Studies in lichens and lichenicolous fungi – no 15: miscellaneous notes on species from eastern North America

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ABSTRACT. – Acarospora americana is revised and separated from A. veronensis. Acarospora superfusa and A. cinerealba are placed in synonymy with A. americana. A lectotype is selected for A. cinerealba. A key to the Acarospora species from North America with gyrophoric/lecanoric acid is presented. Acarospora gallica, A. rugulosa, A. sparsa, A. tongleti, and A. variegata are excluded from the North American lichen biota. Range extensions are reported for A. janae, A. nicolai, and Sarcogyne reebiae. The name Arthonia subcyrtodes is placed in synonymy with A. interviennis. The combination Bactrospora carolinensis (for Patellaria carolinensis) is proposed and B. mesospora is placed in synonymy. The following taxa are described as new to science: Acarospora piedmontensis (from the Piedmont of southeastern North America), A. sphaerosperma (from the Ozarks and Ohio), Lecanora zeroensis (from the Coastal Plain of Georgia), and Melanophloea americana (from the Mid-Atlantic Region). Polysporina cyclocarpa is newly reported from continental North America. Xanthomendoza weberi is revised to include X. rosamariae and Xanthoria wetmorei as synonyms.

KEYWORDS. – Calciphiles, keys, new species, taxonomy.

INTRODUCTION

It is widely recognized that fieldwork and revision of herbarium specimens yields new discoveries, interesting finds, and occasionally clarifies or solves long standing taxonomic/homennclatural or floristic problems. Often, this research is peripheral to other projects and although such information should be disseminated in print it does not always fit well in the context of other project-specific publications. As such we began this series in 2004 with the intent of establishing a vehicle to communicate short relevant notes on lichens and lichenicolous fungi. For various reasons the title of this series has evolved since 2004, and although most numbers were published in Mycotaxon some were published elsewhere. In an effort to standardize numbering of this series and facilitate its citation by researchers we provide an index below following the materials and methods section. The present contribution continues this series with a compilation of notes on taxa from eastern North America, many of which pertain to research conducted by the first author in collaboration with the other authors during a month long visit to The New York Botanical Garden (NYBG) in March, 2011.

MATERIALS AND METHODS

Specimens were studied in dry condition using a Bausch & Lomb StereoZoom 7 dissecting microscope and subjected to chemical analysis using standard spot tests (reagents are abbreviated following Brodo et al. (2001)) and Thin Layer Chromatography (TLC). TLC was carried out at NY using solvents A and C, following Culberson & Kristinsson (1970). Images were captured using an Olympus DP20 digital camera with Microsuite Special Edition. The illustrations were prepared using Adobe Photoshop. All measurements are based on water mounts of hand cut sections unless otherwise indicated.

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PART I – INDEX TO THE SERIES “STUDIES IN LICHENS AND LICHENICOLOUS FUNGI”


PART II - NOTES


Acarospora cervina v. cinereoalba (Fink) Fink comb. inval., Mycologia, 1: 88. 1909


FIGURES 1-3 (PAGES 48-50).

DESCRIPTION. – Hypothallus endosubstratic. Thallus of dispersed or contiguous areoles to subsquamules, these often lobulate, up to 3 mm in diameter, to 0.6 mm high, but often shorter, rarely forming squamules; occasionally forming verrucae (then sometimes looking similar to A. elevata H. Magn. especially if surface is shiny). Attachment broad, the mycelial base sometimes elongating, rarely forming a stout, stipe-like structure. Upper surface pale to dark brown, sometimes black, epruinose, matt or rarely
shiny, usually smooth, or often densely pruinose especially in arid habitats of western North America, sometimes with a blackish margin. Lower surface white to dark brown, ecoricate, becoming black through interaction with substrate. Cortex paraplectenchymatous, mostly 20-40 μm thick, with thin upper layer reddish brown, lower layer hyaline, rarely with an epinecral layer of dead and gelatinized hyphae, <10 μm thick. Cortical cells distinct, round, 3-6 μm in diam. Algal layer continuous, not interrupted by hyphal bundles, relatively even, mostly 100-140 μm thick, thinner to lacking beneath apothecium, algal cells mostly 10-15 μm in diam. Medulla hyaline, mostly of thin-walled hyphae, 2-4 μm, with some hyphae to 6 μm, often swollen at septa, branching, continuous with attaching hyphae, often inspersed with crystals to 15 μm in diam., most dissolving in K. Apothecia 1-6 per areole, often with a single apothecium. Disc immersed, dull brown to black, usually epruinose, red-brown when wetted, usually round, smooth, up to 1 mm in diam., but sometimes punctiform and <0.3 mm, especially in eastern North American specimens the disc surrounded by a distinctive elevated parathecial crown rising above the surface of the disc but visible in infrequent immature areoles in many specimens. Paratheciurn narrow to expanded to 80 μm wide in crown. Hymenium hyaline, spreading in water, mostly (80-)100-120(-150) μm tall, ephymenium c. 10 μm tall, coherent in water, pigmentation light brown, paraphyses mostly 2 μm in diam., apices usually slightly expanded to 3 μm, often with brown pigment caps, I+ blue, usually slowly turning red. Asci various, cylindrical to clavate, 60-110 x 12-25 μm. Ascospores simple, hyaline, narrow to broadly ellipsoid, most 10-25(-30) μm deep, hyaline, variable. Pycnidia not observed.

CHEMISTRY. – No substances detected. Spot tests: K-, C-, KC-, P-, UV-.

ECOLOGY AND SUBSTRATE. – Acarospora americana is common on granitic rock, volcanic rock and sandstone, rarely occurring on calcareous rock, cinnabar, mine tailings, soil or wood, in a wide range of habitats.

DISTRIBUTION. – The species is widespread in North America.

DISCUSSION. – It is with great pleasure that we are able to resurrect the absolutely appropriate name Acarospora americana for one of the most common species in North America outside of the Greater Sonoran Desert Region. In the Sonoran Flora, a broad concept of A. veronensis A. Massal. was used when the first author was unable to resolve the delimitation of A. americana, A. cinereoalba, and A. superfusa from A. veronensis s. str. within that study area (Knudsen 2007). In 2011, examination of the extensive holdings at NY from eastern and midwestern North America provided a panoramic view of the variation in this common species and the opportunity to solve this perplexing problem, bringing to conclusion the process that began with the separation of A. superfusa from A. veronensis (Lendemer & Knudsen 2011).

Acarospora americana was originally described by Magnusson (1929) from epruinose brown areoles in the type collection of A. cinereoalba collected by Bruce Fink in Kane County, Illinois in 1895. Fink himself determined these epruinose brown areoles incorrectly, but consistently, as L. cervina Ach. Admixed with these areoles on the same specimen there were also pruinose areoles which Fink correctly recognized as a pruinose variation of L. cervina. He published the name L. cervina v. cinereoalba for such pruinose areoles; however the protologue does not contain a differential diagnosis and thus the name is a nomen nudum. Subsequently, Magnusson (1929) validated the name A. cinereoalba, describing the pruinose individuals as A. cinereoalba while describing the epruinose individuals as A. americana. There are no differences in macro- or micromorphology between A. americana and A. cinereoalba except the presence/absence of pruina, which is a variable character even in the type material (fig. 1B, D & F). Magnusson (1929) even had misgiving about A. cinereoalba stating “more on account of its appearance rather than its anatomy I have got the opinion that it is a separate species.”

