degrees, minutes, and seconds, UTM notation, or another system. If GPS is used, it is useful to state on the specimen label what reference system the GPS device has been set to, because there are many grid systems, often more than one per country. Degrees, minutes, and seconds on United States Geological Survey topographic maps are coordinated with GPS setting NAD 27. Latitudes and longitudes can also be obtained from topographic maps, but it is necessary to use a calibrated scale to calculate a position accurately, because of information loss when an area of the curved surface of the earth is transferred to a flat, two-dimensional printed map. The Coordinator (Lakeland, FL 33803-5938), a scale designed especially for USGS topographic maps, corrects for this difference. Positions can also be gotten from the Internet at, for example, a web site such as <TopoZone.com>. Precise georeference data stored in computers can be transformed into distribution maps by software programs written especially for such operations.

Exchange participants seeking information on maintaining a personal bryophyte herbarium may wish to consult Davison (2002) and Flowers et al. (1945). Additional details on collecting and processing specimens also can be found in a number of references including Schofield (1985) and Ireland and Bellolio-Trucco (1987).

At present, neither Exchange serves as an identification service, so participants are expected to submit accurately named specimens. Of course, the exchange directors, and many other professional bryologists, are often willing to examine problematic material when unknowns are few and likely to be taxonomically and floristically interesting.

We welcome new members and the continued active participation of those who are current members of the Moss and Hepatic Exchanges. Specific questions may be directed to us at nmiller2@mail.nysed.gov or pgdavison@una.edu.

ACKNOWLEDGMENTS

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Announcement Board:

- At the direction of the ABLS Executive Committee we are implementing a two stage upgrade to Evansia. With volume 23 we have upgraded paper quality and switched to a two column format. We have also instituted an author-solicited peer-review system.

- Effective with issue 22 (1) the senior author of each manuscript published in Evansia receives an electronic copy of their paper as a pdf file.

- Please remember that at least one author on each manuscript must have a current subscription to Evansia.

- **Bryology & lichenology** - Eagle Hill seminars 2006
  Seminars at the Humboldt Institute on the coast of Maine!

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  Dr. Irwin M. Brodo (ibrodo@mus-nature.ca)

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  July 16 - 22, 2006
  Dr. Nancy G. Slack (slacknan@aol.com)

  Taxonomy and Ecology of the Genus Hypnum and Similar Genera
  July 23 - 29, 2006
  W.B. Schofield (Wilf) (wilfs@unixg.ubc.ca)

  The Fruticose Lichen Genus Usnea in New England
  September 3 - 9, 2006
  Dr. Philippe Clerc (philippe.clerc@cjb.ville-ge.ch)

  Syllabi are available

  For more information, please contact the Humboldt Institute, PO Box 9, Steuben, ME 04680-0009.
  207-546-2821. Fax 207-546-3042
  E-mail: mailto:office@eaglehill.us

  Online registration and information:
  http://www.eaglehill.us

- Invitation to participate in a 3-day lichen workshop, Sept. 5-7, 2006, at Opal Creek Ancient Forest Center in western Oregon, USA.
- The cost of $106 includes room and board. We still have space for more participants.
- John Villella will lead us in a foray and workshop in the outstanding natural areas at Opal Creek: giant forests, sculpted gorges, abandoned mines, outcrop and talus areas, and crystal clear water. We are hoping that participants will come prepared to give a short, informal presentation on a taxonomic group or special habitat of interest, but this is optional. For example, you might wish to reveal the secrets of Buellia in the PNW, or of lichens on Alnus rubra. A computer and projector will be available.

- PREREQUISITES
  - This workshop is designed for people who have already studied lichens, so we will not be providing instruction for beginners. A few microscopes will be provided, but we recommend bringing both compound and dissecting microscopes if you can.

- RESERVATIONS are due no later than 30 Aug 2006. First come, first served, with a maximum of 30 participants. We will be staying at Opal Creek Ancient Forest Center, in the Lodge. Total cost is $106, including room and board. Rooms are combinations of shared bedrooms and private rooms. Two bathrooms with showers are shared. Food will be prepared by the lodge. See the registration form about camping options; however, for maximum pleasure and learning we strongly recommend staying in the lodge and eating with the group.

- To register, go to http://home.comcast.net/~nwlichens/events.htm, then download and print the registration form. Send the form along with your check to the

NWL Sec.-Treas., Bruce McCune, 1840 NE Seavy Ave, Corvallis OR 97330.
Happy lichenizing! -Bruce McCune

- New bryophyte book available: "Outstanding Mosses & Liverworts of Pennsylvania & Nearby States"
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Guide to contributors to *EVANSIA*

The aim of *Evansia* is to provide a vehicle for the presentation and exchange of useful information on North American bryophytes and lichens. Articles are frequently popular in nature rather than technical and are intended to teach and inform both amateurs and professionals. The articles include, but are not restricted to, announcements of and reports on forays and meetings, presentations of techniques and aids for studying and curating lichens, bryophytes, and hepatics; and reports on local floras. Checklists and papers documenting new regional, state, or county records must include voucher specimens (collector and collection numbers) and an indication of where the specimens are deposited or a literature reference. Occasionally, articles of broad interest from locations other than North America may be included.

Evansia is published with the aid of desktop publishing software. Manuscripts must be submitted as Microsoft Word documents (Times New Roman, size 10 font) attached to an email and sent directly to the editor. All submissions must be in English; however, we will publish manuscripts with abstracts in English as well as French or Spanish.

After a manuscript has been received it will be acknowledged by e-mail. Images can usually be transmitted as email attachments; however, a good quality hard copy of any illustration should also be mailed to the editor.

IMPORTANT: Authors should not spend time elaborately formatting their manuscript and should avoid numerous font changes, using footnotes, or other special features. When the manuscript is formatted for *Evansia* most of this work will have to be removed. Note that *Italics*, **bolding** and <u>underlining</u> must be included where appropriate. See recent copies of *Evansia* to resolve questions about style and format.

EFFECTIVE WITH THIS VOLUME: An author-solicited review of all manuscripts is required. When the senior author submits a manuscript for review they should also request that the reviewer forward a copy of all review documentation to the editor.

"Announcement Board". Please submit information about Bryological or Lichenological fieldtrips, seminars, meetings; or comments about curatorial techniques. Please include dates, locations and contact information for meetings or fieldtrips. Deadlines for announcements will be March 1st (issue 1), June 1st (issue 2), September 1st (issue 3), and December 1st (issue 4).

Manuscripts, as email MS Word attachments, should be sent to the Editor:

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EVANSIA

VOLUME 23 NUMBER 3

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Bryophytes of Limestone Rise Preserve, Albany County, New York

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Abstract. A study was made over a two year period of the bryophytes found at Limestone Rise Preserve, located in Albany County, New York. The preserve is administered by the Eastern New York Chapter of the Nature Conservancy. Collections were made periodically from old woods, new woods, wetlands, fields, glacial ridges, shale outcrops and deep crevasses in bedrock limestone. This is the checklist that resulted from this study.

The Limestone Rise Preserve is located in the Town of Knox, Albany County about 20 miles west of Albany, New York. It lies at the western edge of the Helderberg escarpment at latitude 47° 28'N, longitude 074° 08'W. The Preserve comprises many distinct habitats, such as old woods, new woods, wetlands, fields, glacial ridges, and deep crevasses in the bedrock limestone. This geographical diversity supports a large bryophyte flora including some endangered species.

The Preserve comprises some 61 acres, split into two almost equally sized areas by a road (Route No. 146). The nature of these two sites varies dramatically. On the north lying portion the area is mostly a low flatland. This part of the Preserve was pastureland until about 50 years ago, and now young aspen, pine and maple are becoming established. A glacially formed ridge, dating from the Wisconsin Ice Sheet, separates the former meadow from an area of open water located at the southern boundary of this section. The section also has a wetland area, with open water at its northernmost edge.

The area south of the road rises steeply from the road embankment to a well-forested section of mature trees. Hemlock, sugar maple, ash and white pine, hornbeam and striped maple are found there. The bedrock limestone in this section is honeycombed with solution channels that apparently were formed over the millennia by rainwater. Some of the larger channels are nearly two feet across and ten to fifteen feet in depth. The sides and bottoms of these solution channels are entirely covered by bryophytes. Also in this section construction has exposed areas of limestone bedrock. This bedrock was under water some 500 million years ago and has subsequently lifted. In this small area many fossils (Tentaculitis, Leperditia, and Spirifer) can be found. But more significantly for this study, it has many calciphilous bryophytes.

Shortly after the Limestone Rise Preserve was acquired by the Eastern New York Chapter of the Nature Conservancy, an initial inventory was made of the trees, plants, birds and animals. This inventory included five common mosses and a notation that some six other species (unnamed) had been found. Preliminary trips to the Preserve revealed that there were dozens of species and the present list was begun. Beginning in April 2004, regular visits to the Preserve were made with the goal of generating as complete a list of bryophytes as possible. Sites in all sections were visited throughout the collecting season. The solution channels demonstrated a regular change in the dominant mosses as the seasons progressed. This study continued until the end of the 2005 collecting season.

A complete set of voucher specimens for the species found in the Preseve has been deposited in the herbarium of the New York Botanical Garden (NY). Collections large enough to split into duplicates have been deposited in the herbarium of the Missouri Botanical Garden (MO) as well as in the private herbarium of the author. The nomenclature used in this study follows Anderson *et al* (1990), Iwatsuki and Tan (2001), Buck and Allen (2004), Allen and Pursell (2005), Hicks (1992), and Paton (1999).

LIMESTONE RISE PRESERVE BRYOPHYTES

Mosses

Amblystegium varium (Hedw.) Lindb.
Amphidium mougeotii (Bruch & Schimp. *in* B.S.G.) Schimp.
Anacamptodon splachnoides (Fröl. *ex* Brid.) Brid.

Anomodon attenuatus (Hedw.) Hüb.
A. rostratus (Hedw.) Schimp.
A. viticulosus (Hedw.) Hook. & Tayl.
Atrichum altecristatum (Ren. & Card.) Smyth & Smyth
Bartramia pomiformis Hedw.
Brachythecium campestre (C. Müll.) Schimp. *in* B.S.G.
B laetum (Brid.) Schimp.
B. populeum (Hedw.) Schimp. *in* B.S.G.
B. rutabulum (Hedw.) Schimp. *in* B.S.G.
B. velutinum (Hedw.) Schimp. in B.S.G.
Brotherella recurvans (Michx.) Fleisch.
Bryhnia graminicolor (Brid.) Grout
B. nova-angliae (Sull. & Lesq. *in* Sull.) Grout
Callicladium haldanianum (Grev.) Crum
Calliergon cordifolium (Hedw.) Kindb.
Campylium hispidulum (Brid.) Mitt.
C. radicale (P. Beauv.) Grout
Ceratodon purpureus (Hedw.) Brid.
Climacium americanum Brid.
Ctenidium subrectifolium (Brid.) Buck & Allen
Dicranella heteromalla (Hedw.) Schimp.
Dicranum fulvum Hook.
D. flagellare Hedw.
D. montanum Hedw.
D. polysetum Sw.
D. scoparium Hedw.
D. viride (Sull. & Lesq. *in* Sull.) Lindb.
Didymodon rigidulus Hedw.
Drepanocladus aduncus (Hedw.) Warnst. var. *kneiffii* (Schimp. *in* B.S.G.) Mönk.
Encalypta procera Bruch
Entodon challengeri (Paris) Cardot
E cladorrhizans (Hedw.) C. Müll.
Ephemerum crassinervium (Schwägr.) Hampe
Eurhynchium pulchellum (Hedw.) Jenn.
Fissidens bryoides Hedw.
F. dubius P. Beauv.
F. osmundioides Hedw.
F. taxifolius Hedw.
Funaria hygrometrica Hedw.
Gymnostomum aeruginosum Sm.
Hedwigia ciliata (Hedw.) P. Beauv.
Herzogiella striatella (Brid.) Iwats.
H. turfacea (Lindb.) Iwats.
Homomallium adnatum (Hedw.) Broth.
Hylocomium splendens (Hedw.) Schimp. *in* B.S.G.
Hypnum imponens Hedw.
H. lindbergii Mitt.
H. pallescens (Hedw.) P. Beauv.
Leskea polycarpa Hedw.
Leskeella nervosa (Brid.) Loeske
Leucobryum albidum (Brid. *ex* P. Beauv.) Lindb.
L. glaucum (Hedw.) Ångstr. *in* Fries
Mnium marginatum (With.) Brid. *ex* P. Beauv.
M. thomsonii Schimp.
Myurella sibirica (C. Müll.) Reim.
Orthotrichum anomalum Hedw.
O. ohioense Sull. & Lesq. *in* Aust.
O. sordidum Sull. & Lesq. *in* Aust.
O. stellatum Brid.
Plagiomnium ciliare (C. Müll.) T. Kop.
P. cuspidatum (Hedw.) T. Kop.
P. ellipticum (Brid.) T. Kop.
Plagiopus oederiana (Sw.) Crum & Anderson
Plagiothecium laetum Schimp. *in* B.S.G.
Platydictya confervoides (Brid.) Crum
Platygyrium repens (Brid.) Schimp. *in* B.S.G.
Pleurozium schreberi (Brid.) Mitt.
Pohlia wahlenbergii (Brid.) Mitt.
Polytrichum commune Hedw.
P. juniperinum Hedw.
P. pallidisetum Funck
P. piliferum Hedw.
Ptilium crista-castrensis (Hedw.) De Not.
Rauiella scita (P. Beauv.) Reim.
Rhodobryum ontariense (Kindb.) Par. *in* Kindb.
Rhytidiadelphus triquetris (Hedw.) Warnst.
Schistidium apocarpum (Hedw.) Bruch & Schimp. ssp. canadense Allen & Pursell
Schistidium rivulare (Brid.) Podp.
Steerecleus serrulatus (Hedw.) Robins.
Taxiphyllum deplanatum (Bruch & Schimp. *ex* Sull.) Fleisch
Tetraphis pellucida Hedw.
Thamnobryum alleghaniense (C. Müll.) Nieuwl.
Thelia asprella Sull. *in* Sull. & Lesq.
Thuidium delicatulum (Hedw.) Schimp. *in* B.S.G.
T. pygmaeum Schimp.
T. recognitum (Hedw.) Lindb.
Timmia megapolitana Hedw.
Tortella tortuosa (Hedw.) Limpr.
Ulota crispa (Hedw.) Brid.
U. hutchinsiae (Sm.) Hammar

Liverworts

Cololejeunea biddlecomiae (Aust.) Evans
Conocephalum conicum (L.) Lindb.

Frullania eboracensis Gott.
Lophocolea heterophylla (Schrad.) Dum.
Marchantia polymorpha L.
Nowellia curvifolia (Dicks.) Mitt.
Odontoschisma denudatum (Nees) Dum.
Pellia epiphylla (L.) Lindb.
Plagiochila asplenoides (L.) Dum.
Porella platyphylla (L.) Pfeiff.
Porella platyphylla var. platyphylloidea (Schwein.) Lindb.
Ptilidium pulcherrimum (Web.) Hampe
Radula complanata (L.) Dum.
Riccia fluitans L.
Riccia rhenana Lorb.
Ricciocarpus natans (L.) Corda
Scapania nemorosa (L.) Dum.
Trichocolea tomentella (Ehrh.) Dum.

The author wishes to thank the Eastern New York Chapter of the Nature Conservancy for granting permission to undertake this study; Bruce Allen for checking the determinations, and for his generous help during this study; and William R. Buck for his advice and help with the field work.

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Lichens of Limestone Rise Preserve, Albany County, New York

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Abstract. A list of 63 lichens and lichenicolous fungi is provided. Tremella candelariellae Diederich is new to North America on a new host, Candelariella efflorescens R. C. Harris & Buck, a species of *Bacidia* probably new to science is noted, and Rinodina efflorescens Malme is new to New York.

Bill Buck and I had a one day opportunity to collect at the Limestone Rise Preserve with Jean Kekes to whom we are indebted for her hospitality. Obviously the lichens have not been searched for with the same intensity as the bryophytes but the collection is nonetheless of sufficient interest to merit reporting. The site characteristics are described in the preceding paper (Kekes, 2006). At first glance the prospect was not encouraging as the southern part of the preserve is densely shaded and the northern part with rather young, dense second-growth. For this reason the lists from the two parts are kept separate below. The lack of overlap in species composition is mostly real although "weedy" species collected first in the southern part were not re-collected in the northern part. However, as past experience has shown, even unpromising sites often provide pleasant surprises. The results once again show how much basic collecting of fungi (including lichens) needs to be done before even a minimal sketch of their diversity exists for eastern North America. Vouchers are deposited at The New York Botanical Garden (NY).

Southern part of preserve: Older, moist hardwoods with dense shade and exposed limestone.

Absconditella lignicola Vězda & Písut, on lignum – *Harris 51820.*

Anisomeridium polypori (Ellis & Everh.) M. E. Barr, on base of oak – *Harris 51821.*

Arthonia caesia (Körb.) Körb., on trunk of *Carya ovata* – *Harris 51822.*

Arthonia helvola (Nyl.) Nyl., on base of *Fraxinus* – *Harris 51823.*

Bacidia rubella (Hoffm.) A. Massal., on trunk of old *Acer saccharum* – *Harris 51824.*

Bacidia schweinitzii (Michen.) A. Schneid., on trunk of old *Acer saccharum* – *Harris 51825.*

Bacidia sp., on trunk of old *Acer saccharum* – *Harris 51826.*

Epihymenium green, with crystals; exciple patchily green, with numerous crystals; hypothecium colorless; ascospores ca. 20-28 x 1.7-2.3 µm; conidia bacillar 6-8 x 1.5 µm. The only species reported from North America by Ekman (1996) with crystals in the exciple is *B. absistens* (Nyl.) Arnold which has ascospores over 40 µm in length and filiform conidia. In aspect and ascospore size it seems closer to *B. circumspecta* (Vainio) Malme which lacks epihymenial and excipular crystals.

