

On the specific epithet “*vaccinii*” of Ashmead, 1887 and Burks, 1979 (Hymenoptera, Cynipidae)

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Abstract

Ashmead (1887) provided descriptions of two species of Cynipidae with “*vaccinii*” as the specific epithet: *Solenozopheria vaccinii* Ashmead, 1887 and *Acraspis vaccinii* Ashmead, 1887. There are numerous nomenclatural issues that have arisen from these descriptions. To resolve them, we have examined all relevant primary types and provide images of these specimens, as well as their labels. We recognize as valid the two “*vaccinii*” species, *Loxaulus vaccinii* (Ashmead, 1887) and *Zopheroteras vaccinii* (Ashmead, 1887), and list their synonyms. We also include the following new nomenclatural and taxonomic acts: *Acraspis vaccinii* Ashmead, 1887: lectotype by present designation; *Callirhytis vaccinii* Burks, 1979: species *incertae sedis*; *Andricus impositus* Beutenmüller, 1918: revalidated status; *Andricus verifactor* Kinsey, 1922: new status.

Keywords

Acraspis, *Andricus*, *Callirhytis*, gall wasps, *Loxaulus*, nomenclature, *Solenozopheria*, taxonomy, *Zopheroteras*

Introduction

Oak gall wasps (Hymenoptera, Cynipidae, Cynipini) are by far the most species-rich group of gall wasps, with about 1,000 known species in 50 genera worldwide (Melika and Abrahamson 2002; Csóka et al. 2005; Ronquist et al. 2015; Péntzes et al. 2018; Pujade-Villar et al. 2020; Melika et al. 2021; Melika and Nicholls 2021). The oak gall wasp tribe Cynipini induces galls on host plants within both *Quercus* L. and non-*Quercus* genera of Fagaceae [such as *Chrysolepis* Hjelmq. and *Notholithocarpus* Manos, Cannon and S.H. Oh in North America (Burks 1979; Csóka et al. 2005; Péntzes et al. 2018; Melika et al. 2021)].

About 680 species of oak gall wasps are known from the Nearctic region (Burks 1979; Melika and Abrahamson 2002; Melika and Nicholls 2021). Many of these species have been repeatedly transferred to other genera over time by different authors, which has inevitably led to numerous nomenclatural issues – for example, misplacements and misassociations of species with the same specific epithet. These nomenclatural problems worsen when a species originally described solely from galls, that is, without obtaining the adult wasps, is later associated with the wrong adults. This is what has happened with the species that share the epithet “*vaccinii*”.

Ashmead (1887) described two species of Cynipidae with “*vaccinii*” as the specific epithet: *Solenozopheria vaccinii* Ashmead, 1887: 149 and *Acraspis vaccinii* Ashmead, 1887: 136. There are numerous nomenclatural issues that have arisen from these descriptions, so our intent here is to bring clarity and resolution to these problems. To this aim, we have traced the usage of the epithet “*vaccinii*” throughout history to clarify the affiliation of the species involved.

Material and methods

We have examined the original descriptions of the species involved and all relevant primary types. A total of nine species is addressed in this revision: *Acraspis vaccinii* Ashmead, 1887; *Andricus chapmanii* Melika & Abrahamson, 2021; *And. impositus* Beutenmüller, 1918; *And. lustrans* Beutenmüller, 1913; *And. robustus* Weld, 1926; *And. verifactor* Kinsey, 1922; *Callirhytis vaccinii* Burks, 1979; *Cynips vacciniiformis* Beutenmüller, 1913, and *Solenozopheria vaccinii* Ashmead, 1887.

The type material and other material examined are deposited in the following institutions: the American Museum of Natural History (AMNH), New York, USA; the Academy of Natural Sciences of Drexel University (ANSP), Philadelphia, Pennsylvania, USA; the National Museum of Natural History (USNM), Washington, D.C., USA.