We recently removed Acarospora superfusa from synonymy with A. veronensis based on its areoles that are larger when fully developed and can become squamulose (Lendemer & Knudsen 2011). Acarospora superfusa is recognized here as another name for the pruinose form of A. americana (figs. 1-3). Magnusson (1929) considered A. superfusa to have a wider disc and larger more heavily pruinose areoles than his concept of A. cinereoalba. As was the case for A. cinereoalba, Magnusson’s species concept was based on gestalt rather than his usual taxonomic measurements (Magnusson 1930; Lendemer & Knudsen 2011).
Figure 1, *Acarospora americana*, areoles marked “A” were described or would be determined by Magnusson as *A. americana* while those marked “C” were described or would be determined by Magnusson as *A. cinereoalba*. A, C & E, variation of pruinose and epruinose areoles in a single population (*Harris 12143*; scales = 0.5 mm). B, D & F, isotype of *A. americana* and lectotype of *A. cinereoalba* (*B. Fink s.n.; scales = 0.5 mm*).
Figure 2, *Acarospora americana*. A & B, typical pruinose specimens Magnusson would determine as *A. superfusa* (Harris 12143; scales = 0.5 mm). C & D, *A. americana* growing on wood (Advaita 6122; scales = 0.5 mm). E & F, typical epruinose population with elevated parathecial crowns and lobulate areoles (Buck 36470 & Harris 12143 respectively; scales = 0.5 mm)
Figure 3, *Acarospora americana*. A-E, typical large pruinose population of *A. americana* Magnusson would have identified as *Acarospora superfusa* (Morse 15048). F, typical epruinose population with elevated parathecial crowns (Buck 36470). Scales = A & F: 1.0 mm; B-E: 0.5 mm.
We compared Magnusson’s description of *Acarospora veronensis* (Magnusson 1929), European specimens of that taxon, and the revised description of *A. americana*. On the macromorphological level, *A. veronensis* differs from *A. americana* in having areoles that are generally smaller (usually 0.3-0.5(-1.0) vs. usually 0.5-2.5 mm), lacking subsquamulose lobulation, parathecial crowns, and pruina. On the micromorphological level, *A. veronensis* differs from *A. americana* in having a thin (to 15 μm) or indistinct parathecial (thus not forming an expanded parathecial crown), a generally lower hymenium ((65-80 vs. (90-))100-120(-150) μm), and a shorter subhymenium (usually 15-20 vs. 30-40 μm). There are no substantial differences in ascus and ascospore size between the two species. Both species predominately have one apothecium per areole (fig. 1E). Reduced specimens of *A. americana* often are macroscopically indistinguishable from *A. veronensis* in America. The easiest way to separate *A. veronensis* from such reduced forms of *A. americana* is by its hymenium which is approximately 80 μm high. The two species are sympatric in southern California and the Ozarks (regions not glaciated during the last ice age), with *A. americana* being the common species and *A. veronensis* the infrequent species. In Europe, *A. veronensis* is common. It is not known if *A. americana* occurs in Europe.

Specimens and populations of *Acarospora americana* can differ in their gestalt through environmental interactions. The species can be considered polymorphic as is expected in a successful species with a wide distribution including many different habitats and a variety of substrates, including wood and mercury mine tailings. It is also likely a nitrophile and can probably be found in enriched microhabitats. One must become familiar with the prevalent phenotype in one’s study area. This can only be done with careful micromorphological study, but fortunately these characters are relatively invariable. The majority of specimens had a hymenial height of 100 μm, though occasionally they are as tall as 150 μm. One common form of *Acarospora americana* has elevated parathecial crowns with a single apothecium per areole (fig. 1E). It is infrequent throughout most of its range, but common in Quebec and Ontario in Canada and the Piedmont of South Carolina. The occurrence of this form is noted in specimens cited.

The majority of the specimens of *Acarospora americana* we examined were epruinose. Epruinose populations are rather plain and easily overlooked when reduced. When densely pruinose, the species can be confused with some specimens of *A. nicolai* (Knudsen & Morse 2009). That species is distinguished especially by the presence of gyrophoric/lecanoric acids (note these are sometimes only detectable by TLC). It has overlapping measurements with *A. americana* and is sympatric at least in the Great Plains and the Ozarks.

The variability of *Acarospora americana* caused Magnusson to describe the species again as *A. applanata* H. Magn. This name will be treated in a future publication because a lectotype needs to be selected, but it is definitely a synonym, based on several types examined from New Mexico at FH and UPS. Magnusson misidentified Californian material of *A. americana* collected by A.C.T.W Herre (FH!) as *A. obscura* H. Magn., a species we only recognize as occurring in Africa if it is a distinct species at all (Magnusson 1929, Knudsen 2007). It should be noted that *A. tenebrica* H. Magn. described from Texas is still considered a synonym of *A. veronensis* (Magnusson 1929, Knudsen 2007).

**Selected specimens of *Acarospora americana* examined.** – CANADA. ONTARIO. BRUCE CO.: Bruce Peninsula National Park, 190 m, 21.ix.2008, W.R. Buck 54247 (NY). CARLETON CO.: Ottawa, along Rideau River, Hog’s Back, 8.x.1976, on granite, R.C. Harris 12143 (NY, elevated parathecial crowns abundant). SASKATCHEWAN. Grasslands National Park, 899 m, 19.vi.2009, on acid rock, C. Freebury 859 (CANB). QUEBEC. Comité de Charlevoix-Est, Centre Ecologique de Port-au-Saumon, along St. Lawrence River, 9.xii.1997, on granitic shoreline rocks, W.R. Buck 32405 (NY, elevated parathecial crowns common). U.S.A. CALIFORNIA. [COUNTY UNKNOWN]: sine date. H.N. Bolander 136 (NY); LOS ANGELES CO.: Santa Monica Mountains, 1905, H.E. Hasse s.n. (NY); Latigo Canyon, 571 m, 15.x.1994, K. Knudsen 1538 (UCR); Claremont, Bernard Biological Field Station, 420 m, 17.i.2005, on granite boulder, K. Knudsen et al. 2183.2 (UCR). ORANGE CO.: Santa Ana Mountains, upper Fremont Canyon, 596 m, 16.vii.2005, on sandstone, K. Knudsen et al. 3417 (UCR); Santa Rosa Plateau, 573 m, 13.vi.2006, on scattered volcanic rocks on clay, Knudsen 6400 (UCR). RIVERSIDE CO.: Joshua Tree National Park, Lost Horse Mountain, 1539 m, 9.xii.2010, on gneiss, K. Knudsen 12915.3 (UCR); Palm Springs, sine date, H.E. Hasse s.n. (NY): 1900. H.E. Hasse (NY). SAN BENITO CO.: Clear Creek Management Area (BLM), cinnabar outcrop above Clear Creek Road, 1000 m, 21.iv.2011, common on cinnabar, Knudsen et al. 13589 (NY, UCR, most thallus surfaces black in overall populations); New Idria, 777 m, 22.iv.2011, common on mercury mine tailings and sandstone in full sun near historic mill, K. Knudsen et al. 13608 (UCR). SAN BERNARDINO CO.: Joshua Tree National Park, Eureka Peak, 1591 m, 22.i.2006, K. Knudsen 5252.2 (UCR); Clark Mountains, Mojave National Preserve, edge of wash south of Pachalka Springs, 1548 m, 11.x.2009, on HCl- boulder, K. Knudsen 11769 w/ N. Pietrasiak (UCR). SAN DIEGO CO.: Santa Margarita Mountains, near Margarita Peak, Camp Pendleton, 778 m,