Biatora longispora (Degel.) Lendemer & Printzen, on trunk of *Acer saccharum* – *Harris 51827.*

Bilimbia sabuletorum (Schreb.) Arn., on mosses – *Buck 49375.*

Candelariella xanthostigma (Ach.) Lettau, on trunk of *Carya ovata* – *Harris 51828.*

Chaenothecopsis debilis (Sm.) Tibell, on lignum – *Buck 49376.*

Cladonia furcata (Hudson) Schrad., over rock – *Harris 51829.*

Cladonia pyxidata (L.) Hoffm., over rock – *Harris 51830, Harris 51831* (an abnormally squamulose form).

Cladonia rangiferina (L.) F. H. Wigg., on soil – *Harris 51832.*

Cladonia subtenuis (Abbayes) Mattick, on soil – *Harris 51833.*

Coenogonium pineti (Ach.) Lücking & Lumbsch, on rotten stump – *Buck 49355, Harris 51834.*

Cresponea chloroconia (Tuck.) Egea & Torrente, on trunk of old *Acer saccharum* – *Harris 51835.*

Graphis scripta (L.) Ach., on base of *Acer saccharum* – *Harris 51836.*

Lecanora thysanophora R. C. Harris, near base of *Acer saccharum – Harris 51838* (with apothecia).
Lecidea berengeriana (A. Massal.) Nyl. *s. lat.*, on bryophytes on base of old *Acer saccharum – Buck 49375A, Harris 51839.*
Lecidea erythrophaea Flörke, on trunk of *Carya ovata – Harris 51840.*
Lepraria lobificans Nyl., on base of oak – *Harris 51841.*
Leptogium lichenoides (L.) Zahlbr., on limestone – *Buck 49378, Harris 51842.*
Melanelixia fuliginosa (Duby) O. Blanco et al., on trunk of *Fraxinus – Harris 51844.*
Micarea prasina Fr., on lignum – *Harris 51845.*
Mycobilimbia epixanthoides (Nyl.) Vitik. et al., on mosses – *Harris 51846.*

Sterile but closely resembles fertile material from Michigan and Minnesota.
Myelochroa aurulenta (Tuck.) Elix & Hale, on trunk of *Quercus – Harris 51847.*
Peltigera elisabethae Gyeln., over limestone – *Harris 51848.*
Peltigera neckeri Müll. Arg., over limestone – *Harris 51849.*
Peltigera praetextata (Sommerf.) Zopf, over limestone – *Harris 51850, 51851* (fertile).
Phaeocalicium polyporaeum (Nyl.) Tibell – *Harris 51852.*
Phaeophyscia pusilloides (Zahlbr.) Essl., on trunk of Acer *saccharum – Harris 51853.*
Phaeophyscia rubropulchra (Degel.) Essl., on trunk of *quercus – Harris 51854.*
Physcia millegrana Degel., on trunk of dead *Acer saccharum – Harris 51855.*
Protoblastenia rupestris (Scop.) J. Steiner, on limestone – *Buck 49362, Harris 51856.*
Punctelia rudecta (Ach.) Krog, on trunk of *Quercus – Harris 51857* (isidia becoming lobulate).
Trapelia placodioides Coppins & P. James, on sandstone erratic – *Harris 51858.*

Northern part of preserve: Younger, more open, drier woods with acidic glacial erratics.
Acarospora fuscata (Nyl.) Arn., on erratic – *Harris 51859.*
Caloplaca cerina (Hedwig) Th. Fr., on trunk of *Populus tremuloides – Harris 51860.*
Caloplaca holocarpa (Ach.) A. E. Wade, on trunk of *Populus – Buck 49385.*
Candelaria concolor (Dickson) Stein, on trunk of old *Acer rubrum – Harris 51861.*
Cladonia grayi Sandst., on base of *Betula – Harris 51862.*
Cladonia ochrochlora Flörke, on rotten stump – *Harris 51863.*
Cladonia phyllophora Hoffm., on soil among mosses – *Harris 51864.*
Cladonia polycarpoides Nyl., on soil – *Harris 51865.*
Flavoparmelia caperata (L.) Hale, on base of oak – *Harris 51867.*
Flavopunctelia flaventior (Stirton) Hale, on trunk of dead apple – *Harris 51868.*
Ionaspis alba Lutzoni, on erratic – *Harris 51869.*
Lepraria elobata Tønsberg, on erratic – *Harris 51870.*
Lepraria neglecta (Nyl.) Lettau, on erratic – *Harris 51871.*
Melanelixia subaurifera (Nyl.) O. Blanco et al., on *Rhus typhina* along road – *Harris 51872.*
Parmelia sulcata Taylor, on *Rhus typhina* along road – *Harris 51873.*
Phaeocalicium curtisii (Tuck.) Tibell, on *Rhus typhina*, along road – *Buck 49387.*
Physcia adscendens H. Olivier, on trunk of *Populus tremuloides – Harris 51874.*
Physcia stellaris (L.) Nyl., on dead branch of *Acer rubrum – Harris 51875.*
Porpidia crustulata (Ach.) Hertel & Knoph, on erratic – *Harris 51876.*
Porpidia macrocarpa (DC.) Hertel & Schwab var. *nigrocruenta* (Anzi) Fryday, on erratic – *Harris 51877.*
Punctelia subrudecta auct. Amer., on trunk of *Acer rubrum* in swamp – *Harris 51878.*
Rinodina efflorescens Malme, on trunk of *Acer rubrum* in swamp – *Harris 51879.*
New for New York State.
Trapelia coarctata (Sm.) M. Choisy, on erratic – *Harris 51880.*
Tremella candelariellae Diederich & Etayo*, on *Candelariella efflorescens* R. C. Harris & Buck – *Harris 51881.* Not previously reported from North America. Also first report from *C. efflorescens.*
Vouauxiomyces truncatus (de Lesd.) Dyko & D. Hawksw.?*, on *Xanthoparmelia conspersa* (Ach.) Hale – *Harris 51882.*

Cole & Hawksworth (2001) describe *V. tulasnei* with broad conidiospores from *Xanthoparmelia* but this collection seems better placed in *V. truncatus s. lat.*
Xanthoparmelia conspersa (Ach.) Hale, on erratic – *Harris 51883* (A form with very long, branched isidia).

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Changes in the Bryophyte Flora of Cunningham Park and Alley Pond Park, Queens County, Long Island, New York City

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Abstract. A recent inventory of the bryophyte flora of Cunningham and Alley Pond Parks, Queens County, New York City resulted in documentation of thirty-eight moss species, eight liverworts and one Hornwort. These results are compared with results of earlier studies performed on the parks between the years of 1975 and 1986. Over this time period drastic changes in the bryoflora have occurred, most notably the loss of more than forty percent of the species previously reported including the loss of one species listed as rare in New York State.

Keywords. mosses, liverworts, bryophytes, New York, species loss, Queens County, Long Island

Cunningham Park and Alley Pond Park are located in Queens County, Long Island, New York, within the political boundaries of the City of New York. Combined these two parks comprise approximately 1013 acres of open space, consisting of diverse vegetation types. Both parks have large tracts of natural forest areas as well as managed areas such as athletic playing fields. Falling within a large urban area, and thus within close proximity to numerous universities, the vascular flora of both Alley Pond Park and Cunningham Park have been extensively studied over the past several decades (Loeb 1992; Greller 1977; Greller and Garcia 1986; Lefkowitz and Greller 1973; Stalter 1981). Within New York City parks and throughout the greater geographic region of Long Island, documentation of and research into the bryophyte flora has been limited. After some earlier twentieth century studies in the area by Cain and Penfound (1938), Grout (1916), and Jelliffe (1899), very little work has been focused on Long Island bryophytes. Several bryologists have done significant collections on Long Island for works covering greater geographic regions. Recent papers (Biechele 1993; Morgan and Sperling 2005; Sperling and Morgan 2003) have begun to address local bryophyte floristics and will provide baseline data for further studies.

We conducted this study in an attempt to document the changes in the bryophyte flora from earlier records (1975-1986) and our more recent surveys. Documenting these changes is important in monitoring the overall status of the parks in question. These data may be indicators of larger ecological changes throughout the region as well. Bryophytes have been used as indicators of air pollution (Davis et. al. 2001), and in the monitoring of longer-term air pollution trends (Pott and Turpin 1996) and are therefore an integral part of monitoring the health of both urban and rural natural areas.

MATERIALS AND METHODS

Cunningham Park and Alley Pond Park are located in Queens County, New York, on Long Island. The forested portions of both parks are classified in the Oak Chestnut region of Braun (1950). Within Cunningham Park, the dominant combination of red oak (*Quercus borealis* var. *maxima*) tulip tree (*Liriodendron tulipifera*), flowering dogwood (*Cornus florida*), and red maple (*Acer rubrum*) characterize the forest (Greller 1977). In Alley Pond Park, red oak (*Quercus rubra*), black oak (*Quercus velutina*), and flowering dogwood (*Cornus florida*) are the dominant trees (Stalter 1981). In addition to the forested areas, there are a number of other vegetation types including maintained athletic fields and neglected roadsides bordering the park.

From January 2003 until October 2005, the sites were visited and sampled regularly resulting in approximately 350 samples being collected which were later identified in the lab. Voucher samples of each species have been placed in the Biology Department Herbarium Collection at Queens College, Flushing NY. No additional species have been added to the current species list since mid 2004.

These results were compared to earlier collections made by J. Sperling between the years of 1975 and 1986 (Sperling and Morgan 2003). Earlier collections made within the park are found in Sperling (1958) but are only partial and entirely included within the later findings and are not considered here for comparison purposes.

RESULTS AND DISCUSSION

In total, eighty-four species of bryophytes have been recorded for Cunningham and Alley Pond Parks consisting of sixty-one moss species, twenty-one liverworts, and two hornworts. The earlier moss flora consisted of fifty-nine species while the current moss flora consists of thirty-eight including two species not previously found in the park. This represents a loss of forty-one percent of previously documented species. This was offset by the addition of two new species for a net loss of thirty-six percent of the Parks' moss species. For liverworts, the earlier flora consisted of nineteen species while currently; the flora consists of only eight including two species not previously recorded. This represents a net loss of sixty-eight percent of previously recorded species. This was partially offset by the two newly found species resulting in a loss of fifty-eight percent of the liverworts. Hornworts, which were formerly represented by two species, are now represented by only a single rare species. These numbers are represented in Table 1.

One species present in the earlier study, *Sphagnum platyphyllum* (Braithw.)Warnst., is listed as S1 by the New York State Natural Heritage Program. With this designation this species is considered critically imperiled in New York State due to extreme rarity, five or fewer sites or very few remaining individuals, or extremely vulnerable to extirpation in New York State due to biological factors (Young and Weldy, 2005). While previously present, as confirmed by an expert (Sperling and Morgan 2003), this species is now extirpated within the both Alley Park and Cunningham Park.

Several other species deserve further note such as *Sphagnum lescurii* Sull. which while still present in the parkland, is now rare and difficult to locate. This is in contrast to J. Sperling's personal observations of *S. lescurii* being quite common during his earlier work. *Pallavicinia lyellii* (Hook) Carruth. is another formerly common species. When performing the earlier collections, J. Sperling (pers. obs.) could reliably find the species in essentially every kettle pond and wet depression in the park. Currently, only one site has *P. lyellii* and the authors were reluctant to collect a sample the plant for fear of eliminating its presence altogether. Another noteworthy species is *Polytrichum ohiense* Ren. & Card. which is newly listed for the park. This species occurs at only one site in the park and is present in an area where extensive forest replanting has occurred in recent years (City of New York, 2004). This replanting resulted in the importation of numerous balled and burlaped trees and significant disturbance of the surrounding soil. This new species report may very well be the result of recent anthropogenic factors. Since first finding the species in 2003, the population has diminished to the point where it now appears extirpated in the park. These findings underscore the importance for additional quantitative analysis of the bryophyte flora of both parks.

This disturbing loss of species richness within the parks raises the importance level for future studies on the causes of such a decrease. These levels of bryophyte loss are even more severe than the twenty five percent native species loss recently observed over a fifty year study of vascular plants at another nearby urban park (DeCandido, 2004). A variety of factors may be acting independently or in combination including foot traffic, local climate, air quality, successional patterns, or even the impact of invasive species. New York City Parks serve a population of over ten million people within the city and surrounding counties on Long Island and are visited by a sizeable number of people each year. The heavy foot traffic at Cunningham Park and Alley Pond Park, two of the city park systems largest and best-known parks, may be taking a heavy toll on the bryophyte flora. Future studies comparing the flora in relation to footpaths are underway and may provide important data for the future selection of park trails.

A variety of local climatic factors may also be involved, most noticeably the observed drying out of several of Alley's kettle ponds which provided suitable habitat for Sphagnum mosses.

Air pollution is not likely to be a factor since many of pollutants now in New York City air are at significantly lower levels than reported in the 1970s and 1980s. The authors have hypothesized that improvements in city air quality may even play a role in the occurrence of the two epiphytic liverworts, *Frullania bolanderi* Aust. and *F. eboracensis* Gott., and one epiphytic moss *Orthotrichum pumilum* Sw.; none of which were previously reported for the park.

Succession within the parks has likely played a role in forest species richness, however the authors feel that an aging woodland would show a trend in the opposite direction of what has been observed. More recent studies of the forest canopy will need to be performed to confirm or dismiss the role of succession.

Invasive species have exerted a significant impact on local vascular plants in recent years. In particular, Norway Maple (*Acer platanoides*) has been shown to have a negative impact upon some native Long Island plants (Fang 2005). In Alley Park, Stalter (1981) showed that from 1936 to 1975, Norway Maple increased from essentially non-existent to an Importance Value of 19. From personal observations both authors confirm that there are now large stands of Norway Maples throughout both parks including some large trees contributing to the forest canopy. Whether or not this invasive tree impacts bryophyte communities in a similar manner will provide numerous questions for future researchers.

In conclusion, there will likely be additional bryophytes added to the park's checklist. However, the authors acknowledge that earlier collections were not performed with the same intensity and diligence as the more recent studies. This leads us to believe that any bryophytes added to the more recent lists would have been offset by those missed in earlier studies. This also leads us to the conclusion that there has indeed been a significant and unfortunate loss of bryophyte species within these two biologically and socially important urban parks.

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Table 1. Summary of the species richness of bryophytes for Cunningham Park and Alley Pond Park.

	Previous	Current (new)	Total Species	% Richness Lost
Mosses	59	38 (2)	61	36%
Liverworts	19	8 (2)	21	58%
Hornworts	2	1(0)	2	50%
Totals	80	47(4)	84	41%

APPENDIX 1

Key to Symbols
! -- Now extirpated within the parks
+ -- New addition to the flora of the parks
No symbol indicates species found presently and in past studies

Class MUSCI

Family Amblystegiaceae
Amblystegium serpens (Hedw.) B.S.G.
A. juratzkanum Schimp
! *Calliergon stramineum* (Brid.) Kindb.
! *Campylium hispidulum* (Brid.) Mitt.
Drepanocladus exannulatus (B.S.G.) Warnst.
Leptodictyum trichopodium (Schultz) Warnst.

Family Aulacomniaceae
Aulacomnium palustre (Hedw.) Schwaegr.

Family Brachytheciaceae
! *Brachythecium calcareum* Kindb.
B. oxycladon (Brid.) Jaeg. & Seuerb. var. *oxycladon*
! *B. rutabulum* (Hedw.) B.S.G.
! *B. salesbrosum* (Web. & Mohr.) B.S.G.
! *Eurynchium hians* (Hedw.) Sande Lac
! *Rhynchostegium serrulatum* (Hedw.) Jaeg. & Sauerb.

Family Bryaceae
Bryum argenteum Hedw.
! *B. caespiticium* Hedw.
! *B. capillare* Hedw. var. *flaccidum* (Brid.) B.S.G.
Pohlia nutans (Hedw.) Lindb.

Family Dicranaceae
! *Bruchia flexulosa* (Sw. *ex* Schwaegr.) C.Muell.
Dicranella heteromalla (Hedw.) Schimp.
Dicranum flagellare Hedw. var. *minutissimum* Grout.
! *Dicranum fulvum* Hook.

Family Ditrichaceae
Ceratodon purpureus (Hedw.) Brid.
Ditrichum pallidum (Hedw.) Hampe.
Ditrichum pusillum (Hedw.) Hampe.

