

Monographiae Botanicae **106**

Małgorzata Ruszkiewicz-Michalska

The genus *Asteromella* (Fungi:  
Ascomycota) in Poland

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**Editorial office**

University of Wrocław  
Institute of Environmental Biology, Department of Vegetation Ecology  
Przybyszewskiego 63, 51-148 Wrocław, Poland  
tel.: +48 71 375 6315  
email: [mb@pbsociety.org.pl](mailto:mb@pbsociety.org.pl)

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## About the author

Małgorzata Ruskiewicz-Michalska, Department of Algology and Mycology, University of Łódź, Łódź, Poland, email: [mrusz@biol.uni.lodz.pl](mailto:mrusz@biol.uni.lodz.pl)

## Abstract

The critical revision of 59 *Asteromella* species occurring in Poland is presented, based primarily on specimens from Poland, as well as selected herbarial materials from France, Germany, Italy, Latvia, Lithuania, Romania, Slovakia, Switzerland and Ukraine. Some exsiccata, including types of *Asteromella carlinae* Petr., *Asteromella ludwigii* Petr., *Asteromella ovata* Thüm., *Asteromella petasitidis* Petr., *Depazea agrimoniae* Lasch, *Mycosphaerella agrimoniae* Syd., *Phyllosticta borszczowii* Thüm., *Phyllosticta cicutae* Lind, *Phyllosticta eupatoriicola* Kabát & Bubák, *Phyllosticta pleurospermi* Died., *Phyllosticta salicina* Kabát & Bubák, *Phyllosticta senecionis-nemorensis* Sävul. & Sandu, *Phyllosticta wandae* Namysl. were also studied. Each species is accompanied by the information pertaining to host spectrum, morphology of conidiomata, conidiophores, conidiogenous cells and conidia, distribution in Poland and globally, as well as information on synanamorphs and teleomorph, if present.

Two species, *Asteromella moeszii* Ruskiewicz-Michalska & Mullenko spec. nov. on *Pulmonaria obscura* and *Asteromella rupprechtii* Ruskiewicz-Michalska spec. nov. on *Agrimonia eupatoria* are described, based on Polish specimens. A new name, *Asteromella huubii* Ruskiewicz-Michalska nom. nov., is proposed to replace *Asteromella angelicae* (Sacc.) Moesz ex Bat. & Peres. Nine *Phyllosticta* and two *Depazea* species were redispersed into *Asteromella*: *Asteromella acetosae* (Sacc.) Ruskiewicz-Michalska, comb. nov., *Asteromella adoxicola* (Lasch) Ruskiewicz-Michalska, comb. nov., *Asteromella alnicola* (C. Massal.) Ruskiewicz-Michalska, comb. nov., *Asteromella bacilloides* (Dominik) Ruskiewicz-Michalska, comb. nov., *Asteromella prunellae* (Ellis & Everh.) Ruskiewicz-Michalska, comb. nov., *Asteromella garbowskii* (Gucevič) Ruskiewicz-Michalska, comb. nov., *Asteromella lysimachiae* (Allesch.) Ruskiewicz-Michalska, comb. nov., *Asteromella populina* (Fuckel) Ruskiewicz-Michalska, comb. nov., *Asteromella salicina* (Kabát & Bubák) Ruskiewicz-Michalska, comb. nov. Neotype of *Asteromella bacilloides* and a lectotype of *Asteromella adoxicola* are designated.

Nine species reported in the literature are not confirmed to occur in Poland; this includes two species that need to be recollected [*Asteromella scabiosae* (Kalymb.) Vanev & Aa and *Asteromella mali* (Briard) Boerema & Dorenb.], as dried specimens are scarce and deficient. Affinity of *Asteromella confusa* (Bubák) Petr. to *Asteromella* vs. *Phoma* is briefly disputed. New records and new data on the distribution of *Asteromella* species in Latvia, Poland, Slovakia, Switzerland and Ukraine are also provided. Three species are reported as new to Polish fungi: *Asteromella prunellae*, *Asteromella melampyrina* and *Asteromella moeszii*.

## Keywords

fungal biodiversity; Poland; anamorphic fungi; microconidial or spermatial state; asexual morphs; *Mycosphaerella* s. l.; *Phyllosticta*; *Depazea*; *Ramularia*; *Septoria*

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### **Competing interests**

No competing interests have been declared.

# 1. General synopsis of the genus

The anamorphic genus *Asteromella* Pass. & Thüm., currently located in Dothideomycetes *incertae sedis* Ascomycota [1], is most likely polyphyletic [2] as polyphyletic is its presumed teleomorphic stage assigned to the genus *Mycosphaerella* s. l. [3] (see also Chapter 1.3). *Asteromella* appears to be an assembly of species that share the same type of conidiogenesis and conidiomatal characteristics, presumably due to the function-related convergence of these structures. Traditionally, leaf-inhabiting, pycnidia-forming fungi that produce minute, rod-shaped or bacteria-like, one-celled, hyaline conidia were ascribed to this genus. Species of *Asteromella* were separated primarily on the basis of supposed host specificity, as it is impossible to distinguish species using only a small number of morpho-anatomical features exclusively [4,5]. The genus concept has not been amended since its description in 1880. In contrast, the status of the genus has changed significantly over time, ranging from being defined as a taxonomic entity [6], an anamorph genus [7] and a supposed fertilizing agent in sexual reproduction [8] (andromorph [9]). Nomenclature pertaining to fungal structures followed these changes and a number of alternate terms were used for conidiomata (pycnidia, pycnostromata, spermogonia, spermatogonia), spore-bearing and producing structures (sporo-, conidio- or spermatophores, spermatiferous, conidio- or spermatogenous cells) and spores (pycnospores, conidia, microconidia, spermatia). Currently, *Asteromella* fungi are commonly considered to be the spermatial or microconidial states of species of the polyphyletic genus *Mycosphaerella* Johanson s. l. (see, e.g., [8,10]).

The genus *Asteromella* has not been critically monographed, either locally or globally. The genus was partially revised in 1960s by Batista et al. [11] and Batista and Peres [12], who examined and illustrated 30 species. Later, Vanev and Aa [10] presented a compilation of all names published in *Asteromella*, together with basic information concerning the type specimens of each of the 168 species listed.

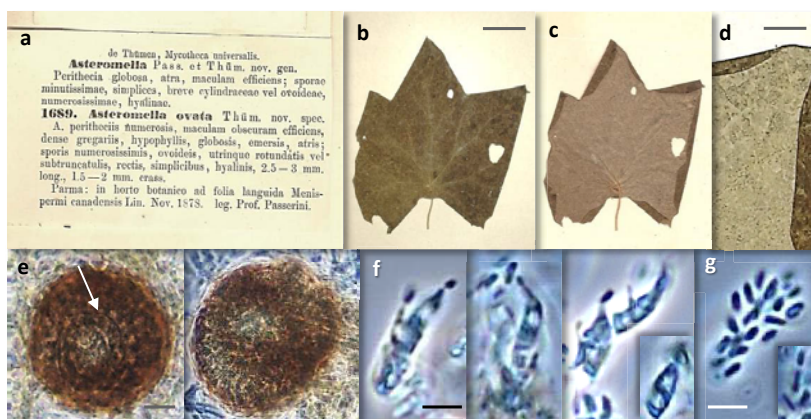
According to 10th edition of *Dictionary of Fungi* [2], the number of *Asteromella* species was estimated at 234 in 2008. In July 2016, the total number of *Asteromella* species listed in the databases of Index Fungorum [13] and MycoBank [14] accounts for 264 (see Appendix 1 in Chapter 6). This number includes a number of questionable names (illegitimate or invalid) and five species excluded from the genus in course of studies conducted by von Höhnelt [15], Sutton [4] and de Gruyter et al. [16]. These are *Asteromella epitrema* Cooke, *A. sphaerospora* Sacc. & Traverso, *A. castaneicola* (Ellis & Everh.) Petr., *A. tiliae* (F. Rudolphi) Butin & Kehr and *A. lupini* (Ellis & Everh.) Petr.; these are currently placed in genera *Dasystictella* Höhn., *Coniella* Höhn., *Paraconiothyrium* Verkley and *Plenodomus* Preuss, respectively. Four *Asteromella* species are attributed to F. Petrak [13]; however, the time and place of their publication is unknown; they are *Asteromella leptidea* (Fr.) Petr., *A. livida* (Ellis & Everh.) Petr., *A. longissima* (Pers.) Petr. and *A. quercicola* Petr. (see final notes, Appendix 2).

More than 60% of the taxa currently accepted in *Asteromella* were originally described in other genera: mostly in *Phyllosticta* Pers., but also in *Phoma* Sacc., *Ascochyta* Lib. and others. Most were transferred to *Asteromella* fairly recently, in the course of the revision of the genus *Phyllosticta* s. l. [5].

## 1.1. Historical review

The genus *Asteromella* was introduced in 1880 with a description of a single coelomycetous fungus producing minute, bacteria-like spores, i.e., *Asteromella ovata* Thüm., collected by G. Passerini in Parma, Italy [6]. Type species, with specimens distributed in *Mycotheca Universalis* No. 1689, is hosted by *Menispermum canadense* L. (Fig. 1), as mentioned in the protologue [6]. The host plant was later erroneously cited in *Sylloge Fungorum* III [17] to be *Acer pseudoplatanus*, collected in Klosterneuburg, Austria. This misstatement was followed by Vanev and Aa [10] listing both plant species as hosts of *Asteromella ovata*. The characteristics of type species provided by Thümen [6] included features of conidiomata and conidia, as well as information about dark lesions of host plant leaves caused by fungus. Spore-producing structures (conidiogenous cells) were not mentioned in the diagnosis. The first indication of their presence in type material and illustration were given a century later by Sutton [4]. In early descriptions, *Asteromella* species were characterized based on host species and its reaction to the fungal infection (mainly leaf spots), as well as on the morphology of the conidiomata (as perithecia) and spores. Eleven species were described in the genus during the first 22 years; the descriptions of these species lacked information about conidiophores and conidiogenous cells. The first, although curt, descriptions of conidiophores were provided in 1903 for *Asteromella sphaerospora* (as basidia) [18] (now in *Dasystictella* Höhn.) and in 1913 for *Asteromella asteris* Peck (as sporophores) [19].