**FIGURE 4A, C & E (PAGE 53).**
**Figure 4, Acarospora janae and A. obpallens.** A, C & E, typical areoles and apothecia of *A. janae* (Buck 35075; scales = 0.5 mm). B & D, sterile immature areoles of *A. obpallens* showing pitting, an ontogenic character of the species (Knudsen 635; scales = 0.5 mm). F, mature thallus of *A. obpallens* photographed by Rolf Muertter in the Santa Ana Mountains of southern California, U.S.A. (scale = 3 mm).
may be caused by substrate interaction. It is possible that the color of the lower surface is a variable character and this may be true in several other species in the family. A key to the North American species of *Acarospora* that produce gyrophoric/lecanoric acids, including *A. janae*, is provided below in the appendix.

*Acarospora obpallens* (Nyl. ex Hasse) Zahlbr. is a saxicolous species which also grows on sandy soil especially along the California coast. It is easily distinguished from *A. janae* by its areoles which have pitted surfaces. These are interpreted as the initials of apotecia. This ontogenic character is illustrated here (fig. 4B, D & F). Once one initial becomes fertile the rest usually do not become fertile but persist. Under environmental stress, no apothecia form and the thalline wall between the pits may erode hollowing the areoles as in the specimen reported in McCune and Rosentreter (2007: 82-83). Mature specimens can become quite rugulose (see image of *A. obpallens* in Knudsen et al. (2008)) and be hard to distinguish from *A. janae*, but usually some pits can be found. Fortunately the two species have very different ranges. *Acarospora obpallens* is rare in eastern North America (Knudsen 2006), but is common in southern California and Arizona (Knudsen 2007). *Acarospora janae* occurs from New Mexico eastward.

The widespread *Acarospora thannina* (Tuck.) Herre of North America and the Urals is usually shinier than *A. janae*, often has a stipe, and always has a black lower surface (Knudsen 2007). *Acarospora fuscata* (Schrad.) Th. Fr. is also widespread and common throughout temperate eastern North America. It differs from *A. janae* in having an areolate thallus, with individual areoles that can become quite lobulate in enriched or moist habitats and a lower surface that is usually black. Occasionally, especially on uneven rock surfaces, *A. fuscata* has round areoles with a single apothecium, usually dispersed around the edges of a contiguous thallus, potentially causing confusion with *A. janae*. For users of the Ozark keys (Harris & Ladd 2005), this taxon was given the tentative name “*A. punctata*”.


**DISCUSSION.** – *Acarospora nicolai* is a brown species that produces gyrophoric/lecanoric acid (often in low concentrations, detectable only with TLC) and is heavily pruinose. It is known from Mexico (Puebla) and the United States (Kansas, Oklahoma, Texas) and is probably more widespread but relatively infrequent based on current records. For a description and illustration of the species see Knudsen and Morse (2009). Here its range is extended to include Missouri (the Ozarks) and Virginia. The species probably prefers at least weakly calcareous substrates. All the specimens examined were originally identified as *A. fuscata* or *A. umbilicata* Bagl.

4) *Acarospora piedmontensis* K. Knudsen sp. nov.

Mycobank #561535.

*Figure 5 (Page 56).*

**Similar Acarosporae badiofuscae, sed areolis stipitatis.**

**TYPE:** **U.S.A. SOUTH CAROLINA.** LANCASTER CO.: Forty Acre Rock, ca. 2 mi W of Taxahaw off Co. Rd. 27 at end of Conservancy Road, 34°41’N, 80°31’W, 165 m, 15.iii.1997, on granitic flatrock, W.R. Buck 31607 (NY!, holotype).

**DESCRIPTION.** – *Hypothallus* endosubstratic. *Thallus* of dispersed areoles, becoming squamules, sometimes contiguous through vegetative division, squamules round or angular especially through division, somewhat flat to convex, mostly 0.5-1 mm in diam., <1.0 mm tall. Stipe developing in all areoles as they mature, less than half the width of squamules. *Upper surface* brown, epruinose, matt, smooth to slightly bumpy. *Rim* downturned, often with black edge visible. *Cortex* subparaplectenchymatous, mostly 20-30 μm thick, the thin upper layer dark brown, lower layer hyaline, without a distinct polysaccharide syncortex or epinecral layer of dead and gelatinized hyphal and algal cells. Cortical cells round to angular, various, intergrading with hyphal bands, the uppermost layer of cells in the cortex with dark pigment hoods caps. *Lower surface* brown becoming black through melanization, often with distinct deep fissures, corticate. *Algal layer* continuous to slightly uneven, sometimes thin, not interrupted by hyphal bundles, alga often in vertical rows, lower stratum uneven, 60-100 μm, thinner to punctuated beneath apothecium, algal cells mostly 10-12 μm in diam. *Medulla* hyaline, of thin-walled hyphae, 3-4 μm, often branching, continuous with attaching hyphae. *Apothecia* predominately 1 per squamule, infrequently 2-8 punctiform nascent apothecia but usually merging. *Disc* immersed, dull brown, red-brown when wetted, usually round, smooth or scabrid, epruinose, to 1 mm in diam. *Hymenium* hyaline, coherent but loose in KOH, mostly (100-)150-170 μm tall in mature apothecia, ephymenium ca. 10 μm tall, pigmentation light brown, paraphyses mostly 2(-3) μm in diam., apices in pigment caps to 3 μm wide. *Asci* clavate, mostly 60-100 x 15-25 μm, but often infrequent. *Ascospores* hyaline, simple, 4-5 x 2-2.5, mostly broadly ellipsoid. *Subhymenium* 25-40 μm deep, hyaline. *Hypothecium* distinct, of thin hyphae, often 30 μm deep, often a light golden color, sometimes expanding around the disc to 70-80 μm wide, forming a distinct and sometimes elevated parathecial crown the same color as the thallus. *Pycnidia* mostly 80 μm in diam. Conidia mostly 3 x 1 μm.

**CHEMISTRY.** – No secondary substances detected by TLC. Spot tests: K-, C-, KC-, P-, UV-.

**ETYMOLOGY.** – The name refers to the ancient eastern North American Piedmont that occurs between the Appalachian Mountains and the Coastal Plain, where the species was discovered and is common.

**ECOLOGY AND DISTRIBUTION.** – *Acarospora piedmontensis* occurs in open, sunny habitats on granitic outcrops and complexes of granitic slabs, under 400 meters above sea level, associated with *Quercus* species, old-growth junipers, and *Pinus taeda*. It is apparently endemic to the eastern North American Piedmont, which was unglaciated throughout the cycles of the last ice age, where it is known from Georgia and South Carolina. It often forms large solitary patches 10 cm or more in diameter and can be the dominant crustose lichen in some communities.