Pleuridium subulatum (Hedw.) Rabenh.
Family Entodontaceae
! *Entodon cladorhizans* (Hedw.) C. Muell.
E. seductrix (Hedw.) C. Muell.
Family Fissidentaceae
Fissidens taxifolius Hedw.
Family Funariaceae
Funaria hygrometrica Hedw. var. *Hygrometrica*
Physcomitrium pyriforme (Hedw.) Hampe.
Family Grimmiaceae
Grimmia apocarpa Hedw. var. *apocarpa*
Family Hypnaceae
Callicladium haldanianum (Grev.) Crum.
Hypnum curvifolium Hedw.
! *H. fertile* Sendtn.
Isopterygium elegans (Brid.) Lindb.
I. tenerum (Sw.) Mitt.
Platygyrium repens (Brid.) B.S.G.
Family Leucobryaceae
Leucobryum glaucum (Hedw.) Angstr. *ex* Fr.
Family Leskeaceae
Leskea gracilescens Hedw.
Family Mniaceae
Mnium ciliare (C.Muell.) Schimp.
Mnium cuspidatum Hedw.
Mnium hornum Hedw.
Family Orthotrichaceae
\+ *Orthotrichum pumilum* Sw.
Family Polytrichaceae
Atrichum angustatum (Brid.) B.S.G.
A. crispum (James) Sull.
! *Pogonatum pensilvanicum* (Hedw.) P.-Beauv.
Polytrichum commune Hedw.
! *P. juniperinum* Hedw.
\+ *P. ohiense* Ren. & Card.
Family Pottiaceae
! *Barbula unguiculata* Hedw.
! *Desmatodon obtusifolius* (Schwaegr.) Schimp.
Weissia controversa Hedw.
Family Sphagnaceae
! *S. fimbriatum* Wils.
S. lescurii Sull.
! *S. palustre* L.
! *S. platyphyllum* (Braithw.) Warnst.
! *S. subsecundum* Nees.
Family Tetraphidaceae
Tetraphis pellucida Hedw.
Family Thuidiaceae
! *Haplocladium microphyllum* (Hedw.) Broth.
! *Helodium paludulosum* (Sull.)Aust.
Thuidium delicatulum (Hedw.)B.S.G. var. *delicatulum*

Class HEPATICAE

Family Calypogeiaceae
Calypogeia fissa (L.) Raddi.
Family Cephaloziaceae
! *Cephalozia bicuspidata* (L.) Dum.
! *C. lunulifolia* (Dum.) Dum.
! *C. pleniceps* (Aust.) Lindb.
Odontoschisma prostratum (Sw.) Trev
Family Cephaloziellaceae
! *Cephaloziella rubella* (Nees.) Warnst.
Family Codoniaceae
! *Fossombronia wondraczekii* (Corda.) Dum.
Family Jubulaceae
\+ *Frullania bolanderi* Aust.
\+ *Frullania eboracensis* Gott.
Family Jungermanniaceae
! *Gymnocolea inflata (Huds.) Dum.*
! *Jamesoniella autumnalis* (D.C.) Steph.
! *Jungermannia leiantha* Grolle.
! *J. gracillima* Sm.
Family Lophocoleaceae
Lophocolea heterophylla (Schrad.) Dum
Family Pallaviciniaceae
Pallavicinia lyellii (Hook.) Carruth.
Family Pelliaceae
! *Pellia epiphylla*(L.) Corda.
Family Ptilidiaceae
! *Ptilidium pulcherrium* (G. Web.) Hampe.
! *Kurzia sylvatica* (Evans) Grolle.
Family Ricciaceae
Riccia fluitans L.
Ricciocarpus natans (L.)Corda.
Family Scapaniaceae
! *Scapania nemerosa* (L.) Dum.

Class ANTHOCEROTAE

Family Anthocerotaceae
! *Anthoceros punctatus* L.
Phaeocerus laevis (L.) Prosk.

Notes on some lichens from the Great Smoky Mountains National Park, North Carolina/Tennessee, U.S.A.

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Abstract. Gyalideopsis anastomosans, G. piceicola, Lecidea roseotincta, Microlychnus epicorticis, Mycoblastus caesius and Opegrapha corticola are reported from the Great Smoky Mountains National Park.

Keywords. Lichens, Great Smoky Mountains National Park, North Carolina, Tennessee

In some popular notes (Tønsberg 2004, 2005) I briefly mentioned some species new to the Great Smoky Mountains National Park (GSMNP) in the southern Appalachian Mountains, Tennessee and North Carolina, U.S.A., without citing any specimens. As major range extensions are involved since several of the species appear to be new to eastern North America, most of the species are treated in more detail below. All specimens cited are from the GSMNP and deposited in BG unless otherwise stated.

Gyalideopsis anastomosans P. James & Vězda

On bark of trunks of *Acer rubrum*, *Ilex montana*, *Abies fraseri* and *Picea rubens*, once on twig of *Abies fraseri*, and once on wood on the upper side of a fallen deciduous trunk. Vertical distribution ranged from 575 to 2020 m with most specimens from altitudes above 1600 m. Apparently mainly a species of the park's high elevation conifer forests. Common, but inconspicuous and easily overlooked. Apothecia were not observed, but the species is easily recognized by the characteristic isidia (denoted "thlasidia" by Vězda [see, e.g., Vězda 2003]). In North America this species is widely and commonly distributed in the Pacific Northwest from Oregon to Alaska eastwards to Idaho (Tønsberg 1991, and unpublished material in herbarium BG), and is also known from southern California (Nash & Tønsberg 2004). Recently mentioned new to eastern North America based on material from the GSMNP (Tønsberg 2004).

Specimens seen: **U.S.A.** NORTH CAROLINA, Swain Co., GSMNP, W of Deep Creek, along Deep Creek Trail, 2004, Tønsberg 34173. TENNESSEE, Blount Co., GSMNP, Cades Cove, 2002, Tønsberg 30783. Sevier Co., GSMNP, along Alum Cave Trail, between Arch Rock and Alum Cave, 2003, Tønsberg 33726; Clingmans Dome area, 1994, Tønsberg 20934 (ASU, BG, DUKE); Clingmans Dome area, just downhill from Appalachian Trail, 2002, Tønsberg 30818b; along Clingmans Dome Rd, just N of Road Prong Trail trailhead, 2002, Tønsberg 30882; NE of Newfound Gap, along Appalachian Trail, 2002, Tønsberg 30986.

Gyalideopsis piceicola (Nyl.) Vězda & Poelt Syn. G. alnicola Noble & Vězda

Corticolous on twigs of *Abies fraseri* and *Picea rubens* at altitudes between 1570 and 2000-2010 m in the park's high elevation conifer forests. Common, well-developed (often with both apothecia and hyphophores). Often associated with *Microlychnus epicorticis*. In the park the only known species of *Gyalideopsis* with flabelliform hyphophores. In North America it is very common in the Pacific Northwest from Oregon to Alaska. Recently reported as new to eastern North America from GSMNP by Tønsberg (2004), also found at about sea-level in Canada, Newfoundland (on twigs of *Picea mariana*; unpublished material in herbarium BG).

Specimens seen: U.S.A., Tennessee, Sevier Co., GSMNP, Clingmans Dome, just downhill from Appalachian Trail, 2002, Tønsberg 30828, 30841; along Clingmans Dome Rd, at Road Prong Trail trailhead, 2002, Tønsberg 30868 (ASU, BG, DUKE, GSMNP); NE of Newfound Gap, along Appalachian Trail, 2002, Tønsberg 30890, 30995, 31001; ridge S of Appalachian Trail ca 700 m W of Newfound Gap, 2002, Printzen 6716.

Lecidea roseotincta Coppins & Tønsberg

Corticolous on trunk of *Acer spicatum* and branches of *Viburnum lantanoides* at altitudes between 1780 and 2000-2010 m. Easily recognized in the field by the tendency to produce more or less wine-rèd thalli and by the weakly developed excipulum. In North America this species was previously known from Washington and SE Alaska (Tønsberg 1993 and unpublished material in herbarium BG) in the Pacific Northwest and at about sea-level on Nova Scotia and Newfoundland in the Atlantic northeast (Tønsberg 1993). The species was reported new to the southern Appalachian mountains from GSMNP by Tønsberg (2004).

Specimens seen: U.S.A., North Carolina, Swain Co., GSMNP, NE of Clingmans Dome, along Appalachian Trail, 2005, Tønsberg 35222. Tennessee, Sevier Co., GSMNP, Clingmans Dome, downhill from Appalachian Trail, 2002, Tønsberg 30837; along The Boulevard Trail, 2005, Tønsberg 36297.

Microlychnus epicorticis A. Funk.

Corticolous on twigs of *Abies fraseri*, *Picea rubens*, and branches of *Viburnum lantanoides* at altitudes between 1600 - 1610 and 2000 – 2010 m. A typical species in the park's high elevation, coniferous forests. Often well-developed with both hyphores and apothecia. *Gyalideopsis piceicola* is apparently a frequent associate. Easily distinguished from that species by the long, setiform hyphophores (see also Vězda 2003). *Microlychnus epicorticis* was reported as new to eastern North America by Tønsberg (2004). The monotypic genus *Microlychnus* will be placed in synonymy with *Gyalideopsis* in a forthcoming paper by Lücking & Buck.

Specimens seen: U.S.A., Tennessee, Sevier Co., GSMNP, along Clingmans Dome Rd, at Road Prong Trail trailhead, 2002, Tønsberg 30869; NE of Newfound Gap, along Appalachian Trail, 2002, Tønsberg 30994 (with *G. piceicola*), 31000; Clingmans Dome, downhill from Appalachian Trail, 2002, Tønsberg 30829 (ASU, DUKE, BG, GSMNP), 30839, 30840.

Mycoblastus caesius (Coppins & P. James) Tønsberg

Corticolous on trunks of *Betula lenta* and *Sorbus americana*, on trunks and branches of *Abies fraseri*, and lignicolous on stump (unidentified) at altitudes between 1600-1700 and 1990-2000 m. Usually sterile, but apothecia present in Tønsberg 36331. In North America this species was previously known from the coastal lowlands of the Pacific Northwest from northern California to Alaska (Tønsberg 1992 and unpublished material in herbarium BG), and at about sea-level in Newfoundland in the Atlantic northeast (unpublished material in herbarium BG). Mentioned as new to eastern North America by Tønsberg (2004).

Specimens seen: U.S.A., North Carolina, Swain Co., GSMNP, E of Newfound Gap, along Appalachian Trail, 1992, Tønsberg 18173. Tennessee, Sevier Co., GSMNP, Clingmans Dome, just downhill from Appalachian Trail, 2002, Tønsberg 30800, 30801, 30812, 30827; along The Boulevard Trail, 2005, Tønsberg 36331.

Opegrapha corticola Coppins & P. James

Corticolous on *Cornus florida* and *Quercus imbricaria* at lower elevations (between 540-560 and 650 m) in hardwood forests. Sterile. This species was recently reported new to North America from Arkansas and Oklahoma (Tønsberg 2002), and to the GSMNP (Tønsberg 2004).

Specimens seen: U.S.A. North Carolina, Swain Co., GSMNP, E of Raven Fork River, along Big Cove Rd, 2002, Tønsberg 30980. Tennessee, Blount Co., GSMNP, Cades Cove, 2002, Tønsberg 30725, 30738.

NOTES

Of the species treated above, *Gyalideopsis piceicola*, *Microlychnus epicorticis*, *Lecidea roseotincta*, and *Mycoblastus caesius* may prove to be restricted to the Parks high elevation, coniferous or mixed coniferous-hardwood forests, whereas *Opegrapha corticola* is a species of low-elevation hardwood forests. *Gyalideopsis anastomosans* appears to be mainly a high-elevation species in the park, but with occurrences elsewhere. Main phorophytes for *Gyalideopsis piceicola*, and *Microlychnus epicorticis* are *Abies fraseri* and *Picea rubens*, where they occur commonly on the thinnest twigs (twigs supporting needles). *Gyalideopsis anastomosans* may also occur on conifer twigs, but most collections were from trunks of both hardwoods and conifers. Although *Lecidea roseotincta* appears to occur at high elevations only, it seems to be a species of non-coniferous trees and shrubs associated with the conifer forests. To my knowledge *Microlychnus epicorticis* is known in eastern North America only from the park, whereas *Gyalideopsis piceicola*, *Lecidea roseotincta*, and *Mycoblastus caesius* also occur in Newfoundland; *Lecidea roseotincta* is known from Nova Scotia as well. At their northernmost localites these species occur at about sea-level, whereas at low northern latitudes such as the park (about 35°), they seem to thrive only at high altitudes. Except for *Opegrapha corticola*, the species treated in this note, are commonly and widely distributed in the Pacific Northwest on a wide range of phorophytes.

ACKNOWLEDGEMENTS

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Orthothecium intricatum in Owen Sound, Ontario

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Abstract. Narrow habitat range, inherent rarity, and a general failure to develop an effective search model are used to explain limited reports of *Orthothecium intricatum* in North America.

In a recent article on *Orthothecium hyalopiliferum* Redf. & Allen (Redfearn & Allen 2005) my attention was caught by their reference to aspecimen of *Orthothecium intricatum* (Hartm.) Schimp., collected by Eugene A. Moxley in Ontario. The specimen they alluded to was gathered by Moxley in Owen Sound, Ontario in 1929, and for some time I have been intrigued by the controversy surrounding this record of *Orthothecium intricatum*.

Moxley published a fascinating account (Moxley 1930) of his bryological explorations in the West Hill area of Owen Sound. Within this area he came upon an extensive crevice cave where he found many interesting mosses such as *Cirriphyllum piliferum* (Hedw.) Grout, *Leptobryum pyriforme* (Hedw.) Wils. and *Seligeria paucifolia* (Dicks.) Carruth. (now excluded from North America, this specimen is *S. calcarea* (Hedw.) B.S.G. see Vitt 1976, p.259). At this locality he also found "on a rugged limestone table a patch of golden-green moss" which turned out to be *Holmgrenia intricata* (Hartm.) Lindb., a synonym of *O. intricatum.* He also mentions that the only other record in Canada at that time was one collected by Macoun "On rocks around Kicking Horse Lake [Wapta Lake], Rocky Mountains" (see Macoun & Kindberg 1892, p.179).

Curiously, Moxley's Owen Sound record of *O. intricatum* is mentioned by Crum and Anderson (1981) as suspect. They state they were unable to find the moss during a search for it in 1961, and that "the habitat may have been right for natural vegetation in the past, but it is not suitable now". I, however, disagree with their statement as to the suitability of the area to support natural vegetation. True, houses have been built up to the edge of the talus slope of the West Hill area, but the Niagara Escarpment itself is a forested conservation area. Furthermore, Black's Park which is probably the slope leading to the cave Moxley describes in his article, has 23 flourishing native fern species to this day as well as dolostone blocks coated with most of the same mosses recorded by Moxley.

Crum and Anderson do not seem to have been aware that there was another paper in the Bryologist reporting *Orthothecium intricatum* from Owen Sound (Conard 1938). This paper described a foray led by Eugene Moxley and Clarence Hand, and included Dr. W. C. Steere and his wife. The West Hill area was one of the many places visited and *Orthothecium intricatum* is recorded as being found on "rich, shaded talus". It seems likely that it would have been collected at this time and there must still be a packet of it in a herbarium somewhere in North America. Many of the species recorded on this foray such as *Cratoneuron filicinum* (Hedw.) Spruce and *Thamnobryum allegheniense* (C.Müll.)Nieuwl. are still found in the same locations, so it seems possible that *Orthothecium intricatum* is also still present. This West Hills area is extremely steep and rugged. It seems to me that we really need some young, dedicated, athletic bryologists with time on their hands to make a thorough search to determine once and for all if *O.intricatum* is still present there.

Why is this moss so rare in North America? Aside from the two records already mentioned, there is one from British Columbia and another from Alaska. Is it simply that it specializes in growing in damp limestone or dolostone crevices where no one ever looks, or is it merely that it is hard to distinguish from more common mosses and is overlooked? According to Moxley's description it is not inconspicuous with its golden-green colour and "symmetrical stems, averaging nearly two inches [5 cm] in length". In keys it always seems to come out somewhere near *Pylaisia*.

It seems that Moxley spent nearly all his spare time botanizing, and he was one of those rare people with an eye for minute differences in what he was seeing. Macoun was another collector with this talent. Both of them have had doubts cast on some of their collections. However, it is certainly possible that many of the species they found are still there if you look in the right place. I did once have the experience of picking up a lichen I had never seen before on the shore of Lake Superior at Silver Harbour, only to discover it was *Ephebe lanata* (L.) Vainio previously reported from the same location by Macoun nearly one hundred years before. Nothing is impossible!

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Sarcopyrenia bacillosa (Nyl. *ex* Hasse) Nav.-Ros. & Hladun Rediscovered in California

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Abstract. A new collection of *Sarcopyrenia bacillosa* (Nyl. *ex* Hasse) Nav.-Ros. & Hladun in California is reported. The host is discussed. The nomenclature of the authority is revised.

While staying with Richard and Janet Doell in Richmond for a meeting of the California Lichen Society, a beautiful community on the San Francisco Bay in Contra Costa County, we went out one afternoon before dinner and climbed a ridge in a local park. On a volcanic outcrop sticking out of a grassy hillside we found an unusual lichenicolous fungus. The fungus was parasitic on the widespread and prolific species *Acarospora socialis* H. Magn., turning the yellow thallus brown then black, before its huge black ascomata erupted from the host. After most of *Acarospora* thallus died, the ascomata appeared to persist. An *Aspicilia* had grown through the remains of the *Acarospora* in one area and partially around the black hemispherical ascomata.

Microscopic examination revealed the ascomata to be large subglobose perithecia and the ascospores to be long, simple, and hyaline (30-40 x 1.5-2μm). We easily determined the lichenicolous fungus to be *Sarcopyrenia bacillosa* which, according to Navarro-Rosinés & Hladun (2004) is known only from the type collection made by H.E. Hasse in the foothills of the Santa Monica in southern California in 1897 and has not been collected in over a hundred years.

Our material was compared to an isotype in the Academy of Natural Sciences of Philadelphia (PH 991398) confirming the determination. The collections are identical except that the host of our collection (*A. socalis*) differs from that of the type (a purported cyanolichen in Navarro- Rosinés & Hladun 2004). The only other species of *Sarcopyrenia*, *S. cylindrospora*, reported from North America (Harris 1995) grows on saxicolous crustose lichens with a chlorococcoid photobiont and has septate, not simple, ascospores. Because the perithecia of *S. bacillosa* persist, we believe the Hasse specimens are not parasites on a cyanolichen, but like the *Aspicilia* in Richmond, the cyanolichens had grown around the perithecia. An examination found some green algal cells around the base of the isotype in PH. In our specimens from Richmond, discolored pieces of the host, the photobiont intact, remained around base of some perithecia.