Klebahn [20] was the first to investigate and illustrate the spore-producing structures of *Asteromella*-like fungi. During studies on *Mycosphaerella hippocastani* Jaap, Klebahn [20] observed pycnidia, which he first assumed to belong either to accidental species of *Phyllosticta* or to be filled with bacteria. However, the structures resembling bacteria were also present in the pycnidium of *Septoria* state of *Mycosphaerella*. This led Klebahn [20] to discover microconidia-producing cells intermixed with the conidiophores of macroconidial



**Fig. 1** Isotype of *Asteromella ovata* on *Menispermum canadense* (WRSL). **a** Label with species description. **b,c** Upper and lower surface of host leaf. **d** Leaf fragment with symptoms of infection visible at its lower side. **e,f** Microscopic structures. **e** Conidiomata. **f** Conidiophores and conidiogenous cells. **g** Conidia. Scale bars: **a–c** 1 cm; **d** 2 cm; **e** 20  $\mu$ m; **f,g** 5  $\mu$ m.



state – *Septoria*. Furthermore, the uppermost conidiogenous cell of some *Septoria* conidiophores also produced microconidia (Fig. 10a, page 58 in [20]). Klebahn [20] confirmed a microconidial state in the life cycle of *M. hippocastani* using cultures and concluded that microconidia are formed at the end of the macroconidia-production period. In the same comprehensive study, conidiophores and microconidia of *Mycosphaerella punctiformis* (Pers.) Starbäck f. *tiliae* Kleb. were illustrated as formed in vivo in pycnidia, and inside the basic stroma of the conidiophores of *Passalora microsora* (Sacc.) U. Braun (= *Cercospora microsora* Sacc.). Klebahn [20] considered whether this microconidial state could be identical to *Phyllosticta bacterioides* Vuill., which, according to Vuillemin's [21] description, was also associated with *Cercospora microsora* Sacc. Microconidia were also found in sclerotia accompanying ascomata of *Mycosphaerella hieracii* (Sacc. & Briard) Jaap and in pycnidia from ascospore-derived culture of *Sphaerulina rehmanniana* Jaap [20]. However, in the case of these two species, neither conidiophores nor conidiogenous cells were described. All of these observations presumably concerned the *Asteromella* species although no specific epithets were ascribed to microconidial states by Klebahn [20].

Fundamental for understanding the biology of *Asteromella*-like fungi were studies conducted by Higgins [22–24], who focused on the life history of a few *Mycosphaerella*-like species. Special attention was paid to the connections of anamorphic and teleomorphic stages, and to the role of microconidia. First, Higgins [22,23] characterized in detail the formation of spermogonia and spermatia as well as the development of ascomatal primordia and young ascomata following putative spermatization. Evidence that spores of *Asteromella* do function as spermatia was finally provided in 1936 in a paper concerning the life cycle of *Mycosphaerella tulipiferae* (Schwein.) B. B. Higgins [24]. Another confirmation was provided in a similar study on the biology of *Mycosphaerella brassicicola* (Duby) Lindau conducted by Dring [25] and in case of *Mycosphaerella jaczewskii* Potebnia by Brezhnev ([26], after [27]).

In the next years of the twentieth century, a total of 80 species were described and 69 reallocated in *Asteromella*, primarily from *Phyllosticta* s. l. Two waves of increasing interest in the genus are noted; first, 1923–1934 is associated primarily with the activities of H. Sydow and F. Petrak [28–32]. Petrak [33,34] and H. von Rupprecht [35,36] contributed to the second wave in the 1950s, when more species were transferred to *Asteromella* compared to those that were newly described. In the following years (1960–1961), the first taxonomic surveys of *Asteromella* were carried out by Batista et al. [11] and Batista and Perez [12]. They re-described in total 30 of 138 species known at that time, providing detailed descriptions of habitus, pycnidia and spores, and in the case of a few species, conidiophores. The revisions were based on materials from the herbaria in Leiden (currently U) and Budapest (BP); however, types were studied for only six species: *Asteromella ovata*, *A. phalaridis*, *A. podocarp*i, *A. vulgaris* [11], *A. drymariae* and *A. velata* [12]. In the first paper [11], drawings of pycnidia and spores are provided for each species, the first illustration for the majority of these. In the case of *A. stemmatea* and *A. podocarp*i, the drawings also clearly show the conidiophores. In the second paper, materials primarily collected by G. Moesz were studied [12] and yielded descriptions of two new species: *A. galii-schultesii* Moesz and *A. pulmonariae* Moesz, both invalidly published with Portuguese descriptions. Additionally, seven new combinations were provided, clearly created on the basis of the opinions (?) of Gusztáv von Moesz (died in 1946), since his name is given as an author of the new combinations. None of the new combinations was based on revision of the type materials.



At the start of the twenty-first century, van der Aa and Vanev [5] monographed *Phyllosticta* s. l., that brought about the revision of numerous species and drastic changes in terms of understanding the genus volume. Analyses of holotypes or original descriptions and diagnoses allowed the researchers [5] to reallocate to *Asteromella* 83 species primarily described in *Phyllosticta*. In addition, several dozens of other *Phyllosticta* species were suggested as also belonging to *Asteromella*. Thereafter, only two species have been described and one *Phyllosticta* species has been redispersed to the genus *Asteromella* [37,38]. However, an *Asteromella*-like spermatial state has been reported in association with many recently described ascomycetes including *Cercospora*, *Clypeispora*, *Mycosphaerella*, *Pseudocercospora*, *Ramularia*, *Septoria*, *Sphaerulina*, *Stenella*, *Teratosphaeria* and *Zasmidium* [39–55].

## 1.2. *Asteromella* in a molecular era

For several reasons, fungi classified in *Asteromella* appear to be a group that has been neglected in modern mycology. First, most authors have followed the logical principle of “one fungus – one name”, even prior to being formally introduced to the Melbourne Code in 2011 [56,57]. Secondly, at the basis of the application of this principle to *Asteromella*-like species lies the common conviction of the participation of all such fungi in the fertilization process [2,5,58–63]. This generally-accepted assumption relies mostly on four premises: (i) small size of spores, (ii) their inability to germinate and to infect the host, (iii) the coincidence of spermogonia with asco- and conidiomata, (iv) the high morphological resemblance of spermogonia to young ascomata. However, only in a small number of cases has the fertilizing role of *Asteromella* spores been confirmed in field experiments or observed in the culture-based studies of *Mycosphaerella* species [24–27]. The unreliability of co-habitation is high, however, as demonstrated already by Klebahn in 1918 [20]. Recently, this unreliability has further increased, with reports demonstrating joint occurrence of diverse *Mycosphaerella* species, e.g., in a single leaf lesion of *Eucalyptus* [64,65]. In the newest revision of the *Ramularia endophylla* complex, Videira et al. [66] indicate that the role played by the *Asteromella* spermatial state in the development of the species still needs to be understood.

A third reason for the limited taxonomic interest in *Asteromella* fungi results from problems related to their culturing. Species which were attempted to cultivate did not germinate on any kind of the wide spectrum of cultural media used (e.g., [50,67,68]). However, the number of tested species remains scant. Tests have been conducted almost exclusively for those species that were already confirmed as spermatial states of *Mycosphaerella*. The majority of species, only presumably spermatial, were not tested with respect to growth in axenic cultures.

Modern genetic methods have delivered new insights into the taxonomy of many anamorphic fungi. DNA sequence-data have proven to be an extremely useful tool for integrating different morphs of a holomorph [69]. Examples concern many ascomycetous taxa including *Mycosphaerella* s. l. as well as its segregates, *Septoria* and *Ramularia* (e.g., [66,70–72]). In fact, the complex of *Mycosphaerella* and its anamorphs has recently been widely studied; roughly 35 000 sequences generated to date are available in the GenBank database [73]. In contrast, the molecular data available for species listed under *Asteromella* name remain

limited in the GenBank database [73]. These concern two economically important species: *A. brassicicola* (Chevall.) Boerema & Kesteren and *A. pistaciarum* Bremer & Petr. as well as two taxa recently excluded from the genus by de Gruyter et al. [16]: *Paraconiothyrium tiliae* (F. Rudolphi) Verkley & Gruyter and *Plenodomus lupini* (Ellis & Everh.) Gruyter, Aveskamp & Verkley. A number of endophytic and leaf litter-isolated *Asteromella* sp. sequences has also been contributed by different authors [73]. No data are available on *Phyllosticta* species that supposedly belong to *Asteromella*.

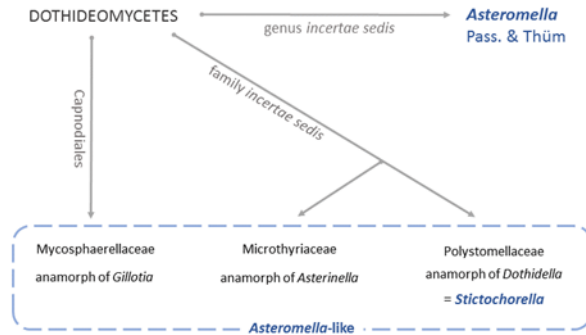
The elucidation of the role of *Asteromella* fungi in the life cycle of ascomycetous taxa as well as the tangled issue of host specificity require genetic and experimental studies that extend beyond the scope of the current study. Most likely, the culture-based approach is as promising as a molecular one, because the characteristics of *Asteromella* states hitherto studied in vitro were completely congruent with those observed in vivo.