**DISCUSSION.** – *Acarospora piedmontensis* is a distinct monomorphic species. Mature squamules are easily identified by a narrow stipe (fig. 5F), dark underside (fig. 5E), and usually a single large immersed apothecium that is red-brown when wetted (fig. 5A-D). Because of its large single apothecia, it could be mistaken for *A. badiofusca* (Nyl.) Th. Fr. s. str. which differs in having broadly attached areoles, a continuous algal layer without a vertical pattern, a shorter hymenium (under 100 μm), and often pseudolecanorine apothecia. *Acarospora badiofusca* is a common montane species of higher elevations in...
Figure 5, Acarospora piedmontensis. A-D, fertile squamules (Buck 31607). E, black underside and stipe of squamule (Buck 31607). F, cross-section of squamule (Harris 40158). Scales = A: 1.0 mm; B-F: 0.5 mm.
North America. Its distribution in eastern North America is not fully understood. However it appears to be very rare and restricted to habitats known to host isolated disjunct lichen populations. Only three specimens of Acarospora badiofusca were seen for this study, one from the Great Falls of the Potomac River in Virginia and two from Little Falls, New Jersey. It has likely been extirpated from the latter site. Using the treatment for Acarospora in the Sonoran Flora (Knudsen 2007), A. piedmontensis could be mistaken for A. obnubila H. Magn. which has a stipe in well-developed specimens, but differs in having a distinctly interrupted algal layer, a pale lower surface, and a thicker cortex (>70 μm vs. 20-30 μm in A. piedmontensis). The two species are also allopatric. A. obnubila is a western North American species, frequent in Arizona and southern California.


5) Acarospora sphaerosperma R.C. Harris & K. Knudsen sp. nov.
Mycobank #561536.

FIGURE 6 (PAGE 58).

Similis Acarosporae dispersae, sed ascosporis plus minusve globosis 7-10(-12) μm vel late ellipsoidis 7-9 x 5-7 μm.

TYPE: U.S.A. ARKANSAS. IZARD CO.: NE corner of Devil’s Knob-Devil’s Backbone Natural Area, 36°00’22” N, 92°02’48” W, sandstone and dolomite outcrops, 24 x.2001, on dolomite, R. C. Harris 45400-D (NY! holotype).

DESCRIPTION. – Hypothallus endosubstratic. Thallus of dispersed areoles arising from the substrate, sometimes contiguous especially by vegetative division, covering areas up to 5 cm, usually solitary, rarely mixed with other saxicolous lichens. Areoles broadly attached, round to irregular in shape, mostly 0.5-1.0 mm. in diameter, usually less than 0.4 mm high. Upper surface waxy white, glossy, turning green when wet, with a red dot (pycnidia or immersed apothecium) in center, then eventually with a superficial reddish brown apothecium with a concolorous or darker concave disc. Epicortex absent. Eucortex paraplectenchymatous, mostly 10-30 μm tall, uneven in height, cells round., 3-6 μm in diam. to angular and irregular, intergrading with bands of medullary hyphae mostly 10 μm thick interrupting the algal layer; hyaline throughout, only becoming light to dark brown in the area above pycnidia or nascent apothecia forming beneath the cortical layer (the pigment becoming more reddish in K). Rim usually concolorous with thallus. Lower surface narrow, white, unless blackened by substrate interactions; Algal layer 40-200 μm thick, continuous with even strata, algal cells mostly 8-12 μm in diam., thin or punctuated beneath apothecia, medullary hyphae interrupting algal layer in narrow bands, sometimes of only 3 or 4 hyphae, hard to observe, but also single anticlinal hyphae interpenetrating algal layer. Medulla hyaline, hyphae thin-walled, 3 μm thick, cells mostly 10 μm long, continuous with attaching hyphae, mostly less than 100 μm thick. Apothecia emergent, predominately 1 per areole, rarely 2, first appearing as a brown conical swelling (looking like the pycnidium), expanding beneath the cortical surface, becoming fertile before eventually the cortical layer is ruptured at the apex of the areole, the punctiform disc exposed, ephymenial pigment thickening, the apothecium becoming elevated, disc eventually dilating up to 0.4 mm, the brown margin formed from cortex. Disc inconspicuous, appearing as a red spot at apex of areole, eventually becoming dilated to 0.3 mm in diam, concave, reddish brown, concolorous with margin. Paratheicum 20-30 μm, continuous with hypothecium, level or lower than ephymenium, at lower substratum of cortex when apothecium is immersed, and remaining at this level when cortex has been breached. Hymenium approximately 170-200(-340?) μm, height various, but ephymenium 10-15 μm, reddish brown after disc is
Figure 6, *Acarospora sphaerosperma*. A, areoles sterile and with the beginning of emergent apothecia (*Harris 45400D*; scale = 0.5 mm). B, areole (center) with fully developed apothecium (*Harris 45400D*, scale = 0.5 mm). C, cross section of fertile areole in I (*Harris 45658*; scale = 100 µm). D, hymenium in IKI (*Harris 45400D*; scale = 30 µm). E, globose ascospores in ascus (*Buck 45077*; scale = 20 µm). F, conidia (*Buck 42931*; scale = 10 µm).
exposed, paraphyses mostly 1.0 μm, lax in water, profusely branching, with oil drops, not constricted at septa, cells usually 5-10 μm, apices slightly expanded, not in pigment caps. Hymenial gel usually I+ blue, with greenish hues, turning red, or I+ red or orange as in Fig. 6D: K/I+ blue. Asci Acarospora-type, long and cylindrical at first, becoming mostly clavate, 100-130 x 30 μm, 100+ ascospores per ascus, sometimes fewer, then the ascus narrower. Ascospores simple, hyaline, quite various, spherical, 7-10(-12) μm, or broadly ellipsoid 7-9 x 5-7 μm (ascospores this broad can look round in the ascus depending on plane of observation). Subhymenium 30-40 μm, I+ blue. Hypothecium continuous with paratheciun, 20-30 μm, deep. Pycnidia rare, with many nascent apothecia. Conidia 5-6 x 1-1.3 μm, rod-shaped.

ETYMOLOGY. – The name refers to the predominantly spherical ascospores.

CHEMISTRY. – No substances detected. Spot tests: K-, C-, KC-, P-, UV-.

ECOLOGY AND DISTRIBUTION. – Acarospora sphaerosperma is a calciphile, occurring on limestone, and on dolomite and chert in dolomite-chert glades in Missouri. The specimen from Ohio was on a pebble in a prairie with alkaline soil.

DISCUSSION. – Acarospora sphaerosperma, like A. dispersa H. Magn., has its center of distribution in the Ozarks. Large ascospores easily distinguish the new species from A. dispersa which has mostly narrow ellipsoid ascospores, 4-6 x 1 μm. Though they can look similar and are probably closely related, A. sphaerosperma has a different gestalt than A. dispersa with its white areoles and red-brown melanized cortical layer around the apothecia. It appears to be a calciphile and is relatively rare.