We also take this opportunity to discuss the authority of *S. bacillosa* which was listed as Nylander alone by Navarro-Rosinés & Hladun (2004). The name was actually published by Hasse (1898) as "*Verrucaria bacillosa* Nyl." Hasse published several papers in which he validated a number of names provided by other lichenologists. It is not clear if the lichenologists who provided the names Hasse validated also provided the descriptions which Hasse published. We assert that to avoid possible ambiguity and place the names in their proper bibliographic/historical context these authorities should be cited with the qualification "*ex* Hasse" and thus the authority of *S. bacillosa* should be "(Nyl. *ex* Hasse) Nav.-Ros. & Hladun".

Specimens: California: Contra Costa Co.: Richmond, Overview Park, above Garrard Blvd, on *Acarospora socialis* H. Magn. on exposed volcanic rock outcrop, 37° 55' 02" N. 122° 22' 52" W. Elev. 46m. Disturbed vegetation and ruderal grass. Knudsen # 5024.1 & 5024.2 (progression of infection, UCR), 5024.3 (DUKE, hb. Etayo, UCR). Lendemer 5831 (hb. Lendemer).

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Warnstorfia tundrae (Arnell) Loeske (Campyliaceae) new for Wyoming

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Abstract. Warnstorfia tundrae is reported new for the state of Wyoming. This collection extends the known range southward by approximately 750 miles and constitutes the southernmost occurrence yet reported for North America.

In August of 2005, *Warnstorfia tundrae* was encountered during the course of bryological field work in the Bighorn Mountains of Wyoming, and was later verified by Lars Hedenäs of the Swedish Museum of Natural History. This species has not been previously reported from Wyoming (Eckel, 1996), nor from any of the conterminous 48 states, with the exception of Maine (Hedenäs, 2000). The nearest edge of the known range is in the Canadian Rockies, approximately 750 miles (1200 kilometers) to the northwest. Otherwise, its North American distribution consists of an arctic/subarctic band through Canada, Greenland and Alaska. This constitutes the southernmost occurrence yet known in North America (Hedenäs, 2000 & personal communication). The species also occurs across northern Eurasia (Hedenäs, 2003).

This collection was made from saturated soil in a fen near the headwaters of the North Fork of the Powder River at an elevation of 9272 feet (2827 meters). The site was located in a large open "park" surrounded by forest of *Pinus contorta* and *Picea engelmannii.* Associated bryophyte species included *Sphagnum warnstorfii* Russ., *Warnstorfia exannulata* (Schimp. in B.S.G.) Loeske, *Calliergon richardsonii* (Mitt.) Kindb. in Warnst., *Meesia triquetra* (Richt.) Ångstr., *Meesia uliginosa* Hedw., *Meesia longiseta* Hedw., *Hypnum lindbergii* Mitt., *Fissidens osmundioides* Hedw., *Campylium stellatum* (Hedw.) C. Jens., *Tomentypnum nitens* (Hedw.) Loeske, and *Paludella squarrosa* (Hedw.) Brid.

Specimen Details: USA, Wyoming, Johnson Co., Bighorn National Forest; headwaters of North Fork Powder River, approx. 0.9 air mi. ESE of Powder River Pass, off USFS Road 29, south of US Highway 16; T48N R85W Section 10; UTM 13 335028E 4889876N; Elev. 9272 feet (2827 meters); 30 August 2005; *Lenz 2410* (S) (RM)

This collection extends the known range of this species considerably southward, and it therefore seems likely that more occurrences could be found in the upper elevations of the Rocky Mountains from Colorado to southern Canada.

Thanks go to Lars Hedenäs for his help in confirming the determination and for providing distributional information, and to Greg Karow of the Bighorn National Forest for his help in obtaining the necessary collecting permit. Thanks also to Dan Norris for his review of this paper and his helpful suggestions.

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Lichens from Ellef Ringnes Island, Canadian Arctic Archipelago

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Abstract. 119 lichen species in 62 genera are reported from Ellef Ringnes Island within the polar desert zone of the Canadian Arctic Archipelago. *Stereocaulon depressum* and *Solorina bispora* var. *subspongiosa* are reported from North America for the first time. *Cystocoleus ebeneus* and *Pertusaria atra* are new to the American Arctic. *Anaptychia bryorum, Caloplaca phaeocarpella, Cladonia scabriuscula, Cladonia squamosa, Cladonia stygia, Endocarpon pusillum, Lecanora leptacinella, Peltigera frippii, Rinodina terrestris, Schadonia fecunda, Stereocaulon groenlandicum, Dermatocarpon miniatum* var. *miniatum* are new to the Canadian Arctic Archipelago. Another 91 species are new to the island.

During 19–30 July 2005 N. V. Matveeva, D. A. Walker, F.J.A. Daniëls, C. Vonlanthen and M. K. Raynolds studied the vegetation in the vicinity of Isachsen Bay, Ellef Ringnes Island, Canadian Arctic Archipelago, Nunavut, 78°47' N, 103°32' W, alt. 30–100 (–220) m (Fig. 1). Information about the vascular plant flora, as well as climate, soils, landscapes and geology of Ellef Ringnes Island can be obtained from Savile (1961). The site is located at the northern end of the North American Arctic Transect in bioclimate subzone A of the Circumpolar Arctic Vegetation Map (CAVM Team, 2003).This site is a part of the North American Arctic Transect (NAAT) that is being used to study the biocomplexity of Arctic patterned-ground ecosystems (Walker et al., 2004). Most of the lichens present were collected at 30 relevés (using the Braun-Blanquet approach) representing zonal, dry, and snowbed habitats. Though occasional collections from stones in the mountains are also included, most species are terricolous lichens. It should be also noted that some types of intrazonal habitat were not sampled. All lichens were identified by M. P. Zhurbenko by means of standard microscopic techniques. Voucher specimens are preserved in herbaria of the Komarov Botanical Institute in St.-Petersburg, Russia (LE) and Institute of Arctic Biology of the University of Alaska Fairbanks (UAF).

Thomson (1990) summarized results of lichen investigations in the Canadian Arctic Archipelago in a list of 456 species, which still comprised less than half of the species number (968) known from the whole American Arctic by that time. Since then further information about the lichen flora of the archipelago was published by Brodo et al. (2001), Hansen (2000), Thomson (1997), Thomson & Scotter (1995), Thomson & Weber (1992), Zhurbenko & Daniëls (2003). According to Thomson (1990) the first lichens from Ellef Ringnes were collected by Alan Innes-Taylor, a member of a Canadian–United States weather station group during 1947 and 1948. These collections were identified by J. W. Thomson. Later in the late 1950s D. B. O. Savile also collected some lichens on the island. These collections are preserved in the CANL herbarium. By 1990 just 26 lichen species were known from Ellef Ringnes Island. Here we add 107 species and thus the known lichen flora of the island now includes 133 species.

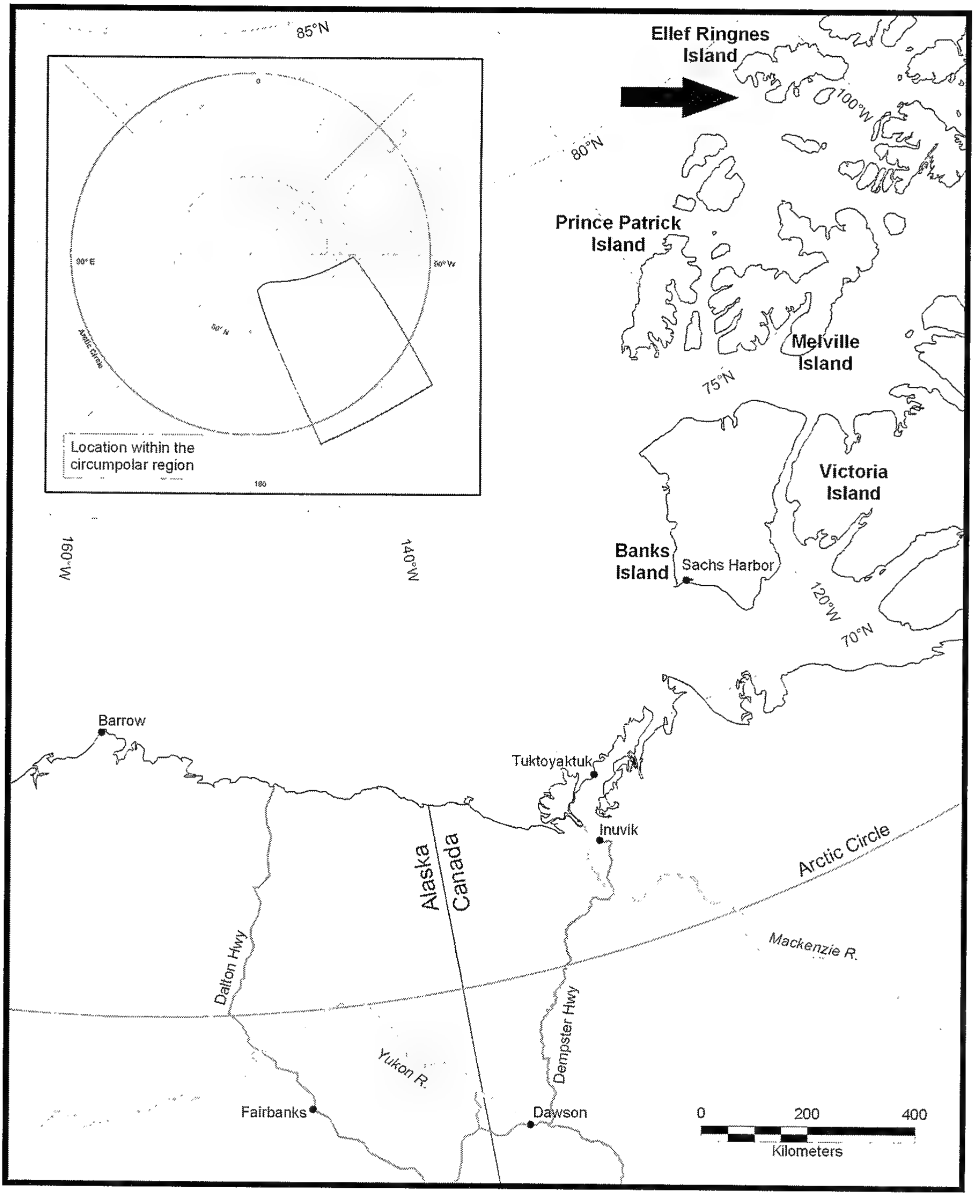

Figure 1. Location of Ellef Ringnes Island within the North American Arctic.

HABITAT TYPES

Bar – dry barrens with small nonsorted polygons 15–20 cm in diameter, almost bare with lichen crusts (*Rinodina terrestris, Fuscopannaria praetermissa, Lecidia wulfenii, Megaspora verrucosa*) and sparse herbs (*Poa abbreviata, Puccinellia andersonii, Papaver radicatum*) along polygon cracks, on dry wind-exposed snowless tops of shale outcrops and along a dry plain above the Isachsen River.

Pol – mesic portions of non-sorted polygons with net-like herb-moss (*Luzula nivalis, Alopecurus alpinus, Festuca brachyphylla, S. caespitosa, S. nivalis, S. flagillaris, Saxifraga spp., Draba subcapitata, D. oblongata, Aulacomnium turgidum, Racomitrium lanuginosum, R. panschii, Sanionia uncinata, Timmia austriaca, Polytrichum alpinum, Syntrichia ruralis, Ditrichum flexicaule, Parmelia omphalodes*) plant cover (30–40%) on gentle (1–5°) shale slopes.

Hum – mesic to moist small turf hummocks with herb-moss plant cover (*Luzula nivalis, Alopecurus alpinus, Festuca brachyphylla, S. caespitosa, S. nivalis, S. flagillaris, Saxifraga spp., Draba subcapitata, D. oblongata, Aulacomnium turgidum, Racomitrium lanuginosum, R. panschii, Timmia austriaca, Polytrichum alpinum, Syntrichia ruralis, Ditrichum flexicaule, Parmelia omphalodes*) on the lower part of shale slopes at the coastal plain.

Wet – wet sites along water tracks and small drainages with *Luzula nivalis, Saxifraga tenuis, S. nivalis, S. rivularis, Ranunuclus sabinei, Aulacomnium turgidum* .

Mos – dense moss (*Racomitrium lanuginosum*) mats with *Stereocaulon alpinum* on volcanic diabase outcrops.

Mtn – barren stony slope of volcanic diabase mountain 1.5 km of the coast, elevations 100–220 m.

Mir – bryophyte mire at base of large snowbed at the mountain base.

Sno – snowbeds at the foot of volcanic diabase mountain close to coast.

ANNOTATED LIST OF TAXA

Annotations for the list of taxa include substrate, habitat types, occurrence within 30 sample plots (figure in parentheses), selected voucher specimens, and accidental notes. Asterisks mark species which have been previously known from the Ellef Ringnes Island.

Agonimia gelatinosa (Ach.) M. Brand & Diederich – on mosses with mineral soil; Wet (1); 24 VII 2005, D. Walker (UAF).

**Alectoria nigricans* (Ach.) Nyl. (including glossy brown modification) – on/ among mosses; Pol, Hum, Mos, Sno (10); 23, 28 VII 2005, N. Matveeva (LE).

**A. ochroleuca* (Hoffm.) A. Massal. – on/ among mosses; Bar, Pol, Hum, Mos, Sno (10).

Anaptychia bryorum Poelt – on/ among mosses and vasculars; Pol, Mtn (3); 23 VII 2005, N. Matveeva (UAF, LE). Within the American Arctic the species has been reported only from Barrow, Alaska (Fryday, 2004). New to the Canadian Arctic Archipelago.

Arctocetraria nigricascens (Nyl.) Kärnefelt & A. Thell – on/ among mosses; Pol, Mos, Mtn, Mir (4); 23 VII 2005, D. Walker (UAF).

Arctomia delicatula Th. Fr. – on mosses; Bar, Pol, Hum, Mos (8); 20 VII 2005, N. Matveeva (LE).

Arthrorhaphis sp. – on mosses with mineral soil; Mos, Mtn (2).

Bacidia bagliettoana (A. Massal. & De Not.) Jatta – on mosses, sometimes with mineral soil; Bar, Mos (2); 28 VII 2005, N. Matveeva; 2005.

Biatora subduplex (Nyl.) Printzen – on mosses with mineral soil; Bar, Pol (3); 24 VII 2005, N. Matveeva (UAF).

Bryocaulon divergens (Ach.) Kärnefelt – on mosses, sometimes with mineral soil; Bar, Pol, Mos (10); 23 VII 2005, N. Matveeva (LE).

Bryodina rhypariza (Nyl.) Hafellner & Türk – on mosses with mineral soil; Pol (1). The species has been reported in the Arctic from few localites from Greenland (Qaanaaq, 77°29' N; Hansen, 1989), Siberia (Taimyr Peninsula, 74°30' N; Zhurbenko, 1996), Beringian Chukotka (Andreev et al., 1996), and Baffin Island (ca. 70°N, Canadian Arctic Archipelago; Fryday, 2000).

Bryonora castanea (Hepp) Poelt – on mosses and old thallus of *Protopannaria pezizoides*; Pol, Hum, Wet, Sno (6); 23 VII 2005, N. Matveeva (LE).

Bryoria nitidula (Th. Fr.) Brodo & D. Hawksw. – on mosses; Mos, Sno (2); 20 VII 2005, N. Matveeva (LE).

Caloplaca ammiospila (Wahlenb.) H. Olivier – on mosses, sometimes with mineral soil, lichens (*Fuscopannaria praetermissa, Peltigera leucophlebia, Rinodina terrestris*), and vasculars; Bar, Pol, Hum, Mos (18); 23 VII 2005, N. Matveeva (LE).

C. cerina (Hedw.) Th. Fr. – on mosses, vasculars (*Saxifraga caespitosa*), and lichens (*Peltigera* sp., *Rinodina terrestris*); Bar, Pol (16).

C. jungermanniae (Vahl) Th. Fr. – on mosses; Bar (1).

C. phaeocarpella (Nyl.) Zahlbr. – on mosses and vasculars (*Saxifraga caespitosa*); Bar (2). New to the Canadian Arctic Archipelago.

C. tetraspora (Nyl.) H. Olivier – on mosses; Bar, Pol (7); 26 VII 2005, N. Matveeva (LE).

C. tiroliensis Zahlbr. – on mosses, sometimes with mineral soil, lichens (*Sticta arctica, Rinodina terrestris, Fuscopannaria praetermissa*), and vasculars; Bar, Pol, Hum, Mos (20); 23 VII 2005, N. Matveeva (LE).

C. tornoënsis H. Magn. – on mosses growing on stones; Mtn (2); 25 VII 2005, N. Matveeva (UAF). This infrequently reported bipolar species has been previously known in the Canadian Arctic Archipelago only from the Baffin Land (Thomson, 1990)

Candelariella placodizans (Nyl.) Lynge – on mosses, sometimes with mineral soil; Pol, Hum, Mos, Sno (7); 23 VII 2005, N. Matveeva (LE).

C. terrigena Räsänen – on mineral soil (forming crusts), mosses, vasculars and lichens (*Fuscopannaria praetermissa, Megaspora verrucosa, Rinodina terrestris*); Bar, Pol (12).

Catapyrenium cinereum (Pers.) Körb. – on mineral soil with mosses; Bar, Pol (3); 22, 24 VII 2005, N. Matveeva (UAF, LE).

Cetraria aculeata (Schreb.) Fr. – on/ among mosses with mineral soil; Bar (3); 22 VII 2005, N. Matveeva (UAF).