### 1.3. Synonyms, classification and asexual/sexual links

Up to seven genera are listed as synonyms of *Asteromella* by different sources [4,10,13,14,74]. First, Petrak [28] stated that the monotypic genus *Stictochorellina*, described by him a year earlier, is identical to *Asteromella*. Petrak [28] also assumed *Asteromella* to be a simplified *Stictochorella* Höhn. Of these two, only the latter was listed as a synonym of *Asteromella* in the compendium of fungal genera in 1931 [75]. Five out of 15 *Stictochorella* names are classified in *Asteromella* and two others were at least temporarily included in the latter genus (according to Index Fungorum [13]). Later, Ciferri [76] provided another synonym of *Asteromella* by reallocating *Phyllonochaeta solani* Gonz. Frag. & Cif., the type species of the monotypic genus *Phyllonochaeta*. In Sutton's "Nomenclature of generic names proposed for Coelomycetes" [74], two other names were added to the list of synonyms: *Apiosporella* and *Aplosporidium*, both of which were introduced by Spegazzini for a new genus in a single paper from 1912 [77]. The newly described monotypic genus *Apiosporella* was already an illegitimate homonym for *Apiosporella* Höhn. from 1909 and *Apiosporella* Speg. from 1910. On subsequent pages, Spegazzini [77] corrects the name twice, first in erratum, where *Haplosporidium* is indicated as the correct name of the new genus. Secondly, the name *Aplosporidium* was applied instead of *Haplosporidium* in the general index to the species mentioned in this and the previous five parts of the series of publications on fungi of Argentina [77]. It is worth noting that in 1910 *Haplosporidium* Speg. had already been illegitimate (homonym of *Haplosporidium* Caullery & Mesnil from 1899).

In the only survey of the genus worldwide by Vanev and Aa [10], *Plectophoma* Höhn. and *Porterula* Speg. were also listed as synonyms of *Asteromella*. Except for *Phyllonochaeta*, the view of Vanev and Aa [10] is followed by the Index Fungorum database [13], while in MycoBank [14], *Apiosporella*/*Aplosporidium* is not listed among *Asteromella* synonyms.

Following the classic approach of anamorph classification, Melnik proposed in 1986 *Asteromellaceae*, i.e., the *Asteromella*-based family in the Coelomycetes class [78]. According to Cannon and Kirk [79], the family is currently included into synonyms of Didymosphaeriaceae Munk (currently in Pleosporales, Pleosporomycetidae [80]). Most authors classify *Asteromella* species together with *Mycosphaerella* in *Mycosphaerellaceae* (e.g., [81,82]), a



**Fig. 2** Taxonomic placement of *Asteromella* and *Asteromella*-like species according to Wijayawardene et al. [83].

family in Capnodiales, Dothideomycetidae, Dothideomycetes, Pezizomycotina, Ascomycota [80]. However, in the available literature, the name *Asteromella* is also associated with taxa other than *Mycosphaerella*. In course of a recent attempt to classify asexual genera in a natural biological system of fungi [83], *Asteromella* and *Asteromella*-like species were listed in four different entries (Fig. 2). The core group of species (primarily described in *Asteromella* or reallocated from *Phyllosticta*, *Phoma* and *Ascochyta*) is referred to as the genus *incertae sedis* within Dothideomycetes (Ascomycota) [83]. *Asteromella*-like species are listed as associated with the genera *Gillotia* Sacc. & Troter, *Dothidella* Speg. and *Asterinella* Theiss.

The *Asteromella*-like asexual state of *Gillotia* was noted by Arx and Müller [81]. The genus *Dothidella* shares *Stictochorella* anamorphs with *Asteromella*, although only a part of the species described in *Stictochorella* was reallocated in *Asteromella* (according to Index Fungorum [13]). The connection of *Asteromella*-like fungi with *Asterinella* likely resulted from a typographical error, as anamorphs of Asterinales were classified in *Asterostomella* Speg. [84]. In recent critical evaluations of ascomycetes [1,85] and in the revision of Asterinales in particular [84], *Asteromella* is no longer listed among the names of asexual morphs of Microthyriaceae.

According to Crous et al. [82], *Asteromella* species are spermatial states of *Mycosphaerella* s. l. taxa belonging to the former *Mycosphaerella* section *Caterva* and section *Mycosphaerella* having *Ramularia* asexual morphs (= *Mycosphaerella* Johanson s. str.) [66]. The analysis of data on synanamorphs associated (co-occurring) with *Asteromella* species in the type materials (Appendix 1) reveals that *Asteromella* fungi had been recorded either with *Ramularia* or *Septoria* morph. This is congruent with the earlier assumption of Aa and Vanev [5], as well as recent results of molecular studies that have proven *Ramularia* and *Septoria* to be different clades of *Mycosphaerella* s. l. [55,72]. The only exception is *Asteromella* (= *Phyllosticta*) *buphthalmi*, described by Allescher [86] as co-occurring with *Ramularia buphthalmi*. The later verification of the holotype also revealed the presence of *Septoria buphthalmi* and resulted in its inclusion in a group of presumed synanamorphs of *A. buphthalmi* [5].

In total, 216 *Asteromella* species are not regarded as associated with any other morph. Among the 47 species of known anamorphic associations, 20 names are linked to *Septoria* taxa (including *Phloeospora*), 16 to *Ramularia*, seven to *Passalora/Cercospora*, two to *Phyllosticta* and one each to *Stagonospora* and *Pseudocercospora*.

According to original species diagnoses and later revisions of type specimens [5], 56% of *Asteromella* species (142 out of 262) co-occurred with their sexual morphs, predominantly those classified in *Mycosphaerella* s. l. In many of these cases, no specific species could be indicated, as only immature, presumably mycosphaerellean ascomata were observed. Moreover, in the case of some host families, more than one *Mycosphaerella* species is described on the host genus or family, mostly with no information on its spermatial state. For the remaining of *Asteromella* species (120), no sexual morphs are indicated in original descriptions, secondary collections or reported in later studies of holotypes.

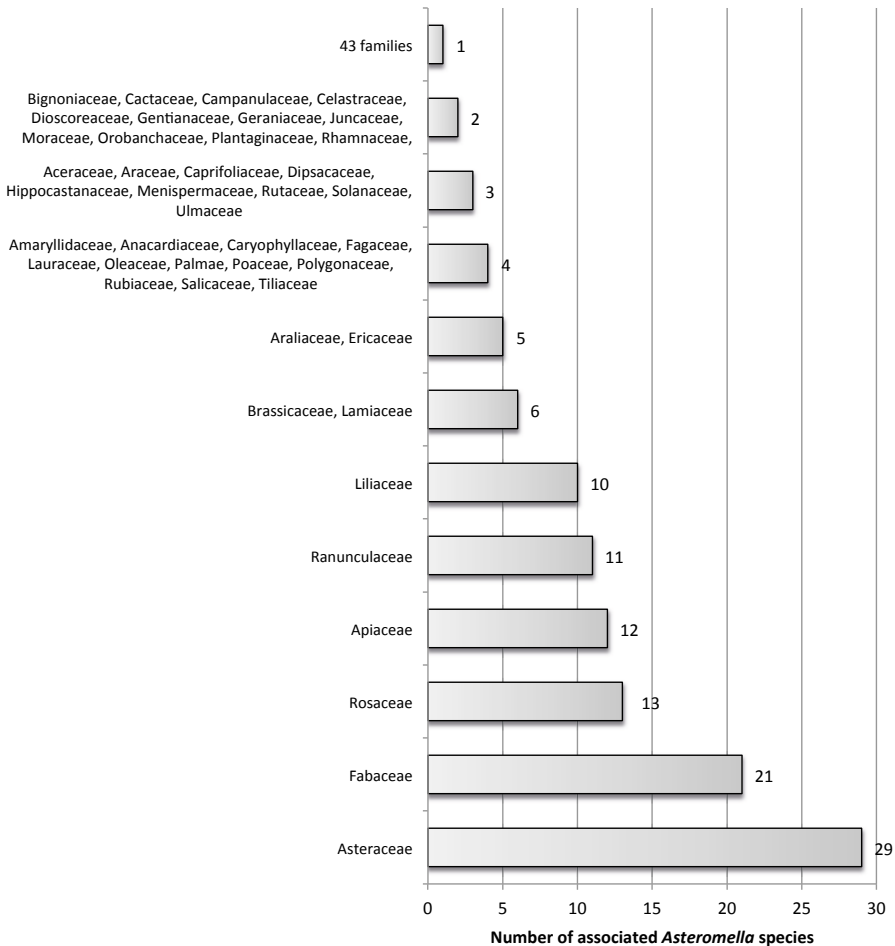
Thirty-one species of *Asteromella* have been listed as co-existing with both asexual and sexual morphs. However, in the majority of cases (18 species), an assumption was made based only on immature mycosphaerella-like ascomata or ascomatal primordia present in type materials [5].

#### 1.4. Ecology and host-plant relationships

The host criterion has been one of the basic criteria for the delimitation of *Asteromella* species, despite not being a stable rule; this is true for 41 host families, primarily dicots from subtropic- and tropical areas. More than a single species has been described for 46 out of the 87 host families containing *Asteromella* hosts (Fig. 3). For six families, association with more than nine *Asteromella* species have been reported. The highest number of *Asteromella* species has been described on hosts from highly differentiated and circumglobally-spread families: Asteraceae and Fabaceae, followed by Apiaceae, Ranunculaceae, Rosaceae and Liliaceae. However, neither host specificity nor the identity of morphologically-uniform species occurring on diverse hosts within the same genus occurring at different continents have been discussed or analysed in the literature until now.

Worldwide, six species are referred to as polyphagous: *Asteromella artemisiae*, *A. longissima*, *A. maculiformis*, *A. osteospora*, *A. ovata* and *A. vulgaris* [10]. As already noted, *Asteromella ovata* was wrongly reported on hosts from two families. Host lists for the rest of the above-listed species include data pertaining to different varieties, forms or states (ana- and teleomorph), although their genetic connections have yet to be proven. Data on *A. artemisiae* exclusively concern the hosts of its supposed teleomorph, i.e., *Leptosphaeria artemisiae*; the exact host of the *Asteromella*-state, to date only observed in culture, is not listed in the diagnosis [87]. Hosts of *A. longissima* include species reported for its basionym *Sphaeria longissima* and synonym *Phoma longissima*. In the case of *A. osteospora*, species hosting var. *samaricola* (*Fraxinus*), as well as hosts (e.g., *Morus* and *Rhamnus*) from Saccardo's secondary collections from PAD, were incorporated into the species host spectrum. Similarly, the fabaceous host of the *Asteromella vulgaris* forma *gleditschiae triacantis* Thüm. was included in the host spectrum of *Crataegus*-associated *A. vulgaris*. This seems illogical in light of the overall host-based taxonomy of this genus and the numerous re-dispositions of other subspecific taxa into new species.

