Studies in Lichens and Lichenicolous Fungi – No. 22: The identities of *Lecidea deminutula*, *L. olivacea* var. *inspersa*, *L. virginiensis* and *Thelenella humilis*

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ABSTRACT. – Notes on four taxa are presented as part of an effort to resolve the taxonomic status of neglected crustose lichen names based on material from North America. *Lecidea deminutula*, described from non-calcareous rocks in the Great Smoky Mountains of Tennessee, is placed in synonymy with *Lecidella enteroleucella*. *Lecidea olivacea* var. *inspersa*, described from hardwood bark in the Great Smoky Mountains of Tennessee, is placed in synonymy with *Lecidella elaeochroma*. *Lecidea virginiensis*, described from seeping, non-calcareous rocks in West Virginia, is lectotypified and placed in synonymy with *Bryobilimbia ahlesii*. *Thelenella humilis* described from non-calcareous rocks in New York is placed in synonymy with *Protothelenella corrosa*.

KEYWORDS. – Floristics, forgotten species, herbaria, morphology, nomenclature, taxonomic innovation.

INTRODUCTION

New species of lichens and lichenicolous fungi continue to be documented and described from North America at a remarkable rate (Allen & Lendemer 2015, Allen & McMullin 2015, Brodo & Lendemer 2015, Brodo & McCune 2017, Carlberg 2016, Cestaro et al. 2016, Cornejo et al. 2017, Driscoll et al. 2016, Esslinger 2017, Esslinger et al. 2017, Fryday 2017, Gasparyan et al. 2017, Guzow-Krzemińska et al. 2017, Holien et al. 2016, Knudsen et al. 2016, Lendemer 2016, Lendemer et al. 2016, Magain et al. 2016, McCune & Lumbsch 2017, McCune et al. 2018, Morse & Ladd 2016, Muggia et al. 2015, Muscavitch et al. 2017, Myllys et al. 2016, Peterson & Goward 2016, Sanders & Lücking 2015, Seavey et al. 2017, Tønsberg & Goward 2016). As a result, the number of taxa reported from North America north of Mexico has steadily increased over time, and now stands at 5561 (Esslinger 2018). Although the discovery of new and previously unreported taxa is a key component of biodiversity documentation, review and revision of historical reports are similarly crucial components that nonetheless are often underappreciated (see Lendemer 2015). In this context, there are many names currently included on the checklist of North American lichens (Esslinger 2018) that were described or reported decades ago, in some cases even more than a century ago, and yet have been little used, if at all, in modern times. As part of ongoing attempts to address the status and taxonomic identity of such names, we present notes on four taxa described from North America.

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MATERIALS AND METHODS

This study is based on specimens deposited in the herbaria of the New York Botanical Garden (NY) and the Canadian Museum of Nature (CANL), supplemented by type specimens borrowed from UPS. Georeferenced voucher data for all NY specimens examined can be accessed via the C.V. Starr Virtual Herbarium at NY (http://sweetgum.nybg.org/science/vh/). Specimens were first studied dry using an Olympus SZ-STB dissecting microscope. Microscopic morphology and anatomy were then studied using an Olympus BX53 compound microscope and sections prepared by hand with a razor blade that were mounted in water or Lugols solution (aqueous iodine). Chemistry was studied using standard chemical tests (K, C, KC, P, UV) following Brodo et al. (2001) and supplemented by thin layer chromatography (TLC) using solvents A and C following Culberson and Kristinsson (1970) but as modified for the peanut butter jar by Lendemer (2011).