Results and discussion

Solenozopheria Ashmead, 1887 was synonymized with *Loxaulus* Mayr, 1881 by Weld (1951: 643); hence *Solenozopheria vaccinii* was then recognized as *Loxaulus vaccinii* (Ashmead). This species had been described based on adult wasps reared from the wild low-

bush blueberry *Vaccinium angustifolium* Ait. (as *V. pennsylvanicum* Lam.) and the northern highbush blueberry *V. corymbosum* L. Melika and Abrahamson (2000) determined that Ashmead (1887) had incorrectly associated the galls with the adult gall wasps, and that the real gall inducer on blueberries was *Hemadas nubilipennis* (Ashmead, 1887) [Chalcidoidea, Ormyridae (after Burks et al. 2022)]. The actual hosts of *L. vaccinii* are oaks, *Quercus chapmanii* Sarg. and *Q. stellata* Wangenh. (Weld 1921). Also, Melika and Abrahamson (2000: 209) synonymized *Loxaulus humilis* (Weld, 1921) with *L. vaccinii*. For future reference in the text, *L. vaccinii*, an oak galler that does not gall blueberry, has not undergone any other taxonomic change and has never been included in *Callirhytis* Foerster, 1869. This information is critical for assigning hosts for parasitoid species (see below).

A chronological summary of these changes is presented here:

***Loxaulus vaccinii* (Ashmead, 1887)**

Solenozopheria vaccinii Ashmead, 1887: 134, 149 (only asexual females);

Compsodryoxenus humilis Weld, 1921: 190, 193 (asexual female and gall);

Loxaulus vaccinii (Ashmead); Weld (1951: 643);

Loxaulus humilis (Weld); Weld (1951: 643) [synonymized by Melika and Abrahamson (2000: 209)].

The history of *Acraspis vaccinii* is far more complicated. Osten-Sacken (1862: 255) characterized a gall from post oak, *Q. stellata* (as *Q. obtusiloba* Michx.), found by him on a tree in Washington (p. 241) in October 1861, but did not provide a name, nor rear any adult wasps. Later, Ashmead (1887: 127, 136) provided a name for this species, duplicating Osten-Sacken’s (1862) description of the gall, and adding a short description of the apterous adult wasps. Ashmead’s unfortunate choice of “*vaccinii*” as specific epithet for this species was in reference to Osten-Sacken’s (1862) mention of the gall shape: “their shape may be compared to that of the flowers of *Vaccinium*”. *Acraspis vaccinii* was later transferred to *Zopheroteras* Ashmead, 1897 (Ashmead 1897: 261). Later, Ashmead (1903: 148) formally designated *A. vaccinii* as the type species of *Zopheroteras*; this act referred only to adults and did not mention the galls.

Almost in parallel, Kieffer (1902: 97) assigned *Acraspis vaccinii* to *Trigonaspis* Hartig, 1840 and, later, Dalla-Torre and Kieffer (1910: 393) considered *Zopheroteras* (galls and adults) a junior synonym of *Trigonaspis*. Weld (1922: 9) resurrected *Zopheroteras* and synonymized *Parateras* Ashmead, 1887 under *Zopheroteras*. In the same study, Weld (1922) mentioned that the gall that Ashmead (1887) had described for *Acraspis vaccinii* corresponded to galls of a winged species which Beutenmüller (1918: 329) had previously described as *Andricus impositus* Beutenmüller, 1918, and stated that the true gall of *Zopheroteras vaccinii* had not yet been described; this was supported by the observation that Ashmead’s *A. vaccinii* adult wasps were apterous (Fig. 1). Hence, Weld (1922) concluded that Ashmead (1887) had misidentified the gall and misassociated adults of his new genus *Zopheroteras* with the galls described as *Acraspis vaccinii*.

However, the name confusion of these wasps was still developing. Based on gall, adult morphology and host, Weld (1926: 95) synonymised *Andricus impositus* with *Andricus lustrans*

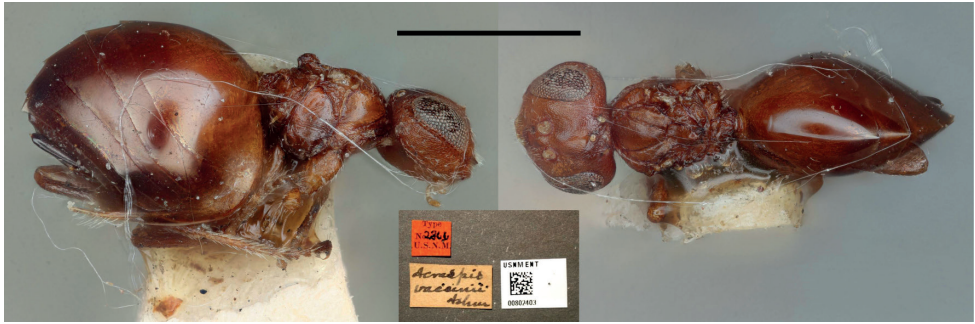


Figure 1. Habitus and labels of Lectotype of *Acraspis vaccinii* Ashmead, 1887, deposited in the USNM (<https://collections.nmnh.si.edu/search/ento/>). Scale bar: 1 mm.