Plurivory of *A. maculiformis* resulted from the merging of several *Phyllosticta* species into that of *Asteromella* and the different supraspecific taxa of its presumed sexual morph (*Mycosphaerella punctiformis*). Nevertheless, *Asteromella maculiformis* has raised less doubt



**Fig. 3** Distribution of the number of accepted *Asteromella* species within the host families (data based on Appendix 1, excluding polyphagous species).

in terms of its plurivory, as it was traditionally limited to broadleaved tree hosts in temperate zones. However, the results of a recent genetic study of *Ramularia endophylla* Verkley & U. Braun (the current name for *Mycosphaerella punctiformis*) yielded new data on the species heterogeneity and host spectrum of its segregates, i.e., *R. vizellae* Crous and *R. unterseheri* Videira & Crous [66]. It has been shown that the two latter species, *R. vizellae* in particular, have broad host spectrum that include trees and shrubs (Aceraceae, Betulaceae, Caprifoliaceae, Fagaceae, Hippocastanaceae, Rosaceae and Tiliaceae) as well as herbaceous plants (*Brassica*, *Lotus*, *Phaseolus*). *Ramularia endophylla* has been limited to *Quercus*- and *Castanea*-derived isolates. The role of the *Asteromella* state in the life cycle of *R. endophylla* has not been proven, nor has the spermatial state of *R. vizellae* and *R. unterseheri* been reported [66]. However, when a genetic connection of *Ramularia* and *Asteromella* is assumed, the host-specificity of *Asteromella* shall be questioned.

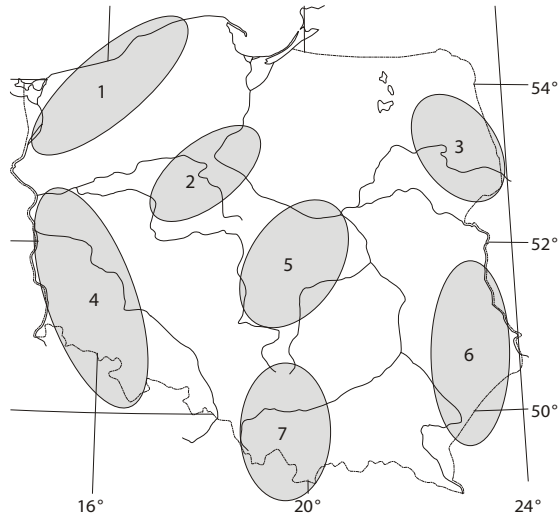
## 2. Material and methods

This study is based on dried exsiccata deposited in the reference collections of B, KRA, KRA-AR (unnumbered), KRAM, LBL, LOD, M, WA, WAUF (unnumbered) and WRS� (unnumbered) (acronyms according to Thiers [88]) and in two institutions: Department of Mycology, University of Warmia and Mazury in Olsztyn (collection of M. Dynowska and E. Sucharzewska) and West Pomeranian University of Technology, Szczecin (collection of I. Adamska and B. Czerniawska), as well as on materials collected by the author in Poland (Fig. 4, Tab. 1), Germany, Latvia and Switzerland.

The following exsiccata were also revised (abbreviations follow Triebel and Scholz [89]):

- Allescher & Schnabl, Fungi Bav.
- Bornmüller, Pl. Lyd. Cariae Exs.
- Fuckel, Fungi Rhen. Exs.
- Kabát & Bubák, Fungi Imperf. Exs.
- Krieger, Fungi Saxon. Exs.
- Migula, Krypt. Germ., Austr. Helv. Exs. (Pilze)
- Petrak, Crypt. Exs.
- Petrak, Fl. Bohem. Morav. Exs. Pilze
- Petrak, Mycoth. Gen.
- Poelt & Scheuer, Reliqu. Petrak.
- Rabenhorst, Klotzschii Herb. Viv. Mycol. Ed.
- Raciborski, Mycoth. Polon.
- Roumeguère, Fungi Sel. Gall. Exs.
- Saccardo, Mycoth. Ital.
- Săvulescu, Herb. Mycol. Roman.
- Siemaszko, Fungi Bialowiez. Exs.
- Sydow, Mycoth. Germ.
- Thümen, Herb. Mycol. Oecon.
- Thümen, Mycoth. Univ.
- Tranzschel & Serebrianikow, Mycoth. Ross.
- Triebel, Microf. Exs.
- Vestergren, Micromyc. Rar. Sel. Praec. Scand.
- Zahlbruckner, Krypt. Exs.

Macro- and microscopic observations of symptoms on plant organs (mostly leaves) and fungal structures were performed using a Nikon SMZ 745T and Nikon Eclipse 50i light microscope with phase contrast, respectively. Images of plant organs infected by fungi were obtained with the use of a digital HP ScanJet 2400 scanner and microphotographs were taken using a Nikon DS-F1 digital camera applying the phase contrast option. Slides were prepared using tap water, lactophenol blue and lactophenol with picric acid solution (the latter used primarily in the case of microphotographs). Measurements were made at 1000× magnification and included 10 conidiomata, 30 conidiophores, conidiogenous cells and 50 conidia per specimen, if the material was sufficiently abundant. Plant species were



**Fig. 4** The main areas of Poland surveyed (numbering in accordance with Tab. 1).

determined according to Rutkowski [90] and Rothmaler [91], and their names follow The Plant List [92].

Cultural attempts were made following the procedures recommended by Crous et al. [93]. Culturing of all the species listed in the paper, with priority given to the most fresh of the available specimens, was attempted. To test germination and growth ability, conidiomata were placed in a drop of distilled water on the sterile microscopic glass and squeezed with a smaller glass to extrude the spores. Following microscopic control, the conidial suspension was struck on Petri dishes with standard media (OA, MEA, PDA, WA), prepared according to the manufacturer's (DIFCO, USA) recommendations. They were then incubated in darkness for 5 days at a temperature of 24°C and 30°C (three samples each). They were thereafter kept at room temperature and in diffuse daylight for 5 days.

### 3. Study objectives

The aim of this study was to present the complete characteristics of *Asteromella* species recorded in Poland and to consider the identity of related *Phyllosticta*, *Ascochyta* and *Depazea* taxa deposited in reference collections in Poland. Morpho-anatomical analyses and cultural attempts were applied for this purpose. In the course of preparing for this monograph, many inconsistencies and errors were found in literature-based and internet-accessible information; wherever possible, these were corrected. Thus, the Polish data are presented against a background of a critical worldwide list of names applicable to *Asteromella* (Appendix 1).

**Tab. 1** The data origin: main areas surveyed as represented by exsiccata and published data.

Area No.*	Localities surveyed	Main sources
1	Szczecin City and surroundings	[119,160,186]
	Słowiński National Park	[129,130,142,161]
2	Poznań City	[166]
	Noteć River valley	[115]
	Bydgoszcz City	[116]
3	Białowieża National Park	[123]
	Biebrza National Park	Own data [140,141]
4	Łuk Mużakowa Landscape Park	Own data
	Gorzów Wielkopolski City and surroundings	[96]
	Sudety Mts	[97]
5	Łódź City and surroundings, Lasy Spalskie Refuge, Załęczański Landscape Park, Przedborski Landscape Park, Kampinos National Park, Dąbrowa Grotnicka and Grądy nad Moszczenicą reserves	Own data and unpublished data from LOD
6	Łęczna-Włodawa Lake District	[127,128]
	Bug River Valley	[132,133]
	Arboretum Bolestraszyce	[159]
	Roztocze National Park	Own data
7	Częstochowa Upland	[136]
	Ojców National Park	[124,125]
	Kraków City and surroundings	[102], unpublished data from KRA-AR
	Gorce National Park	Own data
	Tatry National Park	[131]
	Pieniny National Park	[126]

\* In accordance with numbering in Fig. 4.



## 4. Results and discussion

### 4.1. Historical survey of Polish studies

The first Polish data on fungi currently classified in the genus *Asteromella* date back to 1892, i.e., to Hennings' [94] record of *Phyllosticta saponariae* (Fuckel) Sacc. [= *Asteromella saponariae* (Fuckel) Petr.]. This species was one of the seven *Asteromella* species collected by foreign mycologists [95–98], e.g., H. Diedicke, R. Laubert, G. Moesz and R. Schander up to 1931, in the western part of current Poland (former Mark Brandenburg and West Prussia). Beginning in 1902, roughly 20 “physiographic” papers were written by Polish mycologists including B. Namysłowski, K. Rouppert, W. Siemaszko and Z. Zweigbaumówna, which greatly contributed to the knowledge of Polish fungi. These papers, e.g., [99–108] concerned the results of research trips to regions of pre-partition Poland that at that time had been occupied by Austria-Hungary, Prussia and Russia. The papers were published up to World War II, primarily in *Pamiętnik Fizyograficzny* (Warsaw), *Sprawozdania Komisji Fizyograficznej* (Kraków) and in *Kosmos* (Lviv). Other papers also covered diseases afflicting crops and ornamental plants [109–114]. Follow-up contributions to knowledge about Polish fungi were only published in the late 1950s and 1960s [115–120].

Mycocoenological studies of microfungal occurrence in plant communities yielded the most abundant data on *Asteromella* species in Poland. Initiated by Majewski's study in Kampinos National Park [121], these studies were carried out until the end of the twentieth century and included the following national parks: Białowieża NP [122,123], Ojców NP [124,125], Pieniny NP [126], Poleski NP [127,128], Słowiński NP [129,130], Tatra NP ([131] and the literature cited therein) as well as geographic regions like the Bug River Valley [132,133], Lublin Upland [134], Małopolska Upland [135] and Częstochowa Upland [136] (see [137,138] for a list of papers and plant communities studied). *Asteromella* (*Phyllosticta*) species were reported in the majority of these studies, the exception being papers concerning fungi in Kampinos NP [121], Lublin and Małopolska Uplands [134,135], and early reports from Białowieża NP [122] and Słowiński NP [129,130]. Most of the data on the occurrence of *Asteromella* species in Poland were listed in the literature-based checklist of Polish micromycetes in 2008 [139]. The most recent records hail from studies conducted in the Biebrza and Słowiński national parks [140–142].