I. LECIDEA VIRGINIENSIS IS A SYNONYM OF BRYOBLIMBIA AHLESI


Discussion. – Lecidea virginiensis was first published as a nomen nudum in Millspaugh and Nuttall (1896a: 181). The name was then validated in Millspaugh and Nuttall (1896b). Later, Millspaugh (1913: 160) reproduced the original description with a reference to the earlier validation in the Botanical Gazette. Importantly, all three references cited the same collection (Nuttall 1779) as the only material that had been assigned to the name. Unfortunately, repeated attempts to locate L.W. Nuttall’s original material that had clearly been assigned collection number 1779 were unsuccessful. It appears that Nuttall must have sent material to W.W. Calkins, who then forwarded a specimen to W. Nylander for determination. The only material of this species in H-NYL consists of a specimen sent by Calkins and marked “No. 168” by Calkins, presumably referring to a numbered set of specimens that had been sent for identification to Nylander. As has been documented elsewhere, the above scenario was common practice for several North American workers (e.g., Calkins and J.W. Eckfeldt) who routinely sent collections made by others to Nylander (LaGrecia & Lumbsch 2001, Lendemer & Hewitt 2002). Thus, despite the fact that the specimen in H-NYL lacks Nuttall’s collection number, we here select it as the lectotype because it was indisputably studied by Nylander, described at length by Magnusson (1935), and comprises part of the original material used to prepare the original description (Art. 9.4 in Turland et al. 2018).

Subsequent to its description, the name Lecidea virginiensis was occasionally used in the published literature (e.g., Lowe 1939, Miller & Thomson 1959) and it remains on the North American Checklist (Esslinger 2018). Despite this, the application of the name remains unclear and it does not appear to have been used in recent times (i.e., since Miller & Thomson 1959). While preparing a checklist of the lichens of Indiana, one of us (JCL) was spurred to determine whether L. virginiensis was a distinct and overlooked species, or if it was a synonym of an older name that has become more widely used over time. Examination of the type material at H-NYL (Fig. 1) revealed that L. virginiensis should be treated as a synonym of Bryoblimbia ahlesii.

Bryoblimbia ahlesii was reported from North America under the name L. ahlesii by Harris (1995a) and has subsequently been found to be widespread in temperate eastern North America, including the Appalachian Mountains (Fig. 2A). It has also been reported from Haida Gwaii in coastal British Columbia (McCune 2017). The species is known to be an unusual member of Bryoblimbia in that it typically occurs on wet or damp shaded sandstone (Arup 2004, Coppins & Fryday 2006, Fryday et al. 2014, Purvis et al. 1992) and this perfectly matches the ecology that was originally described for L. virginiensis (Millspaugh & Nuttall 1896a, b). The lectotype fits well with the published descriptions of L. ahlesii in having a thin, continuous, esorediate thallus with small, reddish-brown to black, biatorine apothecia and
Porpidia-like asci. Nonetheless, it differs in having somewhat narrower ascospores (11.8–13.8 × 4.3–5.1 µm vs. 12–17(19) × (5.3)–6.4–7–(9) µm fide Coppins & Fryday 2006). Additionally, the apothecia entirely lack the K+ green granules that have often been reported for the species. While these differences suggest that further study of this group is needed, B. ahlesii is currently circumscribed to include forms that lack K+ green granules in the apothecia (Coppins & Fryday 2006) and the slightly smaller size of the ascospores may be attributable to the small number measured due to a desire to avoid damaging the lectotype. As such, we here place L. virginiensis in synonymy with B. ahlesii. For additional heterotypic synonyms of B. ahlesii (e.g., Lecidea delincta Nyl., L. valentior Nyl.), see Fryday et al. 2014).

Bryobilimbia sanguineoatra (Wulfen) Fryday, Printzen & S. Ekman is another species that is morphologically similar to B. ahlesii and differs morphologically in its narrower ascospores. Although B. sanguineoatra typically grows over mosses, it rarely also occurs on damp, siliceous rocks (Fryday et al. 2014). The width of the ascospores in B. sanguineoatra is comparable to that of Lecidea virginiensis (4.3–5.1 µm in L. virginiensis vs. 3.0–4.5(–6.0) µm in B. sanguineoatra fide Fryday et al. 2014). Given the ecology of the type of L. virginiensis we prefer to treat it as a synonym of B. ahlesii rather than as a potential ecologically atypical form of B. sanguineoatra.