C. islandica (L.) Ach. – on/ among mosses, sometimes with mineral soil; Bar, Pol, Hum, Wet, Mos, Sno (18); 24 VII 2005, D. Walker (LE).

**Cetrariella delisei* (Schaer.) Kärnefelt & A. Thell – on/ among mosses; Wet, Mtn, Mir, Sno (4).

**C. fastigiata* (Nyl.) Kärnefelt & A. Thell – on/ among mosses; Hum, Mos, Mtn, Sno (6); 23 VII 2005, D. Walker; 2005 (LE).

Cladonia amaurocraea (Flörke) Schaer. – on/ among mosses; Mos, Mtn, Sno (4).

C. arbuscula (Wallr.) Flot. em. Ruoss ssp. *arbuscula* – on/ among mosses; Mos (1); 25 VII 2005, N. Matveeva (UAF).

C. arbuscula (Wallr.) Flot. em. Ruoss ssp. *mitis* (Sandst.) Ruoss – on/ among mosses; Mtn (1).

Cladonia chlorophaea (Sommerf.) Spreng. – on/ among mosses, sometimes with mineral soil; Pol, Mos (4).

C. coccifera (L.) Willd. s. l. – on mosses and mineral soil; Pol, Hum, Mos, Sno (11).

C. gracilis (L.) Willd. – on/ among mosses; Pol, Mos, Sno (3).

C. macroceras (Delise) Hav. – on/ among mosses, sometimes with mineral soil; Mos, Mtn (2).

C. pocillum (Ach.) Grognot – on mosses and mineral soil; Bar, Pol, Hum, Wet, Mos (22).

C. pyxidata (L.) Hoffm. – on/ among mosses, sometimes with mineral soil; Pol, Wet, Mos, Mtn, Sno (8).

C. scabriuscula (Delise) Nyl. – on/ among mosses with mineral soil; Pol (1). New to Canadian Arctic Archipelago.

C. squamosa Hoffm. – on/ among mosses; Mos, Mtn (2). New to Canadian Arctic Archipelago.

C. stygia (Fr.) Ruoss – on/ among mosses, sometimes with mineral soil; Mos (1).

This widespread arctic species seems not to have been reported from the Canadian Arctic Archipelago (Ahti & Hyvönen, 1985; Thomson, 1990).

C. trassii Ahti – on/ among mosses, sometimes with mineral soil; Bar, Pol, Hum, Mtn, Mir, Sno (10); 25 VII 2005, N. Matveeva (LE).

Collema ceraniscum Nyl. – on/ among mosses with mineral soil; Bar, Pol, Wet, Mos (13); 22, 24 VII 2005, N. Matveeva (LE).

C. tenax (Sw.) Ach. emend. Degel. – on/ among mosses with mineral soil; Bar (1).

C. undulatum Flot. var. *granulosum* Degel. – on/ among mosses with mineral soil; Bar (1); 28 VII 2005, N. Matveeva (LE).

Cystocoleus ebeneus (Dillwyn) Thwaites – on/ among mosses; Mos (2); 20 VII 2005, N. Matveeva (LE). This cosmopolitan species (Purvis et al., 1992) is known from the Arctic from a few localities, including Greenland (Hansen, 2002), Svalbard (Elvebakk & Hertel, 1997), Severnaya

Zemlya (Zhurbenko & Matveeva, in press) and seems to be new to the American Arctic.

Dactylina arctica (Richardson) Nyl. ssp. *arctica* – on/ among mosses; Mtn (3).

D. ramulosa (Hook.) Tuck. [P+ and P– chemotypes] – on/ among mosses; Mos (3); 26, 27 VII 2005, N. Matveeva (LE).

Dermatocarpon miniatum (L.) W. Mann var. *miniatum* (Syn. *Dermatocarpon arnoldianum* Degel.) – on stone above soil; Bar (1); 28 VII 2005, N. Matveeva (LE). According to Thomson (1984) this variety was known in the American Arctic from a single collection along the northwest coast of Alaska. However, *Dermatocarpon miniatum* var. *complicatum* (Lightf.) Th. Fr. has been reported from the Canadian Arctic Archipelago from Devon Is. (as *Dermatocarpon intestiniforme* (Korb.) Hasse; Thomson, 1990)

Endocarpon pusillum Hedw. – on mosses with mineral soil; Bar (1); 22 VII 2005, N. Matveeva (UAF). Thomson (1984) provided no records of the species in his catalogue of the American Arctic lichens. New at least to the Canadian Arctic Archipelago.

Euopsis sp. – on mineral soil; Bar (1).

Flavocetraria cucullata (Bellardi) Kärnefelt et A. Thell – on mosses; Pol, Mos (3).

F. nivalis (L.) Kärnefelt et A. Thell – on mosses; Mos (1).

Fuscopannaria praetermissa (Nyl.) P.M. Jørg. – on mosses and mineral soil, one of the dominant lichen crust species; Bar, Pol (17).

Hypogymnia subobscura (Vain.) Poelt – on mosses, sometimes with mineral soil; Bar, Pol, Mos (6); 24 VII 2005, N. Matveeva (UAF).

Japewia tornoënsis (Nyl.) Tønsberg – on lichens (*Cladonia macroceras, C. pocillum, Fuscopannaria praetermissa, Parmelia omphalodes ssp. glacialis*), mosses (*Racomitrium lanuginosum*), and sometimes on mineral soil; Bar, Pol, Mos, Sno (9); 20, 23 VII 2005, N. Matveeva (LE); 23, 26, 28 VII 2005, N. Matveeva (LE).

Lecanora epibryon (Ach.) Ach. – on mosses with mineral soil; Bar, Pol (3); 24 VII 2005, N. Matveeva (UAF).

L. geophila (Th. Fr.) Poelt – on mineral soil, sometimes with mosses; Bar, Pol (3); 22 VII 2005, N. Matveeva (LE).

L. hagenii (Ach.) Ach. var. *fallax* Hepp – on vasculars, lichens, mosses, and mineral soil; Bar, Pol (9); 23, 29 VII 2005, N. Matveeva (LE).

L. leptacinella Nyl. – on old shoots of *Racomitrium lanuginosum*; Mos, Mtn (2); 20 VII 2005, N. Matveeva (LE). The species has been previously known in the American Arctic only from Barrow, Alaska (Zhurbenko et al., 1995). New to the Canadian Arctic Archipelago.

Lecidea ramulosa Th. Fr. – on mosses, sometimes with mineral soil; Wet, Mir, Sno (5); 25 VII 2005, N. Matveeva (LE).

Lecidella wulfenii (Hepp) Körb. – on mosses, mineral soil (forming crusts), and vasculars; Bar, Pol (18); 22, 23 VII 2005, N. Matveeva (LE).

Lepraria neglecta (Nyl.) Lettau – on mosses above stones; Mtn (1); 25 VII 2005, N. Matveeva (LE).

L. cf. *vouauxii* (Hue) R. C. Harris – on mosses and mineral soil; Bar, Pol, Hum (10); 22, 23, 28 VII 2005, N. Matveeva (LE). The species has been recently reported from the Canadian Arctic Archipelago from Ellesmere Is. (Hansen, 2000).

Leptogium gelatinosum (With.) J.R. Laundon – on mosses with mineral soil; Bar, Pol (9); 22 VII 2005, N. Matveeva (UAF, LE).

L. lichenoides (L.) Zahlbr. – on mosses and mineral soil; Bar, Pol, Hum, Sno (9); 24 VII 2005, N. Matveeva (UAF).

Lopadium coralloideum (Nyl.) Lynge – on mosses, sometimes with mineral soil; Mos, Mtn (3); 20 VII 2005, N. Matveeva (UAF).

L. pezizoideum (Ach.) Körb. – on mosses, sometimes with mineral soil; Pol, Mos (3); 25, 27 VII 2005, N. Matveeva (UAF, LE).

Megalaria jemtlandica (Th. Fr. & Almq.) Fryday (Syn. *Catillaria jemtlandica* Th. Fr. & Almq., *Lecidea sublimosa* Nyl.) – on mosses and mineral soil, often forming crusts; Bar, Pol, Hum (16); 23, 24 VII 2005, N. Matveeva (UAF, LE). The species has been reported for the American Arctic from a few localities, including Ellesmere Island within the Canadian Arctic Archipelago (Thomson 1990, 1997; Fryday, 2004):

Megaspora verrucosa (Ach.) Hafellner & V. Wirth – on mosses and mineral soil; Bar, Pol (15); 28 VII 2005, N. Matveeva (LE); 30 VII 2005, D. Walker (UAF).

Micarea incrassata Hedl. – on mosses, sometimes with mineral soil; Pol, Hum, Mos, Sno (6); 23, 28 VII 2005, N. Matveeva (UAF, LE).

Mycoblastus sanguinarius (L.) Norman – on mosses; Pol, Mos, Sno (4); 23 VII 2005, N. Matveeva (LE).

Myxobilimbia lobulata (Sommerf.) Hafellner – on mineral soil with mosses; Pol (1); 24 VII 2005, N. Matveeva (UAF).

Nephroma expallidum (Nyl.) Nyl. – on mosses; Mtn (1); 23 VII 2005, N. Matveeva (UAF).

Neuropogon sphacelatus (R. Br.) Alstrup & E. S. Hansen – on rock; Mtn, Sno (3); 23 VII 2005, D. Walker (UAF, LE); 25 VII 2005, N. Matveeva (LE).

Ochrolechia grimmiae Lynge – on mosses; Mos, Mtn (3); 25 VII 2005, N. Matveeva (LE).

O. gyalectina (Nyl.) Zahlbr. – on mosses; Mtn (1); 25 VII 2005, N. Matveeva (LE).

O. inaequatula (Nyl.) Zahlbr. – on mineral soil (forming crusts), mosses and occasionally vasculars; Bar, Pol, Hum, Mos, Sno (22); 20, 22, 23, 28 VII 2005, N. Matveeva (UAF, LE).

Parmelia omphalodes (L.) Ach. ssp. *glacialis* Skult – on mosses, sometimes with mineral soil; Bar, Pol, Hum, Mos, Sno (16); 24, 28 VII 2005, N. Matveeva (UAF, LE).

Peltigera canina (L.) Willd. – on mosses, sometimes with mineral soil; Bar, Pol, Hum, Wet (12); 24 VII 2005, N. Matveeva (UAF).

P. didactyla (With.) J.R. Laundon – on mosses, sometimes with mineral soil; Bar, Pol, Hum, Mos (12); 20, 22 VII 2005, N. Matveeva (UAF, LE). In some specimens soredia turn to isidia.

P. frippii Holt.-Hartw. – on mosses; Pol, Hum, Mos (3); 20 VII 2005, N. Matveeva (LE). The species is known in the Arctic from scattered finds: Greenland, Svalbard, Siberia (Gydan Peninsula, Severnaya Zemlya Archipelago, Taimyr Peninsula, New Siberian Islands) (Vitikainen, 1994; unpublished data of M. Zhurbenko and O. Vitikainen). Though *Peltigera frippi* is not yet included in the North American lichen checklist (Esslinger, 1997) it has been reported from North America in Vitikainen (1994) without indication of the locality which was: Canada, Northwest Territories, Reindeer Station, 68° 39'N 134° 05'W, 1965 leg. Scotter 6032 (preserved in H) (O. Vitikainen, pers. comm.). New to the Canadian Arctic Archipelago.

P. leucophlebia (Nyl.) Gyeln. – on mosses, sometimes with mineral soil; Bar, Pol, Hum, Wet, Mos, Sno (13); 23 VII 2005, N. Matveeva (UAF).

P. rufescens (Weiss) Humb. – on mosses, sometimes with mineral soil; Bar, Pol, Wet, Sno (10); 26 VII 2005, N. Matveeva (UAF).

P. scabrosa Th. Fr. – on mosses; Pol, Hum, Sno (3); 28 VII 2005, N. Matveeva (UAF).

P. venosa (L.) Hoffm. – on mineral soil, sometimes with mosses; Bar, Pol (6); 24 VII 2005, N. Matveeva (UAF).

Pertusaria atra Lynge – on mosses with mineral soil; Pol (1); 23 VII 2005, N. Matveeva (LE). This rare species morphologically resembles *Pertusaria saximontana* Wetmore (Zhurbenko & Lumbsch, in press). It was described from Churchill at the coast of Hudson Bay (58°40' N), Manitoba, Canada (Lynge, 1939) and was further collected at Labrador coast (ca. 51°30' N) (Dibben, 1980) and western Greenland (Hansen & Poelt, 1987). New to the American Arctic.

**P. dactylina* (Ach.) Nyl. – on mosses; Mtn (2).

P. geminipara (Th. Fr.) Brodo – on mosses; Mos, Mtn, Sno (3).

P. glomerata (Ach.) Schaer. – on mosses, sometimes with mineral soil; Pol (2).

P. octomela (Norman) Erichsen – on mosses, sometimes with mineral soil; Bar, Pol (11); 23, 26 VII 2005, N. Matveeva (UAF, LE).

P. oculata (Dicks.) Th. Fr. – on mosses with mineral soil; Bar (1); 28 VII 2005, N. Matveeva (UAF).

P. panyrga (Ach.) A. Massal. – on mosses; Mos (1).

Phaeorrhiza nimbosa (Fr.) H. Mayrhofer & Poelt – on mosses with mineral soil; Bar (1); 28 VII 2005, N. Matveeva (UAF).

Physcia dubia (Hoffm.) Lettau – on herbaceous sheet among mosses; Mos (1).

Physconia muscigena (Ach.) Poelt – on mosses, sometimes with mineral soil; Bar, Pol (6); 26 VII 2005, N. Matveeva (UAF).

Placopsis gelida (L.) Linds. – on loamy soil; Bar, Pol (3); 22 VII 2005, N. Matveeva (LE). The species usually grows on stones in wet situations.

Polychidium muscicola (Sw.) Gray – on/ among mosses, sometimes with mineral soil; Pol, Mos, Sno (4); 20 VII 2005, N. Matveeva (LE).

Protopannaria pezizoides (Weber) P.M. Jørg. & S. Ekman – on mosses and mineral soil; Bar, Pol, Hum, Wet, Mos, Sno (21); 25, 27 VII 2005, N. Matveeva (UAF, LE).

**Pseudephebe pubescens* (L.) M. Choisy – on scree, partly among mosses; Mos (2); 20 VII 2005, N. Matveeva (UAF).

Psoroma hypnorum (Vahl) Gray – on mosses and mineral soil; Bar, Pol, Hum, Mos, Sno (21); 23 VII 2005, N. Matveeva (UAF, LE).

Rinodina mniaraea (Ach.) Körb. var. *mniaraea* and var. *mniaraeiza* (Nyl.) H. Magn. – on mosses, sometimes with mineral soil; Bar, Pol, Mos (6); 23 VII 2005, N. Matveeva (LE).

R. olivaceobrunnea C. W. Dodge & G. E. Baker – on mosses, lichens (*Peltigera didactyla, P. frippii*, crusts), and vasculars; Bar, Pol, Hum, Mos, Sno (16); 20 VII 2005, N. Matveeva (LE).

R. roscida (Sommerf.) Arnold – on mosses, sometimes with mineral soil; Bar (3).

R. terrestris Tomin (Syn. *Rinodina mucronatula* H. Magn.) – on mineral and scree soil (one of the main crust-formers) and mosses; Bar, Pol (13); 22, 24, 26, 29 VII 2005, N. Matveeva (UAF, LE). *Rinodina terrestris* was described from semidesert growing on salt soil at Baskunchak Lake, Russia, south east Europe (Tomin, 1929), and is further known from scattered finds in central and northern Europe, central and northern Asia, North America and western Greenland, being characteristic of dry steppe- or desert-like sites (Mayrhofer & Moberg, 2002). The species has been previously reported from Greenland and the American Arctic not from soil, but from *Salix* twigs and decaying wood (?!) (as *Rinodina mucronatula*; Hansen, 1986; Thomson 1997). New to the Canadian Arctic Archipelago.

R. turfacea (Wahlenb.) Körb. – on mosses, sometimes with mineral soil, lichens (*Fuscopannaria praetermissa, Parmelia omphalodes* ssp. *glacialis, Peltigera* sp., *Solorina crocea, Sticta arctica*), and vasculars; Bar, Pol, Hum, Wet, Sno (19); 24 VII 2005, N. Matveeva (UAF).

Schadonia fecunda (Th. Fr.) Vězda & Poelt – on mosses with mineral soil; Pol, Sno (2); 24 VII 2005, N. Matveeva (UAF). New to the Canadian Arctic Archipelago.

Solorina bispora Nyl. var. *subspongiosa* (Zschacke) Frey – on mosses and mineral soil; Bar, Pol, Wet, Mos, Sno (9); 23, 25, 27 VII 2005, N. Matveeva (UAF, LE). The variety is often morphologically very similar to *Solorina spongiosa* (Ach.) Anzi, with well-developed external cephalodia. Due to our observations in the Siberian Arctic (Zhurbenko & Matveeva, in press) this is a dominant, though often overlooked, variety of *Solorina bispora* in the high Arctic. The variety is known from Europe (see e. g.: Hafellner & Türk, 2001; Purvis et al., 1992; Frey, 1952), but has not been reported from Greenland and North America.

**S. crocea* (L.) Ach. – on mineral soil and mosses; Pol, Mos (2); 24 VII 2005, N. Matveeva (UAF).

Sphaerophorus fragilis (L.) Pers. – on scree soil; Pol (2); 24 VII 2005, N. Matveeva (UAF).