and transferred *A. lustrans* (= *A. impositus*) to the genus *Callirhytis* Foerster, 1869. In the same paper, *Andricus dimorphus* var. *verifactor* Kinsey, 1922 was synonymized under *Callirhytis lustrans* and the galls of *Acraspis vaccinii* were identified as those of *C. lustrans*.

Weld (1951: 650) considered *Acraspis vaccinii* (galls only) as a *nomen nudum*, under *C. lustrans*. However, we consider that this *nomen nudum* assignment was an error as the galls were described under that name, but erroneously associated with the adults described therein, resulting in a mixed type series. Weld (1951: 643) indicated *Acraspis vaccinii* (adult female only) as the type species of *Zopheroteras*.

More recently, Burks (1979: 1095, 1106) considered the adult wasps of *Acraspis vaccinii* as *Zopheroteras vaccinii*, but the galls as *Callirhytis vaccinii* Burks, 1979, listing *Andricus lustrans*, *A. impositus* and *A. dimorphus* var. *verifactor* as junior synonyms of the latter, thus mysteriously regarding Ashmead's name as valid for two different taxa. It can, however, be considered that Burks (1979) effectively established a new species, *Callirhytis vaccinii*, for the galls since he referred to Ashmead's description of them, complying with Article 13.1.2 of the International Code of Zoological Nomenclature (ICZN 1999). Finally, Zhang et al. (2022: 69) re-established the name *Andricus lustrans* as a valid species, removing it from *Callirhytis*.

The International Code of Zoological Nomenclature (ICZN 1999: Article 72.4.1) specifies that the type series includes all specimens that the author included in the new taxon "whether directly or by bibliographic reference" (except any disclaimed by the author). Article 73.2.1 reinforces this broad concept of syntypes, including specimens representing the work of an animal if described before 1931 (Article 1.2.1). Ashmead (1887: 136) quoted Osten-Sacken's description of the gall, rather than writing his own, but also described two adult specimens (implied to have been reared from similar galls), so both components were properly described. He also stated that he had seen similar galls "on the Post Oak at Asheville, N.C." Consequently, the type series must include the two adult female specimens, both labelled as "type 2866" (deposited in USNM and ANSP), plus the gall specimens that Ashmead saw from Asheville, and the gall specimens from Washington that Osten-Sacken used for his description. The USNM has several collections of galls, identified as *Callirhytis vaccinii* and matching the description, and collected on "*Q. obtusiloba*", some from Florida, and others card-mounted without further data but labelled as "type 2866" (Fig. 2A); the latter may very well represent the Asheville specimens, but we cannot assume this since

the type labels were undoubtedly later additions, and we thus do not consider them to be syntypes. Further galls in the USNM, also labelled as *Callirhytis vaccinii*, were collected by Ashmead in Florida, but on “*Q. minor*”, and so cannot be syntypes (although they have erroneously been labelled as cotypes, Fig. 2B). To add to the confusion, there are five galls in ANSP labelled as “type” of *Acraspis vaccinii* in a similar style to some of the USNM galls, but collected in Florida on “*Q. obtusiloba*”, and so also not syntypes. Unfortunately, the syntype galls are thus presumed to be lost, misplaced or unidentifiable as such. We hereby formally designate the USNM type 2866 (USNMENT802403) as the lectotype of *Acraspis vaccinii* Ashmead, 1887 (Fig. 1), and the specimen (also labelled as a type, number 2866) deposited in ANSP as a paralectotype. This fixes the name as applicable to the adult only.

A chronological summary of these changes is provided here:

***Andricus lustrans* Beutenmüller, 1913**

Acraspis vaccinii Ashmead, 1887: 136 (only galls) [synonymized by Weld (1926: 95)];
Andricus lustrans Beutenmüller, 1913: 244; Zhang et al. (2022: 69);
Andricus impositus Beutenmüller, 1918: 329 [synonymized by Weld (1926: 95)];
Andricus dimorphus verifactor Kinsey, 1922: 15 [synonymized by Weld (1926: 95)];
Callirhytis lustrans (Beutenmüller); Weld (1926: 95);
Callirhytis vaccinii Burks, 1979: 1106 (only galls).