DISCUSSION. – Recently while identifying specimens from southeastern North America we examined Willey’s monograph of Arthonia (Willey 1890) and noticed the similarity between A. subcyrtodes and the common species A. interveniens. Examination of the type of A. subcyrtodes revealed it is conspecific with A. interveniens and thus we formally place it in synonymy here. Arthonia interveniens is common throughout southeastern North America and is presently included on the North American Checklist (Esslinger 2010).

7) Bactrospora carolinensis (Ellis & Everh.) R. C. Harris comb. nov.

Mycobank #561537.

8) **Lecanora zeroensis** Lendemer sp. nov.

**Mycobank** #561538.


**DESCRIPTION.** – Thallus continuous to rimose-areolate, esorediate, corticate; cortex 40-80 µm thick, prosoplectenchymatous; algal layer uneven, 20-40 µm thick; apothecia sessile, 0.4-0.6-0.8-(1.1)-1.5 mm in diam. (n= 40); disc dark reddish-brown, epruinose; margin lecanorine, prominent, smooth, entire, with a the proper exciple visible as a distinct hyaline inner “ring”; thalline exciple with a poorly defined cortex or fully ecorcticate, heavily inspersed with small crystals, 80-120 µm thick; proper exciple hyaline, prosoplectenchymatous, 20-30 µm thick; epihymenium reddish-brown, with crystals, both pigmentation and crystals dissolving in KOH; hymenium hyaline, not inspersed, 60-90 µm tall; hypothecium hyaline, not inspersed, 60-70 µm thick; paraphyses simple to weakly branched, not apically expanded; ascii Lecanora-type; ascospores hyaline, 8/ascus, simple, [8.4]-8.6-9.6-(10.6)-11.4 x [5.0]-6.1-7.2-(8.2)-8.5 (n= 20). Photobiont green, coccoid, (7.4)-10.3-(8.6)-12.6 µm in diameter (n= 40). Pycnidia not seen.

**CHEMISTRY.** – Atranorin, norstictic acid, and connorstictic acid. Spot tests (cortex and thalline margin): K+ yellow turning red (forming red crystals in squash mount), C-, KC-, P+ yellow, UV-.

**ETYMOLOGY.** – The epithet “zeroensis” refers to the type locality, Zero Bay, which lacks standing water and is part of the forested wetlands associated with the Little Satilla River.

**ECOLOGY AND DISTRIBUTION.** – The new species is known only from the type locality where it was collected on the bark of a maple (*Acer*) in a remnant hardwood strand wetland/bayhead bisected by a powerline cut. It is likely that the species occurs elsewhere in the region and that it has simply been overlooked because of its superficial resemblance to members of the *Lecanora subfusca* group. It is noteworthy however, that the species has not been encountered during extensive fieldwork in adjacent Florida.

**DISCUSSION.** – *Lecanora zeroensis* is a highly distinctive and somewhat enigmatic species that combines different aspects of the *L. caesiorubella* and *L. subfusca* groups. Superficially the species resembles a member of the *L. subfusca* group because of its reddish-brown pigmented epihymenium. However the excipular anatomy is identical to that of *L. caesiorubella* s.l. and the chemistry is also comparable to members of that group (Lumbsch et al. 1997). The new species is readily recognized by its pigmented epihymenium, apothecia with epruinose discs, the absence of a cortex on the thalline margin of the apothecia, and the presence of norstictic acid.
A similarly puzzling species with norstictic acid, *L. vacillans* H. Magn., was treated in detail by Lumbsch and Guderley (1997). That species combines characters of the *L. subcarnea* and *L. subfusca* groups, is saxicolous, known only from Sweden, and differs from *L. zeroensis* in a number of morphological respects (most notably the presence of a cortex on the margins of the apothecia).

9) *Melanophloea americana* K. Knudsen & Lendemer sp. nov.

Mycobank #561539.

_Similis Melanophloae pacifica, sed ascosporae 4-5 x 1 µm et saxicola._


**DESCRIPTION.** – Thallus absent. Ascomata arising from the substrate individually, superficial, dispersed or congregated, especially on uneven surfaces, hemispherical and black, remaining black when wetted, 0.1-0.5 mm in diam., to 0.3 mm high, circular area conspicuous at apex of ascoma, to 0.1 mm in diam., hyaline and concave in center, formed of apices of interascal filaments surrounded by narrow excipular ring, pale yellowish-brown, sometimes slightly raised. Infrequently ascomata compound with two-four hymenia separated by exciple layer and then with 2-4 openings, not centered at apex of ascomata. Wall of ascomata to 80 µm thick. Outer wall of ascomata 10-30 µm thick, paraplectenchymatous, carbonized, with inner thalline area subparaplectenchymatous, of hyaline hyphae, 10-50 µm thick, with scattered lichenized green chlorococcoid algal cells, to 10 µm. Exciple distinct, of narrow hyaline hyphae 10-20 µm thick. Hymenium usually 150-225 µm high (measurement including subhymenium), I+ blue. Interascal filaments abundant, 0.5-1.0 in diam., moderately branching, apices unexpanded. Asci cylindrical to narrowly clavate, mostly 100-135 x 15-35 µm, 200+ ascospores per ascus, contents of ascus I+ orange-red when ascospores mature. Outer wall of ascus I-. Indistinct I+, K/I+ narrow blue stain of at least the upper endoascus wall. Ascospores simple, hyaline 3.5-5 x 0.5-1 µm. Hypothecium indistinct. Whole ascomata subtended by layer of gelatinized intricate narrow hyphae to 50 µm thick, I-, substrate, sometimes with a few algal cells, attaching ascomata to substrate. Conidiomata not observed.

**CHEMISTRY.** – No substances detected. Spot tests: K-, C-, KC-, P-, UV-.

**ETYMOLOGY.** – The name refers to North America where the species was discovered.

**ECOLOGY AND SUBSTRATE.** – The species occurs on silicate rocks in riparian areas. The holotype has soil deposits from flooding.

**DISTRIBUTION.** – Currently known only from two localities in southeastern Pennsylvania and one in New York. These localities represent small fragments of a once intact natural landscape that has been almost entirely transformed by agriculture and urbanization. Either the species is naturally rare and restricted to riparian areas or it was once more common and its range has been reduced through anthropogenic change. Regardless, suitable habitats in southeastern Pennsylvania should be examined for this species to determine its current status and any potential conservation/management needs.

**DISCUSSION.** – The genus *Melanophloea* P. James and Vězda belongs to the family Thelocarpaceae (James & Vězda 1991; McCarthy 2008; McCarthy & Kantavilas 2009). It is distinguished from *Thelocarpon* Nyl. mainly by having an ascomatal wall of non-periclinal hyphae with a melanized outer layer that is greenish black to red-brown, which can become quite carbonized in *M. pacifica* P. James and Vězda, the type of the genus. *Melanophloea pacifica* is an epiphytic crust on the bark of rainforest trees from the Solomon Islands, Papua New Guinea, and Australia. Besides being corticolous, *M. pacifica* differs from *M. americana* in having globose ascospores, 2-3 µm in diameter. Like the new species, *M. montana* P.M. McCarthy, which is known only from the type locality in the deep shade of a montane rainforest in Australia, is saxicolous on silicate rocks. That species differs in having sparse interascal filaments when mature, an exciple expanding near the apex of the ascoma, a K/I+ blue-black hymenium, and larger ascospores (4-6 x 2-3 µm vs. 3-5 x 0.5-1 µm). Based on the carbonized wall of the ascoma, the corticolous taxon *Thelocarpon nigrum* Aptroot & K.H. Moon from Korea probably belongs in *Melanophloea* (Aptroot
Figure 7, *Melanophloea americana* (all from Aptroot 21389). A & B, ascomata (scale = 0.5 mm). C, cross-section of ascomatum, note that scattered algal cells are not apparent (scale = 200 µm). D, apex of ascomatum (scale = 50 µm). E, ascus tip in IKI (scale = 20 µm). F, ascospores (scale = 20 µm).
It differs from *M. americana* in having thicker interascal filaments (2-2.5 µm) and larger ascospores (9-12 x 5-6 µm).