### 4.2. Ecology and distribution

The current study delivers limited data on the ecology of *Asteromella* species, as neither experiments nor long-term observations were carried out in the field. Fresh materials were collected from diverse plant communities, in habitats that are to various degrees influenced by man-made disturbances, e.g., in forests, meadows, grasslands and in anthropogenic areas

of cities. The highest species number and diversity were recorded in communities of deciduous forests.

The majority of Polish specimens of *Asteromella* species were collected in autumn, primarily in September and October. This corresponds to observations made by Higgins [22–24], Dring [25] and Brezhnev ([26,27]). However, the formation of conidiomata is related to plant phenology, rather than directly to the season of the year. In the case of plants occurring for a short period during the growing season, *Asteromella* conidiomata were formed earlier, that is, in summer rather than autumn (e.g., *A. adoxicola* and *A. convalariae*). The conidiomata were often accompanied by immature ascomata and ascomatal primordia filled with parenchymatous cells. The co-occurrence of *Asteromella* conidiomata and its supposed asexual morphs was revealed in the case of many species.

The highest number of *Asteromella* species was observed for the representatives of Rosaceae, Asteraceae, Ranunculaceae and Apiaceae; this was not surprising, as these families are the most species-rich taxa among Polish flora. They are also known to host the highest number of *Asteromella* species worldwide (see Appendix 1). The majority of other host families represented in Polish materials were associated with between one-to-three *Asteromella* species.

The overall distribution of *Asteromella* species collected and reported from Poland is presented in Fig. 4, with more detailed information given in Tab. 1, together with the primary sources of data, i.e., literature or reference collections. However, the table and map do not include a number of localities that provided single records/species. The areas indicated in Tab. 1 and Fig. 4 were not evenly rich in *Asteromella* species/records. Białowieża and Biebrza national parks (area No. 3), Łęczna-Włodawa Lake District (No. 6), central Poland (No. 5) and Kraków-Częstochowa Upland (No. 7) belong to parts of Poland with the highest numbers of species/records. In course of this study, some attempts were made to complement the knowledge of distribution of *Asteromella* species and some unexplored or underexplored areas were surveyed. However, some of these areas should still be regarded as poorly recognized and in need of additional research (e.g., Gorce National Park, Roztocze National Park, Tatra National Park, Kampinos National Park, Warmia and Mazury, Western Pomerania and Lubuskie Province).

### 4.3. Morphological and anatomical characters

The descriptions of the majority of species include a limited set of characters, i.e., the size of conidiomata (primarily diameter) and conidia. More precise and detailed information concerning the characters of the conidiomatal wall, conidiophores and conidiogenous cells is available almost exclusively for species reallocated to *Asteromella* by Aa and Vanev [5].

*Asteromella* species develop predominantly on the living leaves of plant hosts and rarely on elements of the perianth (e.g., *Asteromella prunellae* on *Prunella vulgaris*). In the majority of species, the fungus causes weak disease symptoms, i.e., stains, leaf spots and discoloration. In the case of some old herbarial specimens, the colours were already lost and it was not possible to characterize them. Leaf lesions generally lack a definite, coloured margin separating the inhabited and uninhabited host tissue. However, the margin is present in

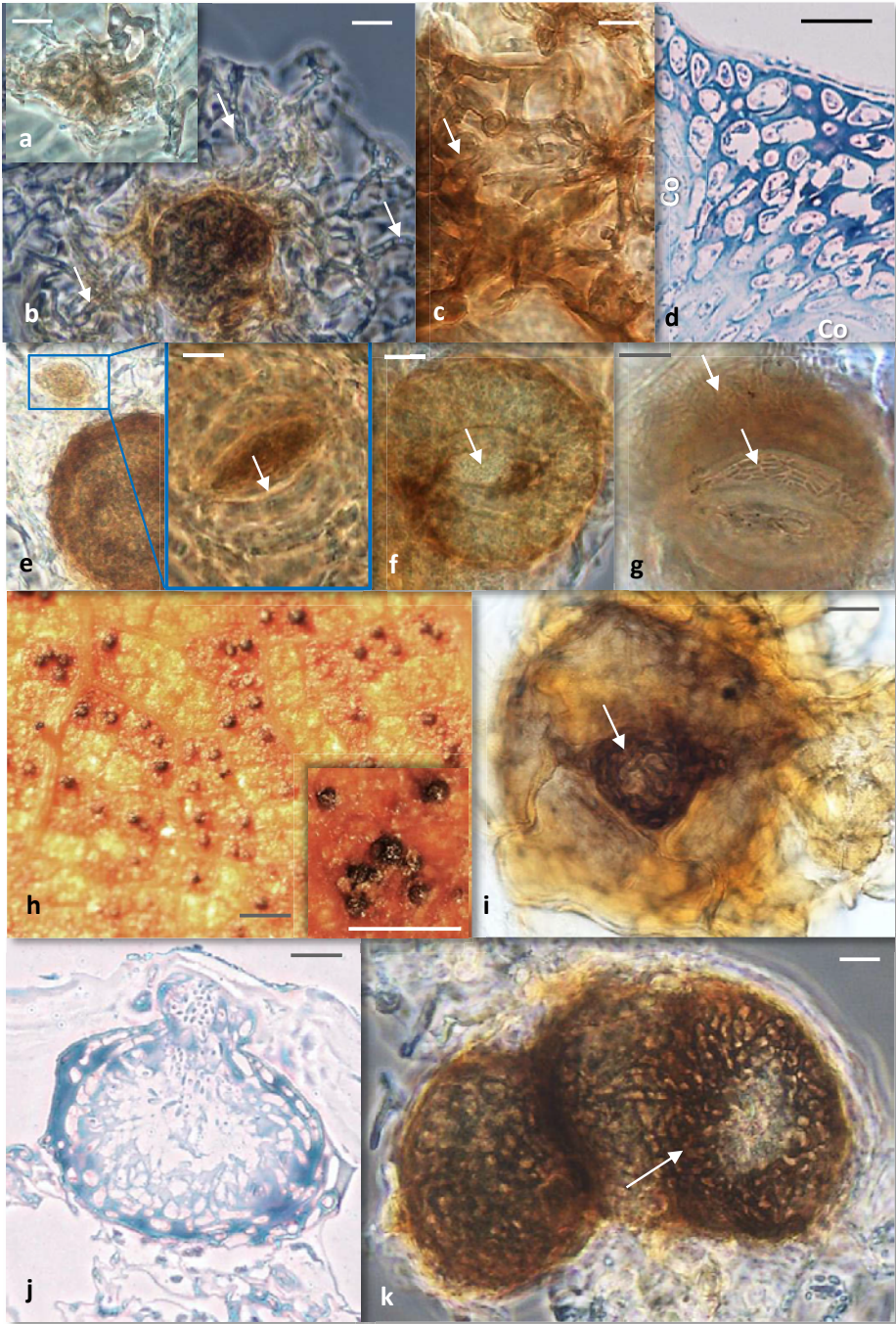
some species (e.g., *Asteromella rosicola*) and is most likely a universal reaction of the host plant, as it has also been observed in host infection by other fungal pathogens. The most stable feature observed in almost all species is the limitation of the inhabited tissue by middle- and lower level leaf-veins, which causes the angular-shaped appearance of the lesions. Such delimited areas of host tissue are often slightly darker or discoloured compared to surrounding areas and can also be thinner or thickened due to “stuffing” with abundant conidiomata. Less frequently, the conidiomata are not accompanied by leaf alterations. This was observed in species causing systemic infection of the host leaves, e.g., *Asteromella ovata* and *A. quercifolii*.

The morphology of *Asteromella* species is relatively uniform. Mycelium is immersed in plant tissue, hyphae are septated, branched, non-anastomosing, hyaline or pale brown to medium brown and 3–4 µm wide (Fig. 5). Conidiomata are generally pycnidial, occasionally pycnostromatic (observed only in *A. aviculariae*) or almost so. In some species (*A. aegopodii*, *A. austriaca*, *A. convallariae* and *A. huubii*), leaf tissue surrounding the conidiomata is densely overgrown with brown hyphae. Pycnidial conidiomata are mostly globose or subglobose, singular or aggregated in loose or dense groups, on both sides of the leaf (e.g., *A. ebuli*), but mostly hypophyllous. When in dense groups, they are more or less angular or multiform, confluent and conform to lesion borders. Conidiomata are immersed in leaf tissue, often with apical parts somewhat projected above the leaf surface and rarely with up to 1/3 part of conidioma elevated above the epidermis (e.g., *A. maculiformis*). In most cases, the emerged part comprises papilla covering ostium; the papilla is rarely lacking. The colour of conidiomata is diverse and to a minor extent changes with age. The colours observed include pale grey to steel-grey, pale to dark brown, sometimes with olive tinges, or black. The conidiomatal tips often have a glassy appearance due to the mass of extruding conidia, which is slimy at first, then crusty. The conidiomatal wall is composed of (2–)3–4 layers of thin-walled cells, primarily *textura angularis* (e.g., type species, *A. ovata* Thüm.). In three species (*A. bacilloides*, *A. garbowskii* and *A. rosicola*) *textura epidermoidea* was observed in studied specimens. Other than *textura angularis* composition of the wall was indicated in descriptions of *A. ixiolirii* (*textura epidermoidea*), *A. tobira* (*textura prismatica*), *A. ungerinae* (*textura globulosa* changing into *textura prismatica*) and *A. intricata* (*textura intricata* changing into *textura globulosa*) [5]. Further studies are needed to elucidate the importance of this feature in the taxonomy of the group.