***Zopheroteras vaccinii* (Ashmead, 1887)**

Acraspis vaccinii Ashmead, 1887: 136 (only adults). Lectotype by present designation;
Zopheroteras vaccinii (Ashmead) Ashmead (1897: 261); Weld (1922: 9);
Trigonaspis vaccinii (Ashmead) Kieffer (1902: 97); Dalla-Torre and Kieffer (1910: 397).

The galls of *Andricus lustrans* (? = “*Callirhytis vaccinii*” galls) are similar to those of a recently described new species, *Andricus chapmanii* Melika & Abrahamson, 2021 (Melika et al. 2021), and also to the galls of *Andricus vacciniiformis* (Beutenmüller, 1913) and *Andricus robustus* Weld, 1926. In fact, Beutenmüller (1918) mentioned that the mature galls of *A. lustrans* resembled those of *A. vacciniiformis*, and Weld (1926) wrote that the gall of *A. robustus* had previously been described in connection with the adult of *A. vacciniiformis*, which must then have come from a gall of a different sort accidentally included in the breeding cage. So, what are the “*Callirhytis vaccinii*” galls (Fig. 2)? The oak host of *A. lustrans* is unknown, according to the original description, but the galls of *A. impositus* (junior synonym of *A. lustrans*) occur on *Quercus stellata* (as *Q. minor* (Marsh.) Sarg.), as do the galls of *A. vacciniiformis* and *A. robustus*, while *A. chapmanii* occurs on *Q. chapmanii*. Osten-Sacken’s (1862) galls, and the others mentioned in Ashmead (1897), occurred on *Quercus stellata* (as *Q. obtusiloba*) as shown in the labels visible in Fig. 2A, thus those galls could belong to *A. lustrans*, *A. vacciniiformis* or *A. robustus*. The gall of *A. lustrans* is unknown according to the original description, but has recently been photographed (Zhang et al. 2022). According to the descriptions of these galls, the shape is globular with a nipple at the apex, while those of *A. chapmanii* are truncate at the apex and depressed centrally;



Figure 2. Galls deposited in USNM collection **A** on *Quercus stellata* (as *Q. obtusiloba*) similar to Osten-Sacken galls, confusingly described by Ashmead as “The Huckleberry-like Gall”; card-mounted galls are labelled “Type 2866” but are not syntypes (explanation in text) **B** similar galls, erroneously labelled as cotypes of *Zopheroteras vaccinii*, collected by Ashmead in Florida on *Q. stellata* (as *Q. minor*). Photos by M. L. Buffington.

Beutenmüller (1913) mentioned that *A. vacciniiformis* galls are similar to the huckleberry fruit or to *Celtis occidentalis* L. fruit, but these fruits have different shapes; huckleberry fruit is truncated distally and depressed centrally and *C. occidentalis* has a pointed fruit.

To this point, the identity of the huckleberry-flower-like galls (truncated distally and depressed centrally) from Osten-Sacken (1862), erroneously associated with the adults used by Ashmead (1887) in his description of *Acraspis vaccinii* (Fig. 2), is uncertain. Since there are no adult samples reared from Osten-Sacken (1862) galls, we cannot associate those galls with any of the species mentioned. We therefore designate *Callirhytis vaccinii* Burks, 1979 as a species *incertae sedis*.

Examining the adults, we found important differences (Table 1). Adults of *A. vacciniiformis* have all metasomal segments pubescent (Fig. 3D), while in *A. lustrans*, *A. impositus* and *A. robustus* the pubescence is restricted to the second metasomal segment only (Fig. 3A–C); which may be the reason why both Weld (1926: 81) and Kinsey (1922: 17) mentioned that the “*vacciniiformis*” gall was incorrectly associated. Additionally, Kinsey (1922) affirmed that “*verifactor*” galls are undoubtedly “*vacciniiformis*” galls, and described

the former as a variety of *A. dimorphus* (both are clustered leaf galls), even though both the adults and the galls of *A. dimorphus* (spherical galls) and *A. dimorphus* var. *verifactor* (urn-shaped galls) are different. Also, the synonymy of *A. lustrans* and *A. impositus* is doubtful because the length of the ventral spine of the hypopygium is different (Fig. 3A, B). *Andricus dimorphus* var. *verifactor* has the metasomal terga micropunctate, similar to *A. chapmanii*, so it is not a synonym of *A. lustrans*. Finally, *A. lustrans* has simple tarsal claws (type mate-