There is some variation in the staining reactions of the ascus and hymenium among the species of *Melanophloea*. Similar variation is observed in *Thelocarpon*, which molecular phylogenetic studies indicate is monophyletic (Lumbsch et al. 2009, Salisbury 1996, Kocourková-Horáková 1998). In the family Thelocarpaceae these differences are used only for species delimitation at this time. This is the first report of the genus *Melanophloea* from North America.


**TYPE:** ITALY: “Sulla dolomia variegata silicifera dal monte Sassalbo sopre Poschiavo” (holotype not located; BM[n.v.], isotype).

**DISCUSSION.** – *Polysporina cyclocarpa* is here reported for the first time from continental North America (Connecticut, Missouri, New York, and West Virginia). It has previously been reported from Greenland (Knudsen & Kocourková 2009). In the past the first author reviewed an E. Lay collection from the Ozarks, which he determined as *P. cyclocarpa*. We were unable to borrow this specimen again to confirm the determination following the revision of western populations as *P. gyrocarpa* (H. Magn.) N.S. Golubk. Based on this specimen the Ozarks are included in the range of *P. cyclocarpa* in continental North America. Most of the specimens cited below were identified as *Sarcogynne privigna* (Ach.) A. Massal., which *P. cyclocarpa* resembles because of the angular edges of its often compressed or vegetatively dividing apothecia, which sometimes even look star-shaped. Like other *Polysporina* species, the disc may at first have no ephymenial accretions. For a full description of *P. cyclocarpa* see Knudsen & Kocourková (2009). The description of *P. cyclocarpa* in the *Sonoran Flora* (Knudsen & Stanley 2007) actually describes *P. gyrocarpa*, a species of Asia and western North America.

Since *Polysporina cyclocarpa* is allopatric with *P. gyrocarpa* in North America, identifications in eastern North America are relatively easy based on the hymenium height (~80-100 µm tall), rarely branching paraphyses that are ~2 µm wide, ascospores ~4-5 x 2 µm, and occurrence on calcareous rock or soft granite in mesic conditions. *Polysporina simplex* is also frequent in eastern North America where it almost always occurs on silicate rock and looks similar to *P. cyclocarpa*. That species generally has smaller apothecia, often thinner more branching paraphyses, and on an average has narrower ascospores, with many closer to 0.5 µm in width. The overlapping size ranges of many morphological features between different species make species in this genus difficult to identify, but only two species are common in North America: *P. simplex* and the lichenicolous fungus *P. subfuscescens* (Nyl.) K. Knudsen & Kocourková.

*Polysporina cyclocarpa* is a calciphile. It was described from dolomite and also occurs on hard limestone in the Alps (Knudsen & Kocourková 2009). The specimen from the Ozarks occurred on dolomite and the specimen from Jefferson County, New York was found on limestone. The other specimens were collected on porous, relatively soft granite associated with swamps and wetlands where the water is probably rich in dissolved calcium ions. All the eastern North American specimens were large (ca. 1 mm.) and even looked larger (to ca. 2 mm) when in the process of vegetative division. The algal layers were especially well-developed, much more than in specimens seen from the Alps (Knudsen & Kocourková 2009).

Figure 8, *Lecanora zeroensis* and *Polysporina cyclocarpa*. A-B, apothecia of *L. zeroensis* (holotype; scales = 0.5 mm). C-D, section of apothecium of *L. zeroensis* in water and polarized light respectively (holotype; scales = 200 µm). E-F, mature apothecia of *P. cyclocarpa* (Lendemer 11525; scales = 0.5 mm).
Figure 9, *Sarcogyne reebiae*. A, stroma containing a pycnidium (*Buck 36693*; scale = 0.5 mm). B & C, Stromata decaying as apothecia emerge (*Buck 36693*; scales = 0.5 mm). D, old apothecium in center. (*Buck 36693*; scale = 0.5 mm). E & F, Young donut-shaped apothecia (*Hodkinson 10208*; scales = 0.5 mm).

**FIGURE 9 (PAGE 65).**

Discussion. – Sarcogyne reebiae is rare in California where it occurs on sandstone and granite. It is only known from Weir Canyon in the Santa Ana Mountains, the Menifee Hills in Riverside County, and Topanga Canyon in the Santa Monica Mountains, all areas with a coastal influence (Knudsen & Standley 2007). It is here reported new to southeastern North America from Alabama, Georgia, Kentucky, Virginia, and West Virginia. Sarcogyne reebiae produces abundant black sessile stroma in which large, 1-locule pycnidia form. The conidiogenous cells are 10–15 x 0.5–1.0 µm and produce abundant small hyaline conidia 2-3 x 0.5-2 µm. In a fascinating ontogeny, the conidiogenous cells atrophy and the stomatal wall begins to decay as an apothecium develops, unfolding to form at first a donut-shaped ascocarp with a thick excipulum. Eventually the apothecia expand, forming a flat disc, with a relatively narrow black to yellowish-brown margin. The mature margin is rarely incised; if so, then usually vegetatively dividing. The epruinose disc is red-black to bright red when wetted. The width of the exciple (up to 100 µm), the height of the hymenium (60-100 µm), and paraphyses size (2 µm wide) overlaps several described species of Sarcogyne in North America. The ascospores are not helpful for determination either, because of variability, but most are narrowly ellipsoid (4-5 x 1-1.5 µm). It is most easily identified by the association of the apothecia with the superficial pycnidia. Most southeastern specimens seen had a scabrid disc.

The robustness of the eastern specimens suggest that the southern California populations are relicts from an earlier, moist ice age climate, and are possibly becoming naturally extirpated by the development of a Mediterranean climate. Unfortunately the expected increased aridity in California from global warming will accelerate this process.


Syn. nov. Xanthomendoza rosmariae S.Y. Kondratyuk & Kärnef. in Lumbsch et al., Phytotaxa, 18: 114. 2011. TYPE: U.S.A. DELAWARE. SUSSEX CO.: “Georgetown, northern entrance drive of Stockley Centre (on bark of aspen growing together with Parmelia sulcata), 1.iv.2000, Crichton 57” (ZT [not ZH!], holotype; NY!, isotype [see discussion below]).