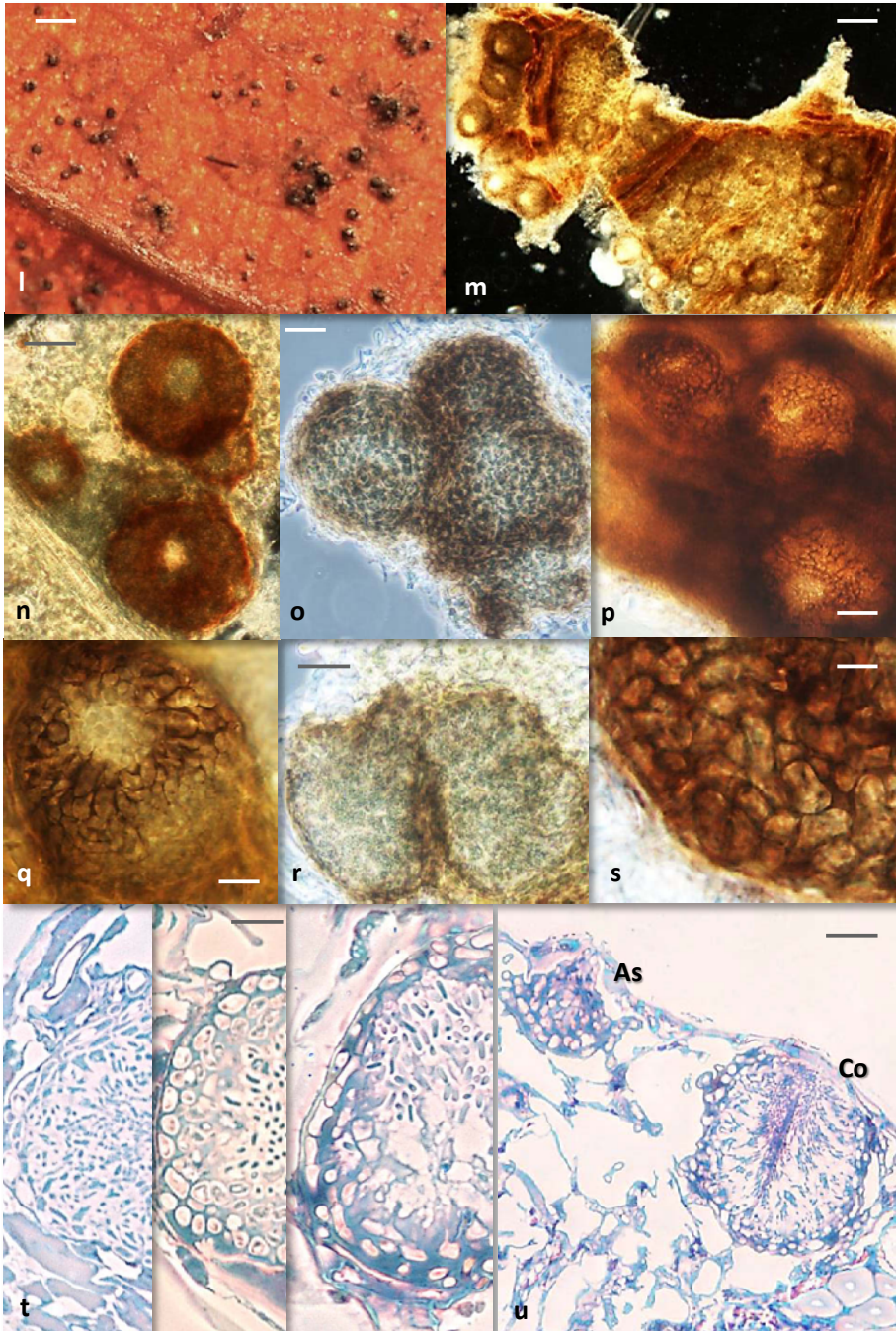
Ostium is central, circular, often well-visible, up to 37 µm (at conidiomatal diameter 49.4 µm), sometimes surrounded by the clypeus-like structure made up of darker, thick-walled cells, or irregular, likely due to lysis of topical cells or their abrasion following maturing.

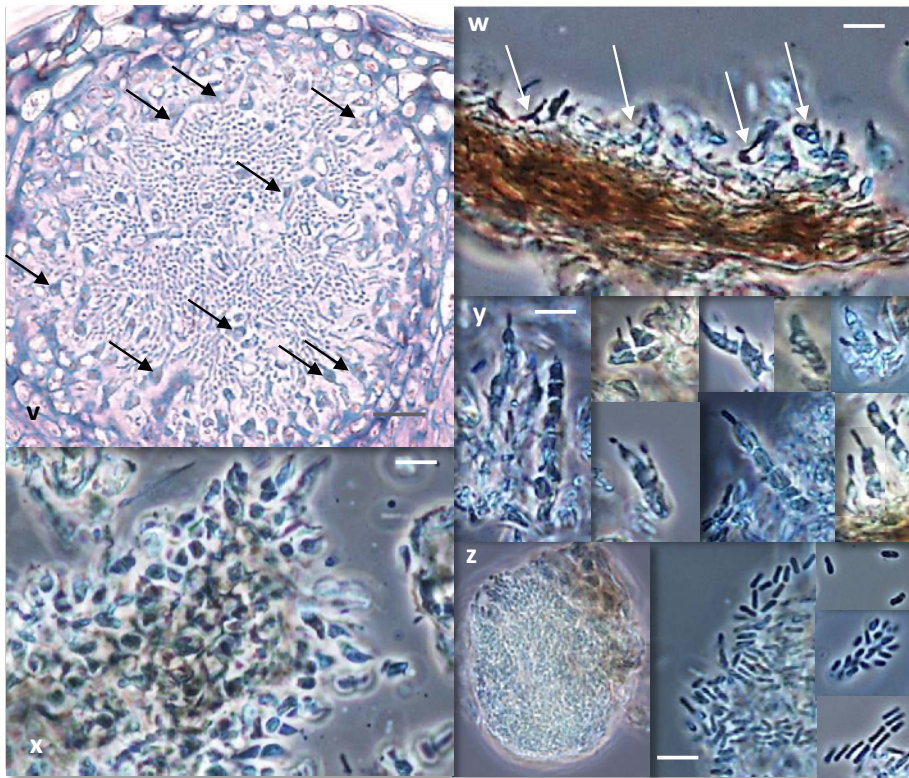
Conidiophores are smooth, hyaline and line the conidiomatal wall, primarily multicellular, tapered toward the apex, branched at the base, from 5 up to 20 µm long and up to 6 µm wide. In some species (e.g., *A. scabiosae*), conidiophores were not observed. Conidiogenous cells are enteroblastic, phialidic, hyaline, cylindrical or conical to globose or subglobose, often in row protruding into conidiomatal cavity, primarily integrated, rarely discrete and with a single conidiogenous loci disposed apically or laterally (then below the transversal septum). The collarete and channel are small and indistinct, and were often not preserved in the specimens.

Conidia mostly form a dense, somewhat viscous mass that frequently hinders observation of conidiophores. Conidia are hyaline, one-celled, eguttulate, minute, 2–7 × 0.5–1.8 µm, 3–5 × 1–1.5 µm in average. The conidial shape is fairly uniform, primarily rod-shaped, with









**Fig. 5** Morpho-anatomical characters of *Asteromella* species. **a–d** Mycelium in the plant tissue (arrows indicate hyphae). **a** Hyphae forming primordium. **b** Pale and loose hyphae. **c** Dark hyphae of stroma-forming *A. aviculariae*. **d** Dense hyphal layer at the leaf surface in the contact zone of two conidiomata (Co) of *A. aegopodii*. **e, f** Conidiomata below leaf stoma (arrow). **e** Young conidiomatal primordium forming under stoma (arrow), near the mature conidioma. **f** Mature conidioma. **g** Spore deposits (arrows) on leaf epidermis around the stoma. **h–k** Conidiomata erumpent above the plant tissue. **h** Leaf fragment with groups of conidiomata. **i** Conidiomatal papilla (arrow) emerging through epidermis. **j** Conidioma with papilla (cross-section). **k** Clypeus-like structure (arrow) surrounding ostiolum. **l–p** Arrangement of conidiomata. **l, m** Diverse arrangement at surface of *Quercus* leaf. **n** Single, mature conidiomata accompanied with primordia. **o** Dense group. **p** Conidiomata immersed in stroma. **q, r** Ostiolum. **q** Papilla with narrow ostiolum in young conidioma. **r** Widely open ostiola in mature conidiomata. **s–u** Conidiomatal wall. **s** External layer. **t** Cross-sections of conidiomatal wall. **u** Cross-section of leaf tissue with conidioma (CO) and presumably young ascoma (As). **v–z** Conidiogenous cells and conidia. **v** Cross-section of conidioma: conidia-forming conidiogenous cells indicated with arrows. **w, x** Fragments of conidiomatal wall lined with conidiogenous cells. **y** Conidiophores and conidiogenous cells. **z** Conidia in viscous mass and single conidia. Scale bars: **a, c, d** 5  $\mu\text{m}$ ; **b, i, j** 20  $\mu\text{m}$ ; **e–g, k** 10  $\mu\text{m}$ ; **h** 1 mm; **l** 1 mm; **m** 100  $\mu\text{m}$ ; **n–p** 50  $\mu\text{m}$ ; **q, t** 10  $\mu\text{m}$ ; **r, u** 20  $\mu\text{m}$ ; **s** 5  $\mu\text{m}$ ; **v** 10  $\mu\text{m}$ ; **w–z** 5  $\mu\text{m}$ .



a slight narrowing at the central portion, rarely cylindrical, with a width equal over the entire length of the spore and rounded ends.

The features that allow for discriminating *Asteromella* species from other similar genera are the fine details of the morphological structure of conidiophores and conidia. The most similar to *Asteromella* are small-spored *Phoma* s. l. (*Phoma* and *Paraphoma* [143]), distinguished by a more elliptical- or ovoidal-shaped conidia and the presence of two or more guttules. The homogenous shape of conidia of the *Asteromella* species is a stable character when compared to the diversely shaped spores observed in vivo in single conidiomata of *Phoma* section *Pilosa*, which have very similar conidiogenous cells [cf. *Phoma betae* A. B. Frank and *Ph. typhina* (Sacc. & Malbr.) Aa [143]]. A fundamental feature that allows for the confirmation of species placement in *Phoma* vs. *Asteromella* is germination of *Phoma* spores on artificial media; this is because spermatial states, by definition, do not germinate. However, in the case of old herbarium specimens that also show no growth on the culture media, this is not an unambiguous test. All the species presented here, whether old or fresh specimens, were tested for the ability of germination and axenic growth and failed.

#### 4.4. Accepted taxa, including reallocated *Phyllosticta* species

The host specificity of *Asteromella* species is accepted here. The characteristics of 59 species are based on Polish materials and additional exsiccata, including type specimens. Three species are reported from Poland for the first time: *Asteromella prunellae*, *A. melampyrina* and *A. moeszii*.