Table 1. Characters differentiating members of the *Andricus lustrans* group mentioned in the text. (*) *Andricus verifactor* has mesoscutum and mesopleuron punctate while in *A. chapmanii* these are not punctate.

Species	Metasomal pubescence	Metasomal punctation	Tarsal claw	Ventral spine
<i>A. chapmanii</i> *	Only 2 nd segment	Present	Simple	Long
<i>A. impositus</i>	Only 2 nd segment	Absent	Toothed	Short
<i>A. lustrans</i>	Only 2 nd segment	Absent	Simple	Long
<i>A. robustus</i>	Only 2 nd segment	Absent	Toothed	Long
<i>A. vacciniiformis</i>	All segments	Present	Toothed	Long
<i>A. verifactor</i> *	Only 2 nd segment	Present	Simple	Long

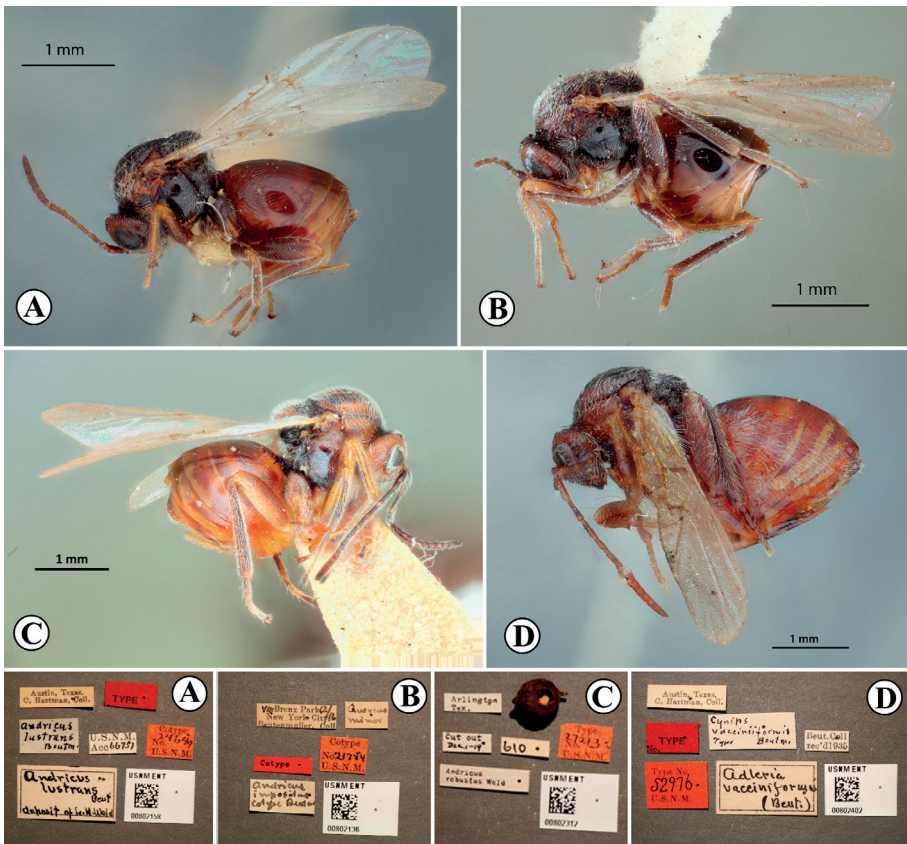


Figure 3. Habitus and labels of type specimens, deposited in the USNM, representing species of concern in this paper **A** *Andricus lustrans*, syntype **B** *Andricus impositus*, syntype **C** *Andricus robustus*, holotype **D** *Cynips vacciniiformis*, syntype. (<https://collections.nmnh.si.edu/search/ento/>). Scale bars: 1 mm.

rial examined), while in *A. impositus* and *A. robustus* they are toothed. Concerning the tarsal claws, *A. impositus* is a valid species, and not a synonym of *A. lustrans*: *Andricus impositus* Beutenmüller, 1918 status revalidated. Regarding the metasomal sculpture, *A. dimorphus* var. *verifactor* (with micropunctures on metasoma) is a valid species, not a synonym of *A. lustrans* (with smooth metasoma): *Andricus verifactor* Kinsey, 1922, stat. nov.