Figure 1. Lecidea virginiensis (all from the lectotype). A and B, detail of the thallus and apothecia, illustrating the variation in apothecial pigmentation. C, section of apothecium mounted in water. D, the same apothecial section after application of KOH. Scales = 1.0 mm in A and B, 50 µm in C and D.
Figure 2. Geographic distributions of two species treated here based on specimens examined for this study. A, distribution of *Bryobilimbia ahlesii* in eastern North America with the type locality of *L. virginiensis* in black. B, distribution of *Protothelenella corrosa* in eastern North America with the type locality of *Thelenella humilis* in black. Note the map for *P. corrosa* also includes literature occurrences published by Fryday (2006, 2010).
II. LECIDEA DEMINUTULA IS A SYNONYM OF LECIDELLA ENTEROLEUECELLA


Discussion. – *Lecidea deminutula* was described from the southern Appalachian Mountains of eastern Tennessee based on material collected on non-calcareous rocks (Degelius 1942). The name does not appear to have been used subsequently in North American literature, and it remains on the North American Checklist (Esslinger 2018). Although a placement in *Lecidella* would have been suggested based on the discussion presented by Magnusson (in Degelius 1942), the name does not appear to have been treated in any of the primary works dealing with the genus (e.g., Andreev & Baibulatova 1986, Andreev et al. 2003; Inoue 1982, 1997, 2000; Kantvilas & Elix 2013; Knoph 1990; Knoph & Leuckert 1994, 1997, 2000, 2004; Leuckert et al. 1990, 1992; Rambold 1989).

We examined the holotype at UPS (Fig. 3A–B) and found that it corresponds well to the current concept of *Lecidella enteroleuecella* (Knoph & Leuckert 1994, 2004), a species that is widespread in temperate eastern North America (Knoph & Leuckert 1994; Fig. 4B). The holotype has a thin, areolate,
esorediate thallus, hyaline hypothecium, hyaline hymenium that is not inspersed with oil droplets, a dark olive-brown ephymenum, and ascospores that measure 9.4–12.2 $\times$ (3.7)–4.4–6.1 $\mu$m in size. Thin layer chromatography of the holotype detected atranorin together with two xanthones, likely arthothelin and thuringione. The identities of the latter two substances were not subsequently confirmed with standards as the type specimen comprises a single rock fragment and we wanted to avoid repeated sampling of the limited available material. Nonetheless, given the morphological characters present in the type, the occurrence on non-calcareous rocks, and the presence of both atranorin and xanthones, the assignment to *L. enteroleucella* seems clear. As such we formally place the names in synonymy here.

*Lecidella enteroleucella* has been little discussed in the published literature subsequent to Knoph and Leuckert (1994). Harris and Ladd (2005) included it in an account of Ozark lichens and compared the species to *L. stigmatea* (Ach.) Hertel & Leuckert, distinguishing the species by the degree of immersion of the apothecia in the thallus (immersed in *L. enteroleucella* vs. sessile in *L. stigmatea*). Based on the specimens examined for this study, the apothecia of *L. enteroleucella* can vary from immersed to sessile, the latter exemplified by the type of *L. deminutula*. *Lecidea stigmatea* differs morphologically in having larger ascospores (11–17 $\times$ 6–9 µm, *fide* Knoph & Leuckert 2004) and chemically from *L. enteroleucella* in producing zeorin as an accessory to atranorin or lichexanthone (Knoph & Leuckert 2004).

OKLAHOMA. AD AIR CO.: just NE of Stilwell City Lake, 1.xi.2000, R.C. Harris 44512 (NY).

III: LECIDEA OLIVACEA VAR. INSERSPA IS A SYNONYM OF LECIDELLA ELAEEOCHRoma


TENNESSEE. SEVIER CO.: Great Smoky Mountains National Park, near The Chimneys, 850 m., 19.ix.1939, on Celtis, G. Degelius s.n. (UPS [L-587982]!, holotype).

Discussion. – Lecidea olivacea var. inserspa was described by Degelius (1942) based on corticolous material collected in the southern Appalachian Mountains of eastern North America. As was the case for L. deminutula, the protologue suggests a placement in Lecidella. Nonetheless, the name does not appear to have been treated in any of the primary works on that genus (e.g., Andreev & Baibulatova 1986, Andreev et al. 2003; Inoue 1982, 1997, 2000; Kantvilas & Elix 2013; Knoph 1990; Knoph & Leuckert 1994, 1997, 2000; 2004; Leuckert et al. 1990, 1992; Rambold 1989). Likewise, following its description the name does not appear to have been used again in the North American literature.