The majority of *Asteromella* species known to occur in Poland were recorded as *Phyllosticta*. Nine *Phyllosticta* and two *Depazea* species are redispersed into *Asteromella*. The new combinations are proposed for species that are not associated with asexual or sexual morph and that differ from known *Asteromella* species on the respective host family. New combinations are also proposed for two species previously ascribed to *Mycosphaerella* species, namely, *Asteromella* spermatial states of *Mycosphaerella lysimachiae* (Höhn.) Höhn. and *M. populi* (Auersw.) J. Schröt., which concerns *Phyllosticta lysimachiae* Allesch. and *Ph. populina* Sacc., respectively. The decision to include these *Phyllosticta* species in specific *Mycosphaerella* was not supported by experiments or genetic studies, but was instead based on the co-occurrence of diverse morphs, where the sexual one was often immature [5]. Furthermore, more than one *Mycosphaerella* species is known to occur on the respective hosts [59,63]. The problem regarding the insufficiently supported transfers of species and the possible taxonomic and nomenclatural consequences thereof have been recognized by many mycologists, and was recently discussed by Hawksworth [144]. As no proof of holomorphy exists in the case of the above-mentioned *Phyllosticta*/*Asteromella* species, the new combinations are proposed to re-include the species in further taxonomic research.

Nine of the species earlier reported from Poland were excluded from the primary list and are characterized in the section concerning insufficiently-studied or doubtful species. The occurrence of six among them in Poland was not confirmed (*A. aviculariae*, *A. garrettii*, *A. gentianellae*, *A. helleboricola*, *A. saponariae* and *A. scorzonerae*) and voucher specimens of two (*A. mali* and *A. scabiosae*) were extremely scarce and deficient. One species (*A. confusa*)

raised doubts as to its taxonomical status, which could not be resolved based on the available specimens.

Details regarding the morphology of conidia-producing structures of many of the species listed here are original and provided for the first time. In cases where Polish literature reports were not associated with corresponding voucher specimens, the species are described based on voucher materials from M, B, WA, WAUF, WRSL, KRA and KRAM reference collections. In the case of *Asteromella garrettii*, *A. helleboricola* and *A. scorzonerae*, the descriptions provided by other authors [5,29,145–147] are presented, since no exsiccata of these species were available for examination. Connections with asexual and sexual morphs are given following Vanev and Aa [10], Aa and Vanev [5], Tomilin [59] and Aptroot [63], unless stated differently. In the worldwide distribution paragraphs, summarized data from several resources [148–155] are supplemented by regional papers, information from original descriptions and own data presented here for the first time.

### Polyphagous species

A single species, *Asteromella maculiformis*, has been reported in association with host species belonging to diverse families. Worldwide it is known to inhabit leaves of trees from the genera: *Castanea*, *Fagus*, *Quercus* (Fagaceae), *Alnus*, *Betula* (Betulaceae), *Ulmus* (Ulmaceae), *Acer* (Aceraceae), *Fraxinus* (Oleaceae) and *Prunus* (Rosaceae) [148]. In Poland, *A. maculiformis* was reported on *Alnus*, *Betula*, *Corylus*, *Fraxinus* and *Rhus* [139,156]. Except for *Betula*, these host genera are also associated with at least one other host-specific *Asteromella* (*Phyllosticta*) species (Tab. 2).

#### *Asteromella maculiformis* (Sacc.) Petr.

Bot. Jb. 62 (Beibl. 142): 145 (1929).

≡ *Phyllosticta maculiformis* Sacc., *Michelia* 2: 538 (1882).

= *Phyllosticta betulae* Oudem., *Ned. Kruidk. Archf. Ser. 3,2*: 743 (1902), nom. illeg. replaced with ≡ *Phyllosticta betulicola* Vasyag., in Bryzova et al., *Flora Spor. Rast. Kazakh. 5,1*: 59 (1967).

= *Phyllosticta betulina* Sacca., *Michelia* 1: 154 (1878).

= *Phyllosticta bresadolae* Sacc. & D. Sacc., *Syll. Fung. 18*: 245 (1906), superfl. name ≡ *Phyllosticta faginea* Bres., *Hedwigia* 39: 326 (1900) ≡ *Ph. humeriformis* Bubák & Kabát, *Fungi Imperf. Exs. Fasc. 2 No. 53* (1904).

**Description.** Leaf lesions brownish, circular, limited with leaf veins. Conidiomata hypophyllous, aggregated, 61.8–98.8 µm diam., numerous, black, globose or subglobose, irregular when merged, up to half of the conidiomata protruding above leaf epidermis, with a well-defined papilla, ostiolum up to 17.3 µm diam., surrounded by a ring of darker cells. Conidiophores 1–5-celled, branched at the base, polyphialidic, 10–20 × 2.5–4 µm. Conidiogenous cells 5–5.5 × 4.5 µm. Conidia rod-shaped, straight, 4–5 × 1 µm (Fig. 6).

#### Host plants and distribution in Poland:

- *Alnus incana* (L.) Moench: as *Phyllosticta* cf. *maculiformis*, Upper Silesia and Cracow Industrial Regions [157];

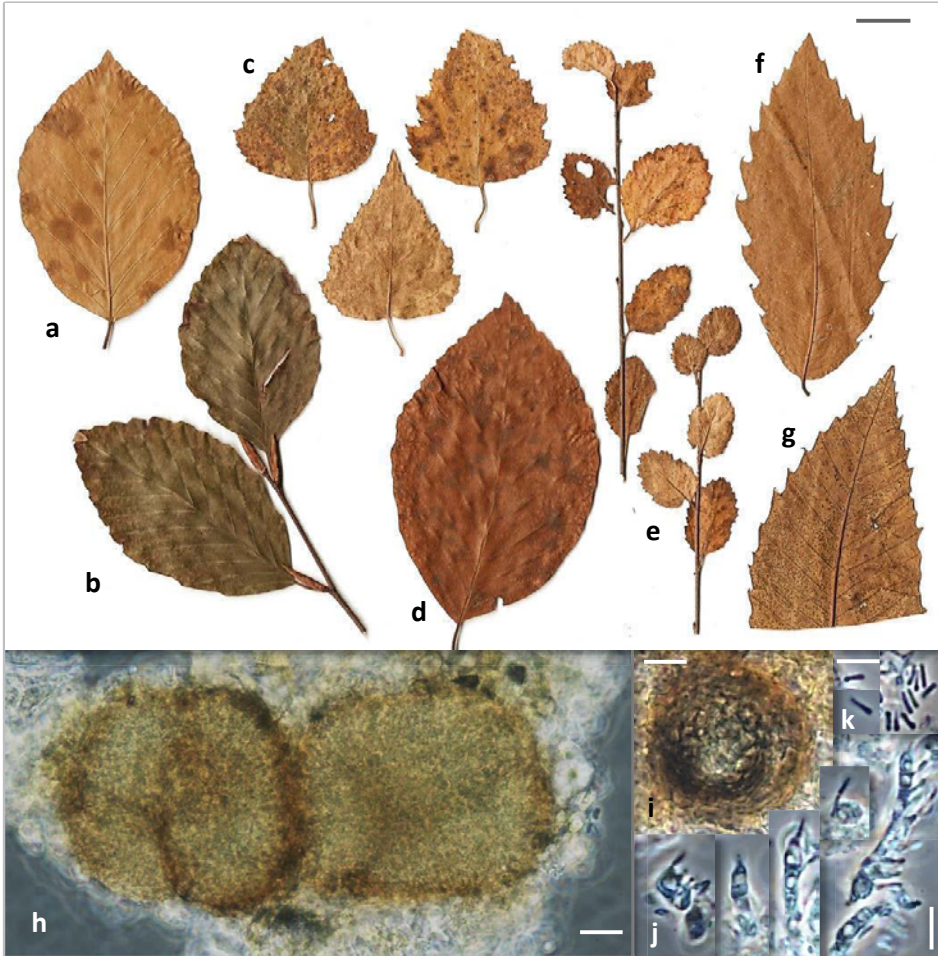


**Tab. 2** *Asteromella maculiformis* and other *Asteromella* species on the same host genera (dimensions in  $\mu\text{m}$ ).

Taxon	Conidioma (diam.)	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. maculiformis</i>	61.8–98.8	1–5-celled; 10–20 $\times$ 2.5–4	5–5.5 $\times$ 4.5	4–5 $\times$ 1	<i>Alnus</i> , <i>Betula</i> , <i>Corylus</i> , <i>Fagus</i> , <i>Fraxinus</i> , <i>Rhus</i>
<i>A. alnicola</i>	49.4–98.8	1–3-celled; 10 $\times$ 4	4 $\times$ 3.5	(2.5–)3.5–4 $\times$ 0.8–1	<i>Alnus</i>
<i>A. fraxini</i> *	nd	nd	nd	5–7	<i>Fraxinus</i>
<i>A. gorholtii</i> *	58–70	nd	nd	3.5–4.6 $\times$ 0.7	<i>Corylus</i>
<i>A. rhoina</i> **	40–100	nd	2–6 in diam.	2.5–3.5 $\times$ 0.5–1.0	<i>Rhus</i>

\* According to Vanev and Aa [10]. \*\* According to Aa and Vanev [5]. nd – no data available.