**S. globosus* (Huds.) Vain. – on/ among mosses, sometimes with mineral soil; Pol, Mos (7).

**Stereocaulon alpinum* Funck – on/ among mosses, sometimes with mineral soil; Pol, Mos, Sno (6); 20, 23 VII 2005, N. Matveeva (UAF, LE).

**S. botryosum* Ach. – on scree, occasionally among mosses; Mos (2); 20 VII 2005, N. Matveeva (UAF); 23 VII 2005, D. Walker (LE).

S. depressum (Frey) I. M. Lamb – on scree soil; Bar (1). The species is rather common in the Arctic, being known for instance from Greenland, Franz Josef Land, Taimyr Peninsula, Severnaya Zemlya Archipelago, Wrangel Island (Dombrovskaya, 1996), but according to Esslinger (1997) is new to North America.

S. glareosum (Savicz) H. Magn. – on mosses and mineral soil; Bar, Pol, Mos (8); 22, 24 VII 2005, N. Matveeva (UAF, LE).

S. groenlandicum (E. Dahl) I. M. Lamb – on stones and scree soil with moss remnants; Pol, Mos, Mir, Sno (5); 25, 26 VII 2005, N. Matveeva (UAF, LE). New to Canadian Arctic Archipelago

S. rivulorum H. Magn. – on moss and scree soil; Bar, Pol, Hum, Wet, Mir, Sno (20); 22, 26 VII 2005, N. Matveeva (UAF, LE).

Sticta arctica Degel. – on mosses and mineral soil; Bar, Pol (8); 23, 26 VII 2005, N. Matveeva (LE); 30 VII 2005, D. Walker (UAF).

Tetramelas insignis (Hepp) Kalb – on mosses, sometimes with mineral soil; Bar, Pol, Hum (14); 22, 23 VII 2005, N. Matveeva (UAF, LE).

T. papillatus (Sommerf.) Kalb – on mosses, mineral soil, and lichens (*Fuscopannaria praetermissa*); Bar, Pol (5); 24, 28 VII 2005, N. Matveeva (UAF, LE).

Thamnolia vermicularis (Sw.) Schaer. var. *subuliformis* (Ehrh.) Schaer. – on/ among mosses with mineral soil; Bar, Pol, Hum, Mos (14).

T. vermicularis (Sw.) Schaer. var. *vermicularis* – on/ among mosses; Pol, Mos (3).

Umbilicaria lyngei Schol. – on stone; Mos (1).

**U. proboscidea* (L.) Schrad. – on stone; Mos (1).

Xanthoria sp. – on herbaceous sheet among mosses; Mos (1).

Discussion

Seven species are associated with stone substrates, the other 112 are terricolous lichens. The terricolous lichen flora of the Isachsen Bay is one of the richest among the known floras of the Canadian Arctic Archipelago (Thomson, 1990). However, taking into consideration that such floras within the polar desert zone can comprise 160–180 species (Zhurbenko, Matveeva, in press), we can estimate that the list is still only 70% complete.

The lichen genera with the most species are typical for the polar desert terricolous lichen floras: *Cladonia* (12 species), *Caloplaca* (7), *Peltigera* (7), *Pertusaria* (7), *Stereocaulon* (6), *Rinodina* (5), *Lecanora* (4), *Collema* (3), *Ochrolechia* (3). Thirteen genera contain 2 species, and 39 contain 1 species (61 genera total).

The most frequent species within 30 relevés are as follows: occurring at more than 20 relevés – *Cladonia pocillum, Ochrolechia inaequatula, Protopannaria pezizoides, Psoroma hypnorum*; at 16–20 relevés – *Caloplaca ammiospila, C. cerina, C. tiroliensis, Cetraria islandica, Fuscopannaria praetermissa, Lecidella wulfenii, Parmelia omphalodes, Rinodina olivaceobrunnea, R. turfacea, Stereocaulon rivulorum*; at 10–15 relevés – *Alectoria nigricans, A. ochroleuca, Bryocaulon divergens, Candelariella terrigena, Cladonia trassii, Collema ceraniscum, Lepraria* cf. *vouauxii, Megaspora verrucosa, Peltigera canina, P. didactyla, P. leucophlebia, P. rufescens, Pertusaria octomela, Rinodina terrestris, Tetramelas insignis, Thamnolia vermicularis.*

The main lichens forming crusts over bare frost patterned ground are *Candelariella terrigena, Fuscopannaria praetermissa*, *Lecidella wulfenii*, *Ochrolechia inaequatula*, and *Rinodina terrestris*. Sometimes they exhibit tiny knobs, evidently due to erosion of neighbouring silty soils that are easily eroded by wind and running water. It is noteworthy that according to Hansen (2001) none of these species are dominant in the lichen-rich soil crusts of Arctic Greenland.

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Announcement Board:

- At the direction of the ABLS Executive Committee we are implementing a two stage upgrade to Evansia. With volume 23 we have upgraded paper quality and switched to a two column format. We have also instituted an author-solicited peer-review system.

- Effective with issue 22 (1) the senior author of each manuscript published in Evansia receives an electronic copy of their paper as a pdf file.

- Please remember that at least one author on each manuscript must have a current subscription to Evansia.

- Index of Bryophytes, 2005, is now available as a pdf file from the authors, marshall.crosby@mobot.org and bob.magill@mobot.org and from the web site http://www.mobot.org/MOBOT/tropicos/most/bryolist.shtml. The Index attempts to include all names for bryophytes published during the calendar year 2005, and it lists some names overlooked for earlier Indexes and some corrections to earlier Indexes. Names at all ranks are included. Basionyms and replaced names are also included for new combinations and new names, respectively. Each newly published name is referenced to a bibliography that provides the complete citation for the book or article in which the name appeared. The intent of this first of a series of annual Indexes it to provide a compact (the Index, 2005, is 12 pages long) means for workers to have an up-to-date look at what has been going on in bryophyte nomenclature. We plan cumulative Indexes beginning with 2001. The Index for 2001–2005 will be available soon.

- New bryophyte book available: "Outstanding Mosses & Liverworts of Pennsylvania & Nearby States"
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Guide to contributors to *EVANSIA*

The aim of *Evansia* is to provide a vehicle for the presentation and exchange of useful information on North American bryophytes and lichens. Articles are frequently popular in nature rather than technical and are intended to teach and inform both amateurs and professionals. The articles include, but are not restricted to, announcements of and reports on forays and meetings, presentations of techniques and aids for studying and curating lichens, bryophytes, and hepatics; and reports on local floras. Checklists and papers documenting new regional, state, or county records must include voucher specimens (collector and collection numbers) and an indication of where the specimens are deposited or a literature reference. Occasionally, articles of broad interest from locations other than North America may be included.

Evansia is published with the aid of desktop publishing software. Manuscripts must be submitted as Microsoft Word documents (Times New Roman, size 10 font) attached to an email and sent directly to the editor. All submissions must be in English; however, we will publish manuscripts with abstracts in English as well as French or Spanish.

After a manuscript has been received it will be acknowledged by e-mail. Images can usually be transmitted as email attachments; however, a good quality hard copy of any illustration should also be mailed to the editor.

IMPORTANT: Authors should not spend time elaborately formatting their manuscript and should avoid numerous font changes, using footnotes, or other special features. When the manuscript is formatted for *Evansia* most of this work will have to be removed. Note that *Italics*, **bolding** and underlining must be included where appropriate. See recent copies of *Evansia* to resolve questions about style and format.

EFFECTIVE WITH THIS VOLUME: An author-solicited review of all manuscripts is **required**. When the senior author submits a manuscript for review they should also request that the peer reviewer forward a copy of all pertinent review documentation to the editor. Once the author has made appropriate adjustments based on reviewer feedback the final manuscript should be emailed to the editor as an MS Word attachment. Ten days to two weeks prior to the publication deadline a penultimate, formatted copy of each manuscript as a pdf file will be emailed to the senior author for final review. Any adjustments or corrections must be reported to the associate editor via email within 10 days; otherwise the manuscript will be printed as is.

"Announcement Board". Please submit information about Bryological or Lichenological fieldtrips, seminars, meetings; or comments about curatorial techniques. Please include dates, locations and contact information for meetings or fieldtrips. Deadlines for announcements will be March 1st (issue 1), June 1st (issue 2), September 1st (issue 3), and December 1st (issue 4).

Manuscripts, as email MS Word attachments, should be sent to the Editor:

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EVANSIA

VOLUME 23 NUMBER 4

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Arthothelium norvegicum in North America

TOR TØNSBERG
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Abstract. We report on the known occurrences of the lichen *Arthothelium norvegicum* in North America. This species is known only along the Pacific coast from southwestern British Columbia to northwestern California. The species is new to Canada.

Arthothelium norvegicum was initially detected in North America by the first author who collected it in British Columbia in 1989 and later in Washington. The species was collected in California by the second author in 2002. These collections prompted a joint effort to report on its North American occurrences. Recently, this species was reported for the first time from North America (Hutten et al. 2006) based on specimens collected by the first author from the Olympic Peninsula in Washington. To our knowledge, this is the only record of *A. norvegicum* from North America.

Arthothelium norvegicum Coppins & Tønsberg
Nord. J. Bot. 4: 75 (1984).

Arthothelium norvegicum and *A. spectabile* are similar, but they can be distinguished by several morphological and anatomical characters. *A. norvegicum* produces apothecia smaller in size [to 0.6(–0.8) mm when round, to 1.2 mm when elongate], ascospores to 42(–49) µm long with (5–)7–9(–10) transverse septa, epithecia reacting K+ greenish, and paraphyses often with a dark brown pigmented cap (Coppins & Tønsberg 1984, Coppins 1992, and Tønsberg unpublished data from specimens in herbarium BG). Contrastingly, A. spectabile produces larger apothecia [to 1.2 mm when round, to 2.0 mm long when elongate], ascospores to 36 µm long with 5–8 transverse septa, epithecia reacting K+ red, and paraphysoid caps usually lacking pigments (Coppins & Tønsberg 1984, Coppins 1992).

In British Columbia and Washington, *A. norvegicum* was collected from the bark of *Alnus rubra* (most specimens) as well as *Malus diversifolia* and *Rhamnus purshiana* (one specimen each) trunks growing along river banks and lake shores. In California, specimens were collected from the bark of *Vaccinium ovatum* that itself occurred as an epiphyte at 91.5 m above the ground on a redwood (*Sequoia sempervirens*) in an old-growth redwood forest on the floodplain of a major river.

In North America *A. norvegicum* has been found in the coastal lowlands from southwestern British Columbia to northwestern California at elevations between 10 and 190 m. These occurrences suggest an affinity for the slightly shaded to well-lit smooth bark of some angiosperm shrubs and trees growing along riparian corridors in wet, low-elevation, coastal habitats. In Europe *A. norvegicum's* hub of distribution is in central Norway where it occurs mainly as an epiphyte on *Sorbus aucuparia* bark in boreal rain forests (Holien & Tønsberg 1996).

This is the first report of *A. norvegicum* from both Canada and California. The species apparently belongs to a large group of lichens with a northwest North America to northwest Europe disjunct distribution. Examples of other lichens exhibiting this distribution pattern are *Micarea xanthonica*, *Pyrrhospora subcinnabarina*, *Rinodina disjuncta*, and *R. stictica* (Tønsberg 1992, Holien & Tønsberg 1996, Tønsberg 1998, Coppins & Tønsberg 2001).

SPECIMENS EXAMINED:

Canada. British Columbia, Vancouver Island, between Qualcam Beach and Port Alberni, S of Cameron Lake, 1989, Tønsberg 12178 (BG);

Vancouver Island, S of Port Alberni, W of the road at China Creek bridge, 1989, Tønsberg 12206 (BG); Vancouver Island, E of China Creek, 0.7 km along the road N of China Creek Park junction, along tributary creek, 1989, Tønsberg 12221 (BG). U.S.A. California, Humboldt Co., Humboldt Redwoods State Park, California Federation of Women's Club Grove, 2002, Williams 313 (HSC). Washington, Clallam Co., Olympic National Park, Ozette Lake, 1997, Tønsberg 24867 (BG), 1999, Tønsberg 27130 (BG); Jeffersen Co., Olympic National Park, Hoh River Valley, along Hoh River Trail, 1999, Tønsberg 27997a (BG); Pacific Co., W bank of Ellsworth Creek, 2003, Tønsberg 33299a (BG); San Juan Co., Lopez Island, between McArdle Bay and Watmough Bay, 1998, Tønsberg 26906a (BG).

ACKNOWLEDGEMENTS

The authors thank Laurens Sparrius, Gouda, The Netherlands, for help with identification of the Californian specimen, Steve Sillett at Humboldt State University who rigged the redwood for rope access, and Trevor Goward, Clearwater, for comments on the manuscript.

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Orthotrichum cupulatum Brid. (Musci: Orthotrichaceae) re-established in the Niagara River Gorge, Ontario

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Abstract. A second collection of *Orthotrichum cupulatum* Brid. from the Niagara River Gorge, Ontario confirms the presence of this species in eastern North America. *Orthotrichum cupulatum* was first collected along the Niagara River by Thomas Drummond and issued in his Musci Americani exsiccatae.

Thomas Drummond (1828) issued a specimen (No. 152, *Orthotrichum cupulatum* Brid.) in his Musci Americani (British North America) exsiccatae that had been collected on "rocks near the whirlpool, below the Falls of Niagara." An examination of one of these specimens in NY revealed the collection to be a mixture of mostly *O. strangulatum* P. Beauv with a few intermixed plants of *O. cupulatum*. In North America *O. cupulatum* is typically found from Vancouver Island, south throughout the Rocky Mountains, and in Mexico. Eastern North American stations of *O. cupulatum* have often been met with suspicion. Macoun and Kindberg (1892) determined Drummond's specimen No. 152 to be the European taxon *O. nudum* var. *rudolphianum* Schimp. Commenting on the uncertainty of *O. cupulatum* in eastern North America, Britton (1894) concluded that additional collections were needed to determine the distribution of this species. Grout (1935) considered *O. nudum* a variety of *O. cupulatum* and referred Drummond's specimen No. 152 to this variety, noting that it was "far out of its usual range." Vitt (1973) rejected the names *O. nudum* and *O. nudum* var. *rudolphianum* from North America and along with Crum and Anderson (1981), considered Drummond's collection of *O. cupulatum* from Niagara Falls dubious until the species could be re-collected there.

Recently, another specimen of *O. cupulatum* from Niagara Falls, Ontario was discovered in the MO herbarium. This specimen (Eckel & Zander 321185), was collected just below the dolomite caprock of the gorge along Foster's Flats, Niagara Glen on the Niagara River, and was originally identified as *O. strangulatum*. Eckel (2004) tentatively determined this specimen as *O. cupulatum* in a "Preliminary Cryptogamic Flora of the Canadian and American Gorge at Niagara Falls." The dark-green plants are tufted, approximately 1 cm high with leaves loosely arranged. They differ from *O. strangulatum* by having somewhat broader leaves. The leaf margins of *O. cupulatum* are recurved from the base nearly to the apex, which can be either acute or obtuse. Unlike *O. strangulatum*, the leaf margins of *O. cupulatum* are unistratose, although the lamina occasionally has bistratose thickenings. *Orthotrichum lescurii* Austin also has unistratose leaves; however this species differs from *O. cupulatum* in having narrowly lanceolate leaves and tightly revolute leaf margins. The upper leaf cells of *O. cupulatum* are irregularly elliptical (8.0–12.5 μm) and in the MO specimen, have 1–3 papillae per cell. The papillae are conical unlike the large, branched papillae observed in many specimens of *O. cupulatum* from western North America. The basal cells are smooth and thick-walled, rectangular at the costae and quadrate near the margins. The capsules of *O. cupulatum* have immersed stomata, are emergent, ovoid, slightly contracted beneath the mouth when dry, and distinctly 16-ribbed with equilength reddish orange furrows. Vitt (1973) considered the 16-ribbed capsules of *O. cupulatum* a diagnostic feature of the species. This character distinguishes *O. cupulatum* from *O. strangulatum* and *O. lescurii* in eastern North America which both have 8-ribbed capsules. The capsules of the *O. cupulatum* specimen in MO have a single peristome. The exostome teeth are vertically striate on the outer surface, yellow, and erect or slightly spreading when dry. In addition, preperistomal fragments are present and can be up to 1/3 the length of the teeth. The large mitrate calyptrae are smooth and have sparse, papillose hairs. The spores are 17–20 µm, rounded, and papillose.

Other bryophyte novelties, disjuct from southwestern North America have been reported from the Niagara River Gorge. Eckel (1986) reported *Didymodon australasiae* var. *umbrosus* (Müll. Hal) R. H. Zander and also (1990) *Eucladium verticillatum* (Brid.) Bruch & Schimp. in B.S.G. from the Gorge. The specimen of *O. cupulatum* in MO is the second known collection from the Niagara River Gorge, Ontario. *Orthotrichum cupulatum* is widely distributed in west and southwestern North America, northern and southern South America, throughout Europe, northern Africa, New Zealand, Australia, and southeastern and central Asia (Lewinsky 1993) making its occurence in eastern North America not unexpected. Although *O. cupulatum* consistently has 16-ribbed, ovoid capsules, the species is otherwise morphologically variable. *Orthotrichum cupulatum* var. *austro-americanum* Lewinsky, *O. cupulatum* var. *austro-cupulatum* (Dixon & Sainsbury) Lewinsky, *O. cupulatum* var. *riparium* Hübener, *O. urnigerum* Myrin, and *O. urnaceum* Müll. Hal. in Kuntze are names currently associated with this variation (Lewinsky 1984a, 1984b; Crosby et al. 2000). Future taxonomic work on these taxa in relation to their geographical ranges is needed to clarify the distribution of *O. cupulatum* sensu lato.