We examined the holotype deposited in UPS (Fig. 3C–D) and found that it is a species of Lecidella that morphologically and chemically agrees well with current delimitations of L. elaeochroma (e.g., Knoph & Leuckert 1997, 2004), a species that occurs sporadically throughout the southern Appalachian Mountains (Fig. 4A). Specifically, the holotype has a thin, esorediate thallus, dark blue-black apothecia with a blue-green hymenium, hyaline hymenium densely inspersed with oil droplets, yellow-brown pigmented hypothecium and exciple, and ascospores that measure 12.7–15.6 × 7.0–9.6 µm. The chemistry of the holotype was studied with both spot tests and thin layer chromatography, using the former we found the thallus was K+ yellow, C-, KC-, P- and UV-, while using the latter, we detected atranorin and an unidentified xanthone. Due to the small size of the holotype we did not subject the material to further chemical analyses, and while such studies should be carried out to identify the xanthone, we suggest that methods such as HPLC should be used as they require minimal material. Following Knoph and Leuckert (2004), L. elaeochroma is morphologically nearly identical to L. euphorea (Flörke) Hertel, differing in the xanthones it produces. Lecidella elaeochroma has widely been reported to react C+ orange, albeit often weakly so, while L. euphorea has been reported to be C- (e.g., Purvis et al. 1992). However the differences between the species do not appear to be clear in North America (Knoph & Leuckert 2004) and further study of species delimitation in this group is clearly needed. We here treat Lecidea olivacea var. inserspa as a synonym of L. elaeochroma, recognizing that there is a chance it could prove to be better accommodated as a synonym of L. euphorea when the group is studied in more detail in the future.

It should be noted that after extensive review of the literature we were unable to locate a published typification for Lecidella elaeochroma. This is despite the fact that the species is considered to be widespread and abundant, especially in Europe (e.g., Purvis et al. 1992). There are three sheets with material identified as L. elaeochroma in Acharius’ herbarium (H-ACH 140A-F, H-ACH 141, H-ACH 154). Of these, H-ACH140A was annotated by Leuckert and colleagues as containing diploicin and lichenxanthone. Given that there are multiple specimens comprising original material which have not been chemically analyzed, and that the one specimen annotated with chemical data does not agree with
published chemical accounts of the species (e.g., Knoph & Leuckert 2004), we defer lectotypification until the material can be studied in detail.

Selected additional specimens of Lecidella elaeochroma examined. – GERMANY. RHEINLAND-PFALZ. Kr. Cochem. Naturschutzgebiet Dortebachtal, along trail from parking area to waterfall, ca. 1 km E of village of Kloten along Hwy 49, 30.i.2010, on Acer, W.R. Buck 55939 (NY).


IV: THELENELLA HUMILIS IS A SYNONYM OF PROTOTHELENELLA CORRosa


Discussion. – Thelenella humilis was described from a single location in the Adirondack Mountains of New York by Harris (1995b). In the more than two decades since its description no additional specimens have been referred to as this taxon and it has rarely been mentioned in the literature (e.g., Morse 2016). Given that this species was described from northeastern North America and only located once, the authors have been curious as to whether it might represent a rare species or a crustose lichen that has otherwise been overlooked in the field. During a visit to New York in 2015 one of us (TM) examined the type of T. humilis and brought it to the attention of the other authors. We quickly realized that the specimen corresponds to typical material of Protothelenella corrosa (Fig. 5). Indeed, P. corrosa is one of the few peritheciate crustose lichens in eastern North America that occurs on non-calcareous rocks and has hyaline, muriiform ascosporas and octosporous asci. Comparison between the original description of T. humilis and published accounts of P. corrosa (e.g., Mayrhofer & Poelt 1985, Lendemer et al. 2009) further confirmed the identification based on the presence of submuriform ascosporas and a C+ pink-red thallus. As is evidenced by the comparative specimens cited below, P. corrosa is widely distributed in northeastern North America and the type of T. humilis was collected well within the documented range of P. corrosa (Fig. 2B). We here place T. humilis in synonymy with P. corrosa.

Figure 5. Morphological comparison of *Thelenella humilis* (A,C,E) (all from the holotype) with *Protothelenella corrosa* (B,D,F) (all from Lendemer 32525). A and B, gross morphology of the thallus. C-F, detail of the ascomata. Scales = 1.0 mm in A-D, 0.5 mm in E and F.

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**LITERATURE CITED**