- *Betula alba* L. nom. dub. (= *B. pendula* or *B. pubescens*, cf. [158]): near Ciechanów [109]; Konstancin [110];
- *Betula humilis* Schrank: Łęczna-Włodawa Lake District, Jezioro Długie Reserve, *Molinietum coeruleae*, coll. W. Mułenko. 21 Oct. 1984, with *Melampsorium betulinum* (Pers.) Kleb., LBL M-4060 [128];
- *Betula pendula* Roth: Dobre near Kazimierz Dolny, thicket at chalky slope, coll. B. Sałata, 30 Aug. 1972, with *Taphrina betulae* (Fuckel) Johanson, LBL M-6396; Białowieża National Park, *Tilio-Carpinetum*, *Circaeo-Alnetum*, *Pino-Quercetum*, *Quercu-Pinetum*, *Peucedano-Pinetum*, *Carici elongatae-Alnetum*, coll. W. Mułenko, Jul.–Oct. 1990, with *Asteroma leptothyrioides* (Kab. et Bub.) B. Sutton, LBL M-23681 [123]; Wieluń Upland, Szachownica Reserve, near the Szachownica cave, lowland acidophilous beech forest, 18 Sep. 1997, coll. M. Ruszkiewicz, LOD PF-3586; Częstochowa Upland, Parkowe Reserve, birch thicket, coll. M. Ruszkiewicz, 19 Oct. 1998, LOD PF-1053 [136]; Bolestraszyce, Arboretum, stand No. 56, coll. B. Wojdyło, 30 Oct. 1998, with *Asteroma leptothyrioides* (Kab. et Bub.) B. Sutton, LBL M-23682 [159]; Częstochowa Upland, Parkowe Reserve, forest section 262o, glade, coll. M. Ruszkiewicz, 30 Sep. 1998, LOD PF-1114; Lasy Spalskie Refuge (PLH100003), Konewka Reserve, forest section 153, *Potentillo albae-Quercetum*, coll. A. Kotynia, 27 Sep. 2004, LOD PF-2603; Łódź, Lublinek forest complex, deciduous forest edge, coll. & ident. E. Połec, LOD PF-3699;
- *Betula pubescens* Ehrh.: Łęczna-Włodawa Lake District, Durne Bagno Reserve, *Sphagnetum medium* [128]; Wola near Pszczyna, *Molinio-Pinetum*, coll. & ident. A. Mysza, 11 Oct. 2006, rev. M. Ruszkiewicz-Michalska, LOD PF-2937; Biebrza National Park, Grzędy Protective Unit, mixed forest, 29 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3587 [140];
- *Castanea sativa* Mill.: Łódź, Źródłowa Str., park, coll. M. Michalski, 21 Oct. 2004, with *Phyllosticta castaneae* Ellis & Everh, LOD PF-509;
- *Corylus colurna* L.: Przelewice near Szczecin [160];
- *Fagus sylvatica* L.: Dąbroszyn near Gorzów Wielkopolski coll. P. Vogel, 28 Nov. 1939, Sydow, Mycoth. Germ., No. 3343, KRA F-1939-70 and KRA F-1939-71; Cracow, Botanical Garden of the Jagiellonian University, coll. J. Kućmierz, 25 Jul. 2005, KRA-AR; Częstochowa Upland, Parkowe Reserve, mixed forest edge, coll. M. Ruszkiewicz, 30 Sep. 1998, LOD PF-1114 [136]; Częstochowa Upland, Żłoty Potok, forest section 271a, deciduous forest edge, coll. M. Ruszkiewicz, 29 Sep. 1998, LOD PF-1083 [136]; Częstochowa Upland, Dąbrowa forest district, *Melico-Fagetum*, coll. M. Ruszkiewicz, 29 Sep. 1998, LOD PF-1078 and LOD PF-1070, both reported in [136]; Częstochowa Upland, Parkowe Reserve, *Dentario enneaphyllidis-Fagetum*, 24 Aug. 1998, LOD PF-1081, same locality and collector, *Luzulo pilosae-Fagetum*, 22 Aug. 1998, LOD PF-1082 and 22 Sep. 1999, LOD PF-1080, all reported in [136]; Łódź, Łagiewnicki Forest complex, forest roadside, coll. & ident. E. Połec, 7 Oct. 2006, LOD PF-3697; Łódź, Łagiewnicki Forest Reserve, *Tilio-Carpinetum calamagrostietosum*, forest path, coll. K. Brózio, 30 Sep. 2007, LOD PF-3664; Bukowa Gróra Reserve near Przedbórz, beech forest, coll. M. Ruszkiewicz-Michalska, 10 Oct. 2008, LOD PF-3695;
- *Fraxinus americana* L.: Przelewice near Szczecin [160];
- *Rhus typhina* L.: Przelewice near Szczecin [160].



**Fig. 6** *Asteromella maculiformis*. **a–g** Symptoms of infection of diverse hosts. **a** *Phyllosticta bresadolae* on *Fagus sylvatica* var. *atropurpurea* (KRA F-1939-71). **b** *Ph. bresadolae* on *Fagus sylvatica* (KRA-AR). **c** *Ph. betulina* on *Betula pendula* (LOD PF-2603). **d** *Ph. faginea* on *Fagus sylvatica* (KRA F-1939-70). **e** *Ph. betulae* on *Betula humilis* (LBL M-4060). **f** *A. maculiformis* on *Castanea vesca* (B 700014744). **g** *Ph. maculiformis* on *Castanea vesca* (B 700015101). **h–k** Microscopic structures (LOD PF-1053, as *Phyllosticta betulina*). **h** Mature conidiomata. **i** Conidiomatal papilla. **j** Conidiophores and conidiogenous cells. **k** Conidia. Scale bars: **a–g** 1 cm; **h,i** 20 µm; **j,k** 10 µm..

**Notes.** *Phyllosticta maculiformis* was wrongly cited as reported from Poland by Diedicke [139]. The concerned locality of Diedicke's [96] record was "Tiefensee bei Werneuchen" that is in fact in Germany. *Asteromella maculiformis* was also reported from two other localities: from Skierniewice on *Fraxinus excelsior* L. [108] and from Słowiński National Park (= *Phyllosticta betulina*) [142,161]. The corresponding specimen from Skierniewice from WAUF comprises of leaves of *Sambucus* sp. parasitized by *Asteromella ebuli* (Fuckel) Moesz (see the entry at this species). In the specimen from Słowiński National Park (on *Betula pubescens* Ehrh., *Vaccinio uliginosi-Pinetum*, Oct. 2003, coll. I. Adamska, deposited in Fungal Collection of West Pomeranian University of Technology in Szczecin) only *Coniothyrium olivaceum* Bonord. was found.

**Additional specimens studied.** ALGERIA. *Phyllosticta maculiformis* Sacc. f. *quercus* on *Quercus ilex* L., near Oran, autumn 1884, Roumeguère, Fungi Sel. Gall. Exs., No. 3347, B 700015100. CZECH REPUBLIC. *Asteromella maculiformis* (Sacc.) Petr. on *Castanea*, Hranice, Park der Militär-Oberrealschule, coll. J. (?) Petrak, Oct. 1919, Poelt & Scheuer, Reliqu. Petrak. 933, M-0142469. GERMANY. *Phyllosticta faginea* Bres. n. sp. on *Fagus sylvatica* L., Nationalpark Sächsische Sweitz, Krinitzschal, Grosser Witerberge Mt., coll. Krieger, Oct. 1896, Krieger, Fungi Saxon. Exs. No. 1633, WRSL. FRANCE. *Phyllosticta maculiformis* Sacc. on *Castanea vesca* L., Alsace, Wasselonne (orig. Elsass: Wasselnheim), coll. A. Ludwig, 30 Oct. 1914, Sydow, Mycoth. Germ., No. 1356, WRSL; as *Asteromella maculiformis* (Sacc.) Ruppr. on *Castanea vesca* L., Alsace, Wasselonne (orig. Wasselnheim), Wangenberg, coll. A. Ludwig, ident. H. Rupprecht, 23 Oct. 1914, Flora vom Elsass, B 700014744. ITALY. *Phyllosticta maculiformis* Sacc. on *Castanea vesca* L., Southern Tirol, Meran, coll. Černý, ident. Fr. Bubák, 9 Sep. 1903, Kabát & Bubák, Fungi Imperf. Exs., No. 101, B 700015099; *Phyllosticta maculiformis* Sacc. (on *Castanea vesca* L., not indicated at the label), near Trento, coll. J. Bresadola, autumn, spring, no year indicated, Roumeguère, Fungi Sel. Gall. Exs., No. 2537, B 700015101. LATVIA. *Phyllosticta betulina* Sacc. on *Betula* sp., Skrīveri, Prov. Vidzeme, coll. K. Starcs, 25 Sep. 1932, Herbarium K. Starcs. Riga, Latviae, No. 138i, B 700015067. SWITZERLAND. *Phyllosticta betulina* Sacc. on *Betula pendula* Roth, Fryburg Canton, Saaneboden bei Düdingen, coll. M. Ruszkiewicz-Michalska & B. Senn-Irlet, 7 Nov. 2008, LOD PF-3588 [162]; *Phyllosticta bresadolae* Sacc. & D. Sacc. on *Fagus sylvatica* L., same locality, Fryburg Canton, Saaneboden bei Düdingen, coll. M. Ruszkiewicz-Michalska & B. Senn-Irlet, 7 Nov. 2008, LOD PF-3589.

**World distribution.** Algeria, Austria, Canada, China, Czech Republic, France, Germany, Great Britain, Greece, Italy, Japan, Korea, Latvia, Netherlands, Poland, Spain, Switzerland, Turkey, Ukraine, USA.

**Synanamorphs and teleomorph.** Some authors (see below) consider *Asteromella maculiformis* to be the spermatial state of *Ramularia endophylla* Verkley & U. Braun [= *Mycosphaerella punctiformis* (Pers.) Starbäck]; however, this remains unproven experimentally. The species has been repeatedly reported as occurring in Poland [142,163]. Recently, *R. endophylla* has been proven to constitute the species complex and two polyphagous species (*Ramularia vizellae* Crous, *R. unterseheri* Videira & Crous) have been distinguished, based on a multi-gene approach [66]. *Ramularia endophylla* s. str. is restricted to *Quercus* and *Castanea* hosts.

**Notes.** The position of *A. maculiformis* (= *Phyllosticta maculiformis* Sacc.) and the listed synonyms is ambiguous. Some authors consider it to be the microconidial state of polyphagous *Mycosphaerella punctiformis* (Pers.) Stårback [= *M. maculiformis* (Pers.) J. Schroet.] (see [49]); this, however, was questioned by Aa and Vanev [5]. Following Tomilin's [59] opinion, they point out that there is no confirmation of a link between *A. maculiformis* and *M. punctiformis*, which is only one of the 12 *Mycosphaerella* species occurring on *Castanea* (type host of *Ph. maculiformis*). However, the same authors [5] accept synonymous *Ph. humeriformis*, *Ph. betulae* and *Ph. betulina* as part of