**FIGURE 10 & 11 (PAGE 67 & 69).**
Figure 10, Xanthomendoza weberi. A & B, isotype of Xanthoria wetmorei (Wetmore 76328, MIN). C & D, thallus and apothecium from isotype of Xanthomendoza weberi (Weber s.n., NY). E & F, thallus and apothecia of X. rosmarieae (McAvoy s.n., NY). Scales = A-C, E: 1.0 mm; D and F: 0.5 mm.
DISCUSSION. – Recently, Xanthomendoza rosmarieae was described in Lumbsch et al. (2011) from a single collection made in Delaware, U.S.A. The type locality is situated in the Coastal Plain of southeastern North America, the region which is the center of distribution for X. weberi (see figure 11). Xanthomendoza weberi was segregated from X. fulva (Hoffm.) Sochtng. Kärnef. and S.Y. Kondr. by Kondratyuk and Kärnefelt (2003). Although not directly linked to X. fulva, the protologue of X. rosmarieae stated that the new species differed from X. weberi which was previously included within X. fulva.

Since the authors of Xanthomendoza rosmarieae implied that it may represent a regional endemic we attempted to examine the only known collection in order to determine whether we might have additional material that had previously been misidentified as X. weberi. Unfortunately, the disposition of the type material is not possible to ascertain with certainty from the protologue, which stated only “holotype ZH, isotype K”. A search of Index Herbariorum (Thiers 2011) revealed no registered herbarium with the acronym “ZH” and that the lichens at K have mostly been transferred to BM. A query to the authors of the name received no reply and a loan request to BM (and subsequent correspondence with K) failed to turn up the relevant material. Since Rosmarie Honegger works in Zürich, Switzerland a loan request was also made to ZT to account for the possibility that “ZH” was a typographical error for “ZT”. The material was also not located at ZT. Since we were aware that the personal herbarium of Oliver Crichton, the collector of the type, had been deposited at DOV we attempted to locate a duplicate of the type collection in that herbarium. A search of DOV failed to locate any such specimen.

While attempting to locate the type material of Xanthomendoza rosmarieae in the herbaria mentioned above we also contacted several colleagues familiar with the type locality, a large mental health facility, one of whom visited the exact site where Crichton had obtained his material. The species was still present at the type locality, abundantly covering the trunks of planted Norway maples (Acer platanoides L., the tree Crichton apparently misinterpreted as “aspen”) along the roadside (W. McAvoy pers. comm.), and a robust fertile collection was obtained. As a last ditch effort to avoid the designation of a neotype we contacted Rosmarie Honegger with the hope that she still had the type material or had some knowledge of its deposition. We were elated when Honegger informed us the material was still housed in her laboratory and offered to send an isotype for inclusion in NY.

It should be noted that despite the problems cited above, the name Xanthomendoza rosmarieae was validly published because the authors both designated a holotype and indicated the herbarium it was deposited in. Had we not located the type material, after considerable effort, we would have been forced to determine the application of this name in the absence of a type. This situation highlights a significant gap in the current ICBN, which does not state whether names introduced with incorrect type specimen deposition information (be it due to orthographic error or not) are to be considered validly published. While extreme, the present case clearly illustrates the problems associated with attempting to determine the application of a name in the presence of erroneous type specimen deposition information.

Using the recent collection and the isotype discussed above we thus set out to determine how Xanthomendoza rosmarieae related to the other sorediate Xanthomendoza populations in eastern North America that we had previously referred to X. weberi. The authors of X. rosmarieae considered its distinguishing features to be “the presence of isidiate soredia, rather wide and short rhizines, narrow ascospores, and a poorly developed true exciple of textura intricata type” (Kondratyuk & Kärnefelt in Lumbsch et al. 2011: 115). In comparing the taxon to members of the X. weberi group they specifically stated it differs as follows: 1) broader rhizines (“90-100 μm wide vs. 50-60 μm wide”), 2) lacking a strongly gelatinized pseudoprosoplectenchymatous true exciple (vs. the presence of that structure), and 3) a higher hymenium and narrower ascospores. We compared the isotype and topotype with an isotype of Xanthomendoza weberi (fide Kondratyuk and Kärnefelt (2003)). Second, we believe that the differences in the proper (“true”) exciple cited by Lumbsch et al. (2011) are extremes of a continuum of variation in types of prosoplectenchymatous hyphal arrangement. The proper exciple of X. rosmarieae is thin and poorly developed, being composed of loosely aggregated textura intricata. While the proper exciple in the type material of X. weberi does differ in being strongly gelatinized and well developed, the hyphal arrangement is no different from that of X. rosmarieae.

The differences in the hymenium and ascospores cited in the protologue were also not supported by the material we examined. The protologue of Xanthomendoza rosmarieae states that the ascospores are
narrower than those of *X. weberi*, however we found them to be slightly wider (12.6-13.3 x 7.2-9.4 µm in *X. rosmarieae* vs. 8.4-13.2 x 4.7-3 µm in *X. weberi*). Even though our ranges were based on very small sample sizes (n=4 and n=12 respectively) overlap was observed. Neither protologue indicates how many measurements the published ranges were based on (“(8)10-16 x 6-8(-11) µm” in *X. rosmarieae* vs “(12-)13-17(18) x (6-)9-10 µm” in *X. weberi*) thus there is no way to evaluate their statistical robustness. Further, the differences between hymenial heights are equally elusive as the protologues cite ranges that abut but do not overlap (“70-90 µm” in *X. rosmarieae* vs. “to 60 µm” in *X. weberi*). However, the description of *X. weberi* does not provide a size range for the subhymenium whereas such data are presented for *X. rosmarieae*.

Regardless of the problems discussed above, one must question whether characters of the apothecia and ascospores should be used to distinguish sympatric sorediate species that are typically sterile. If apothecia and ascospores are required to identify a specimen, this would render the vast majority of collections impossible to determine. The only thallus characters cited by the authors to distinguish *Xanthomendoza rosmarieae* from its congeneres were the width of the rhizines and the presence of “isidioid soredia”. As the differences in rhizine width do not appear to be significant the only remaining character is
the presence of “isidioid soredia”. In fact, neither the authentic material nor the illustrations accompanying the protologue show soredia that differ from those typically observed in *X. weberi*. In fact, the only such structures observed in the isotype of *X. rosmarieae* at NY were derived from admixed thalli of *Candelaria concolor* (Dicks.) Stein [1]. Considering the above we believe there are no significant differences separating *X. rosmarieae* and *X. weberi* and thus place them in synonymy here. This conclusion is further supported by the molecular phylogenetic analyses of Eichenberger et al. (2007) who found that sequences from the type collection of *X. rosmarieae* were not supported as distinct from those derived from other populations of *X. weberi*.

While researching the name *Xanthomendoza weberi* we also discovered the name *Xanthoria wetmorei* S.Y. Kondratyuk & Kärnef. published by Kondratyuk and Kärnefelt (2003) and typified by a collection from Iowa, U.S.A. Since the discussion in the protologue included references to *X. weberi* we decided to also attempt to determine the relationships of this taxon to *X. weberi/X. fulva*. The only distinguishing feature cited by the authors in the protologue of *X. wetmorei* was its much larger size relative to other species. No comparative measurements were provided however, and an examination of an isotype failed to find any significant differences from *X. weberi*. A conclusion that is further confirmed by analyses of nrITS sequence data from the holotype of *X. wetmorei* at LD (P. Fröden pers. comm.). Thus we also place *X. wetmorei* in synonymy with *X. weberi* here.