Acknowledgments

I thank NY for the use of collections and Bruce Allen for confirming the determination of *O. cupulatum* and offering comments about the manuscript. In addition, I thank Patricia Eckel for bringing to my attention other reports on disjunct bryophytes from the Niagara River Gorge.

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Hygrohypnum subeugyrium, new to the Interior Highlands of North America

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Abstract. Hygrohypnum subeugyrium is reported new for Arkansas.

Hygrohypnum is a rare moss in the Interior Highlands of North America. The genus is presently known in the area from a single collection (*Redfearn 33533* DUKE, MICH, MO, SMS, US) made on shaded, vertical sandstone at Terrapin Bluff, Newton County, Arkansas. This collection was originally identified (He *et al.,* 1986) as *H. eugyrium* (Ren. & Card.) Broth., but the specimen actually represents *H. subeugyrium* (Schimp. ex B.S.G.) Broth. The two species have a similar field aspect and are sometimes confused. In fact, Tuomikoski *et al.* (1973) considered them provisionally synonymous. Jamieson (1976) on the other hand thought the two species were only remotely related, and Crum & Anderson (1981) regarded them as distinct species.

Jamieson (1976) reported *Hygrohypnum subeugyrium* in North America from Newfoundland, Nova Scotia, St. Pierre Miquelon, Quebec, Ontario, New Hampshire, New York, and Tennessee. Allen (1996) reported the species from Maine, where it is fairly common, and Pennsylvania. *Hygrohypnum subeugyrium* is often a somewhat smaller plant with more strongly falcate leaves than *H. eugyrium*. But these distinctions are difficult to apply in the absence of comparative material. The two species, however, have very different alar cells. In *H. subeugyrium* the alar cells are quadrate to short-rectangular and incrassate. Although the leaves often have a single row of enlarged cells across the leaf base these cells appear to be associated with the leaf insertions rather than the alar region. In contrast the alar region in *H. eugyrium* is composed of 6–12 enlarged, inflated, thin-walled and bulging cells. In both *H. subeugyrium* and *H. eugyrium* the outer alar cells are hyaline, but in the former species the inner cells are yellowish while in the latter species they are dark-orange to red-brown. Allen (1996) illustrated the differences between *H. subeugyrium and H. eugyrium.*

The alar cells in *Hygrohypnum eugyrium* are very similar to those of *Sematophyllum marylandicum* (C. Müll.) Britt., and the two species are also alike in size as well as aspect. When sporophytes are present *S. marylandicum* is distinguished from *H. eugyrium* by its rostrate opercula and collenchymatous exothecial cells. The gametophytes of *S. marylandicum* differ from those of *H. eugyrium* in having leaves with very weak costae, apices that are plain to slightly recurved rather than incurved, margins that are entire rather than weakly serrulate, and more bubble-like rather than loosely inflated alar cells. The two species are otherwise gametophytically very similar.

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Moss from Space

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Abstract. Ptychomitrium drummondii, P. serratum and *Trematodon longicollis* are newly reported from New York State. An easy way to find the latitude and longitude of sites and view habitats from satellite photos is with the program GoogleEarth, which is free and available on the internet.

In the winter of 2004 – 2005, I found *Ptychomitrium drummondii* (Wils.) Sull. (Ptychomitriaceae) at two urbanized sites in New York State. Small, dense tufts grew at the base of a roadside Norway maple (*Acer platanoides* L.), with *Platygyrium repens* (Brid.) BSG, *Ceratodon purpureus* Hedw. (Brid.), *Leskea polycarpa* (Hedw.), *Entodon* sp. and *Orthotrichum* spp., in North Merrick, Nassau County (Trigoboff c04184, BH & NYS). Large pure expanses, small tufts and scattered plants mixed with *C. purpureus* grew on a roadside American elm (*Ulmus americana* L.), 2 – 4 m high on the trunk and on a large horizontal branch, with *Bryum argenteum* (Hedw.), *Leskea* sp., *Orthotrichum obtusifolium* Brid. and *O.* sp., in Crown Heights, Brooklyn (Trigoboff c0517, BH). Capsules from this season and last were abundant at both sites. To the naked eye, *Ptychomitrium drummondii* looks like an *Orthotrichum* with a seta that is too long (2-2.5 mm) and a capsule that is too short (0.9-1 mm). With a hand lens, the leaves look narrower than those of *Orthotrichum* and curved, but not curled or crisped when dry (Crum and Anderson, 1981). *P. drummondii* is not listed in Ketchledge's (1980) checklist of New York State mosses, or in Grout's (1916) list of mosses in the New York City vicinity. It is known to range from Delaware to Florida, west to Texas, Oklahoma, Missouri and Illinois. It often grows on roadside tree trunks in urbanized areas (Crum and Anderson, 1981 and Reese, 1999).

In January 2006, I found a small tuft of *Ptychomitrium serratum* Bruch & Schimp. (Ptychomitriaceae) on sloping concrete, well above the water level, by a footbridge over a creek, in a half open area of a wooded preserve, surrounded by an extensive suburban area, in Massapequa, Nassau County (Trigoboff c05287, NY & NYS). The plants were not large, but stood out as looking unfamiliar. Also present were *Orthotrichum* sp., *Ceratodon purpureus*, *Barbula unguiculata* Hedw., *Bryum argenteum* and *Bryum* sp. *P. serratum* has never been reported from New York, or nearby states. According to Reese (1999), *P. serratum* grows on "calcareous rock and concrete in forests; 0--2200 m; La., S.C., Tex.; Mexico; West Indies (Dominican Republic)."

In June 2000, an extremely dense, heavily fruiting growth of *Trematodon longicollis* Michx. (Dicranaceae) covered at least 1 square meter of moist, bare waste ground in a 1-m-wide alley between two buildings of the Kenneth W. Post greenhouse complex on the Cornell University campus, in Ithaca, Tompkins County (Trigoboff c005, BH; c0029, NYS). Other mosses at the site included: *Bryum caespiticum* (Hedw.), *Ceratodon purpureus* (Hedw.) Brid., *Amblystegium varium* (Hedw.) Lindb., *Brachythecium* sp., and *Plagiomnium cuspidatum* (Hedw.) T. Kop. In May 2004, the plants were fewer, far less dense and scantily fruiting (Trigoboff c0410, BH). In April 2005, the plants had increased and were fruiting more heavily, but not to the extent seen originally (Trigoboff c0553, BH). The genus *Trematodon* has capsules with distinctive long, slender necks. The neck of *T. longicollis* is about twice as long as the urn. *T. ambiguous* (Hedw.) Hornsch., which also occurs in New York, has a neck about as long as the urn, as well as other differences (Crum and Anderson, 1981). *T. longicollis* is not listed in Ketchledge's (1980) checklist of New York State mosses. In eastern North America, its range extends at least from New Jersey and southern Ontario to Florida and Texas (Crum and Anderson, 1981). Grout (1916) listed it as occurring in the New York City vicinity because it was known from Closter, New Jersey, which is just northwest of New York City. The location of the plants by a greenhouse, as well as the many bryologists who have passed through Ithaca over the years without collecting it, make it safe to say that the plant is introduced.

Google Earth provides high-resolution aerial and satellite imagery with coordinates, elevation, street names and other information. You can download GoogleEarth at: http://earth.google.com/download-earth.html. If you type the coordinates: 40°40'48.42"N 73°27'41.97"W (exactly as given), it should take you to within 2 meters of the *Ptychomitrium serratum*. If you are prone to vertigo, strap yourself into your chair before you hit the return key. You can vary the altitude of the view to suit your purpose. At 300 feet, you can inspect the small bridge and the surrounding area. One thousand feet is a good altitude to "fly" over the land and look for similar bridges, or rock outcrops, creeks, bogs, woods, or the habitat of your choice in any part of the world. GoogleEarth also can help you find your way to the site if you are driving (or parachuting) there. The photo quality varies from place to place, but is sure to improve in the future. The *Trematodon longicollis* site in Ithaca is just a blur, but at 40°40'11.03"N 73°57'3.74"W you can see the tree where the *P. drummondii* occurs in Brooklyn. With luck and a little time spent noting land features and comparing them with GoogleEarth, you can determine the precise latitude and longitude of your plant collections. A similar program is available at: http://dev.live.com/virtualearth/sdk/

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Mosses and Liverworts Growing on the Mossy Cap Polypore (*Oxyporus populinus*)

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Abstract. Thirty-four moss-bearing conks of the basidiomycete *Oxyporus populinus* "mossy cap polypore" were collected at various locations, mainly in Pennsylvania. Conks were returned to the laboratory and mosses examined microscopically for identification. Ten species of moss in seven families and two species of liverworts in two families were identified.

Keywords. Amblystegium serpens, Amblystegium varium, Anacamptodon splachnoides, Brachythecium cf. *salebrosum, Frullania eboracensis, Hypnum pallescens, Leskea gracilescens, Leucobryum glaucum, Lophocolea heterophylla, Oxyporus populinus, Plagiomnium cuspidatum, Platygyrium repens, Pylaisia polyantha*

INTRODUCTION

The basidiomycete fungus *Oxyporus populinus* Fr. [syn. *Fomes connatus* (Weinm.) Gillet], commonly known as the "mossy cap polypore," infects red maple trees (*Acer rubrum* L.) throughout the eastern United States. This wood decaying fungus causes a spongy, white or straw-colored heartrot, known as "piperot," in the lower trunks of both young and old red maple trees, and occasionally in sugar maple trees (*Acer saccharum* Marsh.). The fruiting body of *O. populinus* is a white, perennial, conk often found at the site of a crack, wound, hollow, or canker on infected trunks. Both old and new references state only that "moss" commonly grows on the upper pilear surface of these conks (Baxter 1943, Sinclair & Lyon 2005), with no reference to species. Also, early anecdotal accounts relate that only one moss species colonizes *O. populinus* conks. Furthermore, a search of the literature revealed that species of mosses (or liverworts) associated with this polypore have not been reported. Therefore, the objective of this study was to identify the species of mosses and liverworts growing on conks of *O. populinus*.

Thirty-four moss-bearing conks of *O. populinus* were collected at various locations by the first author or students in his classes. All conks except one were collected within the state of Pennsylvania. The exact locations of students' collection sites are unknown but are mainly in central Pennsylvania since they were collected while the students were attending class. The polypore was identified by the first author and moss and liverwort species were identified by the second author. Voucher specimens of each moss and liverwort species are deposited in MO. All conks were collected from red maple trees, except one collected from sugar maple.

RESULTS AND DISCUSSION

Both liverworts (Marchantiophyta) and mosses (Bryophyta) were found on conks of *O. populinus* (Table 1). Two species of liverworts, representing two families, and ten species of mosses, representing seven families, were identified (Table 2). The two liverwort species are *Frullania eboracensis* and *Lophocolea heterophylla*. The ten moss species are *Amblystegium serpens, Amblystegium varium, Anacamptodon splachnoides, Brachythecium* cf.

salebrosum, Hypnum pallescens, Leskea gracilescens, Leucobryum glaucum, Plagiomnium cuspidatum, Platygyrium repens, and *Pylaisia polyantha*. With regard to frequency, the species listed in descending order with number of collections in parentheses are the mosses *Brachythecium* cf. *salebrosum* (9), *Plagiomnium cuspidatum* (8), *Platygyrium repens* (8), *Pylaisia polyantha* (7), *Amblystegium serpens* (6), *Amblystegium varium* (4), *Hypnum pallescens* (2), *Anacamptodon splachnoides* (1), *Leucobryum glaucum* (1), and *Leskea gracilescens* (1); and the liverworts *Frullania eboracensis* (1) and *Lophocolea heterophylla* (1). These frequency data are also illustrated in Figure 1. Most mosses and liverworts collected are common species except *Anacamptodon splachnoides,* which is less common.

Most *O. populinus* conks support only one or two species of mosses or liverworts, with a range of 1 – 3 (Figure 2, Table 2). A few conks that supported neither moss nor liverworts were observed, but not collected. Some of these were likely first-year conks, not old enough to support moss and liverwort colonies (Hepting 1971), whereas others were not colonized simply due to chance. No attempt was made to correlate conk age with the presence of moss and liverwort colonies. Moss and liverwort coverage on individual conks varied from very scarce (a few tufts) to abundant (colonies covering the entire upper pilear surface).

This is a rather large and varied assemblage of mosses and liverworts to occur on such a limited substrate (the pileus of *O. populinus* conks). However, the perennial conks are soft, wet, and spongy, and remain wet for long periods after rains, absorbing moisture from stemflow and possibly from moisture contained within cracks in the tree trunk. It is likely that moss and liverwort spores randomly alight on the pilear surface, where the moist surface is an ideal micro-site for spore germination, protonema establishment, and colonization. Other species of perennial basidiomycete conks observed in the collection areas were generally hard, dry and woody, and did not support colonies of mosses or liverworts.

CONCLUSION

Early anecdotal accounts relate that only one moss species colonizes *O. populinus* conks. To the contrary, we found ten species of mosses and two species of liverworts, representing nine different families, growing on the mossy cap polypore.

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Table 1. Bryological taxa found growing on conks of *O. populinus*.

Division Bryophyta
Amblystegiaceae
Amblystegium serpens (Hedw.) Schimp.
A. varium (Hedw.) Lindb.
Brachytheciaceae
Brachythecium cf. *salebrosum* (F. Weber & D. Mohr) Schimp.
Frabroniaceae
Anacamptodon splachnoides (Brid.) Brid.
Hypnaceae
Hypnum pallescens (Hedw.) P. Beauv.
Platygyrium repens (Brid.) Schimp.
Pylaisia polyantha (Hedw.) Schimp.
Leskeaceae
Leskea gracilescens Hedw.
Leucobryaceae
Leucobryum glaucum (Hedw.) Ångstr. ex Fr.
Plagiomniaceae
Plagiomnium cuspidatum (Hedw.) T.J. Kop.
Division Marchantiophyta
Frullaniaceae
Frullania eboracensis Gottsche
Lophocoleaceae
Lophocolea heterophylla (Schrad.) Dumort

Table 2. Collection sites for bryophytes collected on conks of *O. populinus*. Collections made in Pennsylvania except for conk number 26, which was collected in New Hampshire. Collections from red maple, except for conk number 34, which was from sugar maple.

Conk No.	Location	Species
1	Cambria Co.	*Amblystegium serpens* *Anacamptodon splachnoides*
2	Cambria Co.	*Amblystegium serpens* *Plagiomnium cuspidatum*
3	Cambria Co.	*Amblystegium varium* *Brachythecium* cf. *salebrosum* *Plagiomnium cuspidatum*
4	Unknown*	*Amblystegium varium* *Frullania eboracensis* *Plagiomnium cuspidatum*
5	Unknown*	*Brachythecium* cf. *salebrosum* *Plagiomnium cuspidatum*
6	Unknown*	*Plagiomnium cuspidatum* *Platygyrium repens*
7	Unknown*	*Platygyrium repens*
8	Cambria Co.	*Pylaisia polyantha*
9	Cambria Co.	*Amblystegium serpens* *Plagiomnium cuspidatum*
10	Tioga Co.	*Platygyrium repens*
11	Fayette Co.	*Lophocolea heterophylla* *Pylaisia polyantha*
12	Centre Co.	*Pylaisia polyantha*
13	Somerset Co.	*Amblystegium serpens*
14	Cambria Co.	*Amblystegium serpens*
15	Huntingdon Co.	*Amblystegium varium*
16	Cambria Co.	*Leucobryum glaucum* *Pylaisia polyantha*
17	Potter Co.	*Pylaisia polyantha*
18	Somerset Co	*Hypnum pallescens*
19	Cambria Co.	*Brachythecium* cf. *salebrosum*
20	Huntingdon Co.	*Platygyrium repens*
21	Unknown*	*Pylaisia polyantha*
22	Centre Co.	*Amblystegium serpens*
23	Warren Co.	*Brachythecium* cf. *salebrosum*
24	Warren Co.	*Platygyrium repens*
25	Tioga Co.	*Amblystegium varium* *Platygyrium repens*
26	Plymouth, NH	*Hypnum pallescens*
27	Unknown*	*Brachythecium* cf. *salebrosum*
28	Cambria Co.	*Brachythecium* cf. *salebrosum* *Plagiomnium cuspidatum*
29	Franklin Co.	*Pylaisia polyantha*
30	Unknown*	*Platygyrium repens*
31	Unknown*	*Brachythecium* cf. *salebrosum* *Leskea gracilescens*
32	Cambria Co.	*Brachythecium* cf. *salebrosum*
33	Wayne Co.	*Platygyrium repens*
34	Potter Co.	*Brachythecium* cf. *salebrosum* *Plagiomnium cuspidatum*

*Exact location of student collections unknown

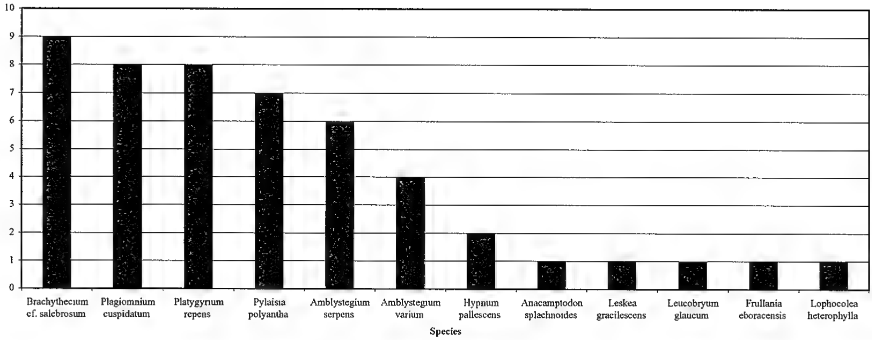

Figure 1. Frequency of moss and liverwort species collected on 34 *O. populinus* conks.