In summary, the species mentioned (in alphabetical order) have the following status and synonymic names:

***Andricus chapmanii* Melika & Abrahamson in Melika et al. (2021)**

Andricus chapmanii Melika & Abrahamson in Melika et al. (2021: 18). Type material deposited in USNM.

***Andricus impositus* Beutenmüller, 1918, status revalidated**

Andricus impositus Beutenmüller, 1918: 329. Type material deposited in USNM.

***Andricus lustrans* Beutenmüller, 1913**

Andricus lustrans Beutenmüller, 1913: 244; Zhang et al. (2022: 69). Type material deposited in USNM and ANSP;
Callirhytis lustrans (Beutenmüller); Weld (1926: 95).

***Andricus robustus* Weld, 1926**

Andricus robustus Weld, 1926: 81. Type material deposited in USNM.

***Andricus vacciniiformis* (Beutenmüller, 1913)**

Cynips vacciniiformis Beutenmüller, 1913: 247. Type material deposited in USNM;
Adleria vacciniiformis (Beutenmüller); Weld (1951: 630);
Andricus vacciniiformis (Beutenmüller); Melika and Abrahamson (2002: 160);

***Andricus verifactor* Kinsey, 1922, stat. nov.**

Andricus dimorphus var. *verifactor* Kinsey, 1922: 15. Type material deposited in AMNH and USNM;
Andricus dimorphus verifactor Kinsey; Weld (1926: 95).

Callirhytis vaccinii* Burks, 1979, *incertae sedis

Acraspis vaccinii Ashmead, 1887: 136 (part, only galls); Weld (1926: 95). Type material presumably lost or unidentifiable as such;
Callirhytis vaccinii Burks, 1979: 1106 (only galls).

***Loxaulus vaccinii* (Ashmead, 1887)**

Solenozopheria vaccinii Ashmead, 1887: 134, 149 (part, only asexual females). Type material deposited in USNM and ANSP;

Loxaulus vaccinii (Ashmead); Weld (1951: 643, only adults); Weld (1926: 95);

Compsodryoxenus humilis Weld, 1921: 190, 193 (asexual female and gall);

Loxaulus humilis (Weld); Weld (1951: 643) [synonymized by Melika and Abrahamson (2000: 209)].

***Zopheroteras vaccinii* (Ashmead, 1887)**

Acraspis vaccinii Ashmead, 1887: 136 (only adults). Type material deposited in USNM and ANSP (see above). Lectotype by present designation;

Zopheroteras vaccinii (Ashmead); Ashmead (1897: 261); Weld (1922: 9);

Trigonaspis vaccinii (Ashmead); Kieffer (1902: 97); Dalla-Torre and Kieffer (1910: 397).

Conclusions

After this revision, the following species are considered to be valid: *Andricus chapmanii* Melika & Abrahamson, 2021; *A. impositus* Beutenmüller, 1918, status revalidated; *A. lustrans* Beutenmüller, 1913; *A. robustus* Weld, 1926; *A. vacciniiformis* (Beutenmüller, 1913); *A. verifactor* Kinsey, 1922, stat. nov; *Loxaulus vaccinii* (Ashmead, 1887); and *Zopheroteras vaccinii* (Ashmead, 1887). *Callirhytis vaccinii* Burks, 1979 is considered as *incertae sedis*.

The specific epithet “*vaccinii*” has given rise to many nomenclatural and taxonomic problems that have persisted over time. Therefore, it was imperative to clarify its status for the sake of future research. For instance, a catalogue of oak-gall parasitoids is currently in preparation, for which accurate identifications are required. The final purpose of this contribution was to clarify the identities of some of the gall makers and their associated galls so as to be able correctly to assign their parasitoids to each determined species of gall. Various authors cite parasitoids of “*Callirhytis vaccinii*” (e.g., Hanson, 1992: 1340), not recognizing that the identity of the true species involved is currently unknown, as shown above.

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