As was pointed out by Lindblom (2006) *Xanthomendoza gallowayi* (S.Y. Kondratyuk & Kärnef.) Sochting et al., may be an earlier name for *X. weberi*. Unfortunately at the time of her study Lindblom was unable to determine the correct application of that name because the type was unavailable for study from H. Subsequently, when discussing *X. rosmarieae*, the authors of that name referred to “*X. gallowayi (syn. *X. weberi*)” (Lumbsch et al. 2011), implying that *X. weberi* is in fact a synonym of *X. gallowayi* as suspected by Lindblom (2006). Recently P. Fröden (pers. comm.) examined the type of *X. gallowayi*, which is still on loan to LD, and confirmed that it is not synonymous with *X. weberi*. This we continue to maintain the name *X. weberi* here.


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LITERATURE CITED

71


**APPENDIX 1 - A KEY TO THE ACAROSPORA SPECIES WITH LECANORIC/GYROPHORIC ACID IN NORTH AMERICA**

1. Thallus yellow ................................................................. 2
2. Thallus effigurate; medulla and cortex C+ red ........................................... *A. erythrophora*
3. Thallus not effigurate; only cortex or medulla C+ red ................................... 3
   3. Cortex C+ red; medulla C--; thallus areolate, coastal California and Baja.............. *A. robiniae*
   4. Cortex C--; medulla C + red; thallus areolate or squamulose; southern North America........ 4
   1. Areoles or squamules usually not reduced to a thalline margin........................................... 5
   5. Spores narrowly ellipsoid, without a mucilage sheath; thallus epruinose, lichenicolous. ................. *A. succedens*
   6. Spores broadly ellipsoid, with distinct mucilage sheath; thallus polymorphic, usually pruinose, not lichenicolous............................................................ *A. nevadensis*
4. Algal layer continuous and not interrupted, sometimes thin........................................... 6
5. Areoles usually reduced to a thalline margin, mostly round with single apothecium........ 7
   7. Areole pitted (faveolate) especially around the apothecia, sometimes pruinose...................... *A. tuckerae*
   8. Areole not pitted (faveolate), not pruinose.................................................. *A. janae*
6. Areoles or squamules usually not reduced to a thalline margin, not mostly round with single apothecium.................................................. *A. pacifica*
7. Thallus usually forming a rimose-areolate crust, usually yellow-brown and dull, often lobulate, lower surface black, common.................................................. *A. fuscata*
8. Thallus not forming a rimose-areolate crust, various brown hues, dull or glossy, lobulate or not, lower surface black or not, frequent or rare.................................................. 9
9. Thallus squamulose; squamules with a stipe; lower surface black......................... *A. theminina*
10. Thallus not squamulose; areoles without a stipe; lower surface not black..... 10
11. Areoles pruinose; thallus not effigurate.................................................. *A. nicolai*
12. Areoles not pruinose; thallus effigurate or not.................................................. 11
13. Areoles becoming subsquamulose; apothecia with epihymenial plectenchyma.................. *A. peliseyph a s. lat.

13. Areoles not becoming subsquamulose; apothecia without epihymenial plectenchyma…………………………………………………A. fuscescens

Notes on species included in the key

Acarospora complanata H. Magn. – For a description see Magnusson (1929). For more information and an illustration see Lendemer and Knudsen (2011). This species is in need of revision in Europe after Clauzade et. al. (1981) made the species concept heterogeneous. The two American specimens of this taxon need further study and may represent a species new to science.

Acarospora erythrophora H. Magn. – For a description see Knudsen (2007).

Acarospora fuscata (Schrad.) Th. Fr. – For a description and illustration see Knudsen (2007). Specimens from eastern North America are often profusely lobulate but always broadly attached.

Acarospora fuscescens H. Magn. – For a description and illustration see Knudsen (2008). This interesting species occurs on sandstone and soil in western North America. It usually forms an exclusive crust, excluding other lichens. Though most apothecia are punctiform, rarely the disc dilates.

Acarospora janae K. Knudsen – For a minimal description and illustration see Lumbsch et. al. (2011). Further notes and extensive illustrations are provided herein.

Acarospora nevadensis H. Magn. – For a description see Knudsen (2007). Most specimens look like A. strigata (Nyl.) Jatta and have broad ascospores similar to those that species. But the spores of A. nevadensis are shorter and have a distinct mucilage sheath. Apparently this species is rare, but it is likely often misidentified because spot tests are not performed. Only a few epruinose populations were seen from Arizona, U.S.A..

Acarospora nicolai B. de Lesd. – For a description and illustration see Knudsen and Morse (2009).

Acarospora opbellens (Nyl. ex Hasse) Zahlbr. – For a description and illustration see Knudsen (2007).

Acarospora peliscypha Th. Fr. – For a description of this species see Knudsen (2007). North American populations are in need of a revision following the revision of the “rugulosa/bullata” in Europe (Knudsen et al. 2010). At this time we do not recognize Acarospora rugulosa Körb. (Thomson 1997; Esslinger 2010) which is probably the earliest name for A. bullata Anzi, a species that does not occurs in North America (Knudsen et al. 2010).

Acarospora robiniae K. Knudsen – For a description and illustration see Knudsen (2007). This is a coastal species from Baja California in Mexico to central California, U.S.A. Currently the most northernmost collection known is from top of Morro Rock, in Morro Bay, San Luis Obispo Co., California (UCR).

Acarospora rosulata H. Magn. – For a description and illustration see Knudsen et al. (2010). Previously North American populations were misidentified as A. bullata Anzi (Magnusson 1929; Knudsen 2007).

Acarospora succedens H. Magn. – This is an older name for A. interspersa H. Magn. (Knudsen 2011). For a description see Knudsen (2007) under A. interspersa. It is no longer recognized as occurring in California. The species described as A. succedens in Knudsen (2007) is now called A. nashii K. Knudsen (Knudsen 2011).

Acarospora thamnina (Tuck.) Herre – For a description and illustration see Knudsen (2007). This species is common in western North America. It has probably been misidentified in Alaskan and Canadian collections as A. fuscata, and is rare in eastern North America. In moist conditions this species can be quite lobulate and look like A. fuscata, but it usually has a well-developed stipe.


Names for Acarospora species with gyrophoric/lecanoric acid excluded from the North America lichen flora

Acarospora rugulosa Körb. – See note for A. peliscypha above.

Acarospora sparsa H. Magn. – This species was based on a single specimen in the herbarium of Bouly de Lesdain, which was presumably lost during World War II (Magnusson 1933). Based on the description, this appears either to be the third time Magnusson described A. nicolai B. de Lesd.
(Knudsen & Morse 2009) or he is describing a morph of *A. obpallens* or *A. janae*. Unfortunately the description is inadequate to allow for the selection of a neotype.

*Acarospora tongleti* Hue – see note *A. variegata* below.

*Acarospora variegata* H. Magn. – This is a European species which needs a new revision. Magnusson reported it from North America based on a specimen in the herbarium of Bouly de Lesdain, which was lost during World War II (Magnusson 1929). It is currently treated as a synonym of *A. tongleti* Hue on the North American checklist (Esslinger 2010), a species described from Belgium. The first author does not know the source of this synonymy nor does he accept it. Neither *A. variegata* nor *A. tongleti* are recognized as occurring in North America.