Figure 2. *Amblystegium serpens* and *Plagiomnium cuspidatum* growing on the upper pilear surface of *Oxyporus populinus* (conk number 2 in Table 2).

New Records of *Leptogium rivale* and *Peltigera hydrothyria* in the Pacific Northwest, USA

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Abstract. Using a random sampling scheme, we surveyed mountain streams of western Washington, western Oregon, and northern California for *Leptogium rivale* and *Peltigera hydrothyria*. We report 36 new records for *L. rivale* and 10 new records of *P. hydrothyria*.

Leptogium rivale Tuck and *Peltigera hydrothyria* Miadlikowski & Lutzoni are foliose cyanolichens of mountain streams. Thalli of *Leptogium rivale* are small (0.5 – 2.0 cm), narrow lobed (~ 1.0 mm), brown to black in color, and form smooth, appressed colonies on submerged and periodically inundated rocks. *Peltigera hydrothyria* (synonym *Hydrothyria venosa* J. Russell) thalli are gray to black, and have medium sized (1.0 cm wide), distinctly veined lobes, and grow under water in loose, ruffle-like clumps. Both species have been reported from mountain ranges in North America, where *P. hydrothyria* appears to be endemic (Lesher et al. 2003).

Peltigera hydrothyria is distributed in the northwestern and northeastern portions of the North American continent. In the northwest, it is known from the Sierra Nevada Mountains in California, the Cascade Mountains in Oregon and Washington, the northern Rocky Mountains (northern Idaho and Montana into British Columbia, Canada), and in southeastern Alaska (Brodo et al. 2001; Geiser et al. 1998; McCune & Geiser 1997; McCune & Goward 1995; Lesher et al. 2003). In the northeast, it is known from the Appalachian Mountains (Connecticut, Georgia, New Hampshire, Pennsylvania, Vermont, Virginia, and Tennessee), and the Catskill Mountains (New York) (ASU herbarium 2006; Brodo et al. 2001; Dennis et al. 1981).

Leptogium rivale was thought to be endemic to North America until its recent discovery in Poland, the Czech Republic (Guttová 2000), and Portugal (van den Boom 2002). In North America, it appears to only occur in the western US. It is known from California, Colorado, Montana, Oregon, Washington, Wyoming, and southeastern Alaska (Geiser et al. 1998; Lesher et al. 2003; McCune & Geiser 1997; McCune & Goward 1995), and it was recently discovered in New Mexico (Carlberg 2005).

In the North American Pacific Northwest, these lichens have been considered rare, late-seral forest associates (Lesher et al. 2003). *Leptogium rivale* is not currently listed but populations are tracked by the Bureau of Land Management in Oregon (USDI 2005), and *P. hydrothyria* was listed with the Survey & Manage program of the Northwest Forest Plan (USDA & USDI 2000). In the summers of 2002 and 2003, we surveyed 220 randomly selected stream sites for aquatic lichens across the Northwest Forest Plan area (western Washington, western Oregon, and northwestern California) (Fig.1). Sampled sites were from the Northwest Forest Plan Aquatic and Riparian Effectiveness Program's study design, where randomly selected sites were also assessed for accessability of stream reaches within USGS 6th field sub-watersheds (USDA & USDI 2002a). Major drainage basins in the US are divided up into hydrologic units that are successively divided five additional times into smaller and smaller units. The largest unit, a 1st field region, encompasses a drainage system for a US major river and averages 285,694 square km in size, and the smallest unit, a 6th field sub-watershed, encompasses a large creek or relatively smaller river system and ranges from 26 to 109 square km in size (Legleiter 2001).

Figure 1.

In this paper, we report new records of *L. rivale* and *P. hydrothyria* from our study. We will report frequency, ecological information, and provide distribution maps in a second paper. The location records from this study may aid conservation and management efforts in the Pacific Northwest. We also include one location provided to us after our fieldwork was completed. Historical locality information for these lichens in the NWFP area can be found in Lesher et al. (2003) and the USDA Natural Resource Information System (NRIS) (USDA 2005).

Taxonomy of *L. rivale* and *P. hydrothyria* follow Esslinger (2006). Vouchers are deposited in OSC unless otherwise noted. National Forest is abbreviated (NF) and Bureau of Land Management is abbreviated (BLM). Watershed names refer to U.S. Geological Survey 6th field sub-watersheds (Legleiter 2001; USDA & USDI 2002b).

Leptogium rivale **Tuck**. CALIFORNIA. Del Norte Co., Six Rivers NF, South Fork Smith River near Island Lake trail, 41.78080° N 123.72550° W, *Carlberg 00790b* (Carlberg personal herb.). Humboldt Co., Six Rivers NF, Mill Creek watershed, South Fork Mill Creek, 41.13014° N 123.50536° W, *Brown 030626-1*. Mendocino Co., Mendocino NF, Beaver Creek watershed, Smokehouse Creek, 39.97783° N 122.95817°W, *Gillock 020712*. Siskiyou Co., Klamath NF, South Fork Salmon River watershed, Black Gulch Creek, 41.09208° N 123.11472° W, *Miles 020706*. OREGON. Clackamas Co., BLM, Salem District, Mollala River watershed, Shotgun Creek, 45.01267° N 122.48852° W, *Miles 020721*; Horse Creek, 44.95411° N 122.42394° W, *Miles 020722-1*; Bear Creek, 44.98791° N 122.6553° W, *Miles 020722-2*; . Josephine Co., Rogue River NF, Carberry Creek, Steve Fork, 42.04567° N 123.28700° W, *Miles 020624*. Coos Co., Siskiyou NF, South Fork Coquille River watershed, Drowned Out Creek, 42.71559° N 123.01689° W, *Annegers 020718*; Panther Creek, 42.74694° N 123.98467° W, *Annegers 020719-1*; South Fork Coquille River, 42.79528° N 123.93998° W, *Annegers 020702-1*. Douglas Co., BLM, Roseburg District, Upper West Fork Cow Creek watershed, Upper West Fork Cow Creek, 42.79875° N 123.81697° W, *Annegers 020720-1*; Wilson Creek, 42.80856° N 123.83597° W, *Annegers 020720-2*; Brush Creek watershed, Brush Creek, 43.54467° N 123. 43842° W, *Kahan 020806-1*; Umpqua NF, Camas Creek, 43.23270° 122.45003°, *Glavich 617*. Jefferson Co., Deschutes NF, Six Creek watershed, Six Creek, 44.53997° N 121.55986° W, *Kahan 020702*. Klamath Co., Deschutes NF, Summit Creek watershed, Whitefish Creek, 43.47823° N 122.04122° W, *Annegers 020722*. Deschutes Co., Deschutes NF, Snow Creek watershed, Deschutes River, 43.88578° N 121.76342° W, *Annegers 020804*. Lane Co., Willamette NF, Blue River, 44.23239° N 121.76342° W, *Carlson 030620-1*; Cook Creek, 44.27678° N 122.19481° W, *Glavich 625*; H.J. Andrews Experimental Forest, McCrae Creek, 44.23450° N 122.20656° W, *Brown 030620-2*; Lookout Creek tributary, 44.23122° N 122.17369° W, *Gillock 020719-2*. Linn Co., Willamette NF, Sixes Creek watershed, Swamp Creek, 44.54900° N 122.17989° W, *Miles 020805-1*; Fitt Creek, 44.53750° N 122.21950° W, *Miles 020806-2*; Quartzville Creek watershed, Freezeout Creek, 44.58431° N 122.19639° W, *Annegers 020815-2*; Bruler Creek, 44.57586° N 122.18422° W, *Annegers 020815-3*, Butte Creek, 44.58658° N 122.20803° W, *Annegers 020816-1*, Quartzville Creek, 44.58425° N 122.18056° W, *Annegers 020816-2*. Wasco Co., Mt. Hood NF, Mill Creek watershed, North Fork Mill Creek, 45.49228° N 121.48133° W, *Kahan 020626*, Barlow Creek, 45.24222° N 121.64839° W, *Nadel 030710*. WASHINGTON. Kittitas Co., Wenatchee NF, Swauk Creek, 47.27767° N 120.69700° W, *Annegers 020829*; South Fork Taneum Creek, 47.10742° N 120.94583° W, *Nadel 020925*. Pierce Co., Mt. Baker-Snoqualmie NF, White River watershed, Ranger Creek, 47.02322° N 121.53331° W, *Annegers 020901*. Skagit Co., Mt. Baker-Snoqualmie NF, Arrow Creek, 48.41772° N 121.39111° W, *Carlson 030910*; Illabot Creek, 48.40708° N 121.35238° W, *Carlson 030911*. Skamania Co., Gifford-Pinchot NF, Big Lava Creek, 45.78853° N 121.65683° W, *Annegers 020818*.

Peltigera hydrothyria **Miadlikowska & Lutzoni**. OREGON. Clackamas Co., Mt. Hood NF, Still Creek, 45.29331° N 121.87172° W, *Miles 020815-4*. Douglas Co. Umpqua NF, Camas Creek, 43.23269° N 122.45003° W, *Glavich 626* Klamath Co., Deschutes NF, Summit Creek watershed, Whitefish Creek, 43.47828° N 122.04122° W, *Annegers 020722-4*. Lane Co., Willamette NF, H.J. Andrews Experimental Forest, Lookout Creek tributary, 44.23122° N 122.17369° W, *Gillock 020719-3*. Linn Co., Willamette NF, Sixes Creek watershed, Swamp Creek, 44.54900° N 122.17989° W, *Miles 020805-2,* Fitt Creek, 44.53750° N 122.19639° W, *Miles 020806-2*; Quartzville Creek watershed, Freezeout Creek, 44.58431° N 122.19639° W, *Annegers 020815-5,* Bruler Creek, 44.57586° N 122.18422° W, *Annegers 020815-6*, Butte Creek, 44.58658° N 122.20803° W, *Annegers 020816-3*, Upper Quartzville Creek, 44.57789° N 122.25483° W, *Annegers 020816-4*.

Discussion

We found only a few new watershed locations for *P. hydrothyria*–Quartz, Sixes, Still, and Summit Creeks, all in Oregon, therefore we still consider this lichen to be rare in the study area. For *L. rivale*, however, we report numerous new locations from new watersheds across all three states in our study area. It is likely that *L. rivale* has been underreported because it is inconspicuous. When submerged, it is easily mistaken for *Verrucaria* ssp., a genus of black crustose lichens, occurring locally in nearly all mountain streams, and when growing on exposed streambeds, the dry, appressed grayish-brown thalli are camouflaged by their rock substrates. The geographic span of *L. rivale* sites new to seven National Forests and BLM districts (Mendocino [CA], Six Rivers (CA), Klamath (CA), Siskiyou (OR), Deschutes (OR), Wenatchee (WA), and Mount Baker-Snoqualmie [WA]) and Oregon BLM Districts (Roseburg and Salem) indicate that this lichen is more widespread than previously thought.

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Oxymitra incrassata (Brot.) Sergio & Sim-Sim (Oxymitraceae) New to Missouri

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Abstract. This paper reports an eastern range extension of the thallose liverwort *Oxymitra incrassata* and is the first report of the species from the state of Missouri.

Oxymitra incrassata (Brot.) Sergio & Sim-Sim is a thallose liverwort that grows on sandstone and igneous substrates. Prior to this report, it was known to occur in Kansas, Oklahoma, Texas as well as in Mexico, South America , Europe and North Africa (Schuster 1992). While searching for the federally-threatened plant, *Geocarpon minimum* Mack., on sandstone glades near Truman Reservoir in Henry County, Missouri, the first author noticed a distinctive thallose liverwort. Its grayish-white ventral scales were overarching the dorsal surface of the green thallus forming a somewhat "caged" appearance to the thallus. According to Schuster (1992) this distinctive characteristic is a result of dessication of the plant and would therefore be absent with abundant moisture. A specimen was collected from the sandy soil and sent to KSP and MO where the plant was identified as *Oxymitra incrassata*.

Oxymitra incrassata (Brot.) Sergio & Sim-Sim. Missouri. Henry Co. 03 April 2006. Smith 4205 (KSP, MO) ca 1.0 mi ESE of Brownington (T40N R25W S21 NW4 SW4) U.S. Army Corps of Engineers-managed land on south side of Truman Reservoir. Sandstone glade on northwest side of Otter Creek Arm of reservoir. Thin, sandy soil over sandstone bedrock. Local. Whitish ventral scales wrapping around upper surface of grooved thallus.

Only a small patch of *O. incrassata* was observed, although several acres of sandstone glade were surveyed. *Hedwigia ciliata* (Hedwig) P. Beauv. was also collected at the site but a complete listing of associated species was not compiled.

This first-known Missouri location is in the Cherokee Plains Subsection of the Osage Plains Section but is only about 7.0 km west of the Ozark Highlands Section boundary (Nigh & Schroeder 2002). The sandstone glade community at the site is similar to numerous glades within the Springfield Plain Subsection of the Ozark Highland Section, so this taxon may eventually be found within the Ozark Highlands. The collection site is about 170 km east-northeast of the nearest previously known location in Woodson County, Kansas.

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Ptychomitrium serratum (Musci: Ptychomitriaceae) New to Missouri and the Interior Highlands of North America

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Abstract. *Ptychomitrium serratum* is reported new to Missouri and the Interior Highlands of North America, representing a significant range extension for the species.

Key Words. *Ptychomitrium serratum,* Missouri, Interior Highlands of North America

Franklin County is one of the larger counties in Missouri. It is located west of St. Louis in the east-central part of the state on the Salem Plateau of the Interior Highlands of North America. The county is shaped roughly like a square about 30 miles on a side. It includes 930 square miles, is bordered on the north by the Missouri River, and the Meramec River cuts through the southeastern part of the county. The county has a rolling topography and consists mainly of farmland interspersed with sections of upland oak-hickory forest.

Meramec State Park is located on the southern border of Franklin County, approximately 70 miles southwest of St. Louis. Parts of Crawford and Washington counties also are within the the park boundaries, giving Meramec State Park the distinction of being the only Missouri state park at a point where three counties join. The park was established in 1927 and has slightly less than 7,000 acres. In 1933 numerous structures, some still existing, were built in the park by the Civilian Conservation Corps. The Meramec River flows through the park, providing canoeing, swimming and fishing for visitors. The park had the dubious honor of being selected as the site of the infamous Meramec Dam. This project, luckily for river lovers, was eventually cancelled. The park has a rugged landscape, ranging from 550 feet to 950 feet elevation and is mainly upland oak-hickory forest, There are also numerous springs and more than 40 caves in the park. It has good facilities, including campgrounds, trails, a modern visitor center, motel, conference center, boat ramp, canoe float trips, park store, dining lodge, cabins and guided tours through Fisher Cave. On summer weekends, the park is often crowded with visitors.

On 27 January 2006, while conducting a bryophyte survey of the park for the Department of Natural Resources, the junior author noticed an abandoned, concrete, building foundation while climbing a hill near the park entrance. The site was in a shrubby opening of an upland oak-hickory forest, located on a south-facing slope at 635 feet elevation. Several collections were taken from the concrete foundation, one of which turned out to be *Ptychomitrium serratum* (Müll. Hal.) Bruch & Schimp. *in* Besch., a moss new to Missouri as well as the Interior Highlands of North America.

Ptychomitrium serratum (Müll. Hal.) Bruch & Schimp. *in* Besch. Missouri. Franklin County. Meramec State Park, *Holmberg 1433* (MO).

Plants dark-green, brownish or blackish, in small tufts, 10–20 mm tall; leaves crisped with incurved margins when dry, spreading when wet, 3.5–5.0 x 1.0 mm, lanceolate, tapering to an acute apex, coarsely toothed in upper 1/3, not to weakly decurrent, margins plane, often 2–3 stratose, weakly revolute below; upper cells 8–12 μm long, smooth, round to quadrate, thick-walled, basal cells linear, smooth; costae percurrent, in cross section with guide cells and two stereid bands; sporophytes not present.

The plants from this collection compared very well with descriptions given in Allen (2005), Crum & Anderson (1981), Reese (1984) and Crum (1994). Only one small clump of the *Ptychomitrium* was collected, along with *Bryum argenteum* Hedw. and *Tortella humilis* (Hedw.) Jenn. Several searchers returned to the site at a later date to assess the quantity of *Ptychomitrium* present, but none was found.

Ptychomitrium serrratum has been reported in the United States from Texas and Louisiana (Crum & Anderson 1981; Reese 1984). Reese (1998) adds South Carolina to its distribution. The presence of *Ptychomitrium serratum* in Missouri represents a significant range extension for this species.

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Announcement Board:

- At the direction of the ABLS Executive Committee we are implementing a two stage upgrade to Evansia. With volume 23 we have upgraded paper quality and switched to a two column format. We have also instituted an author-solicited peer-review system.

- Effective with issue 22 (1) the senior author of each manuscript published in Evansia receives an electronic copy of their paper as a pdf file.

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- Index of Bryophytes, 2005, is now available as a pdf file from the authors, marshall.crosby@mobot.org and bob.magill@mobot.org and from the web site http://www.mobot.org/MOBOT/tropicos/most/bryolist.shtml. The Index attempts to include all names for bryophytes published during the calendar year 2005, and it lists some names overlooked in earlier Indexes and some corrections to earlier Indexes. Names at all ranks are included. Basionyms and replaced names are also included for new combinations and new names, respectively. Each newly published name is referenced to a bibliography that provides the complete citation for the book or article in which the name appeared. The intent of this first of a series of annual Indexes it to provide a compact (the Index, 2005, is 12 pages long) means for workers to have an up-to-date look at what has been going on in bryophyte nomenclature. We plan cumulative Indexes beginning with 2001. The Index for 2001–2005 will be available soon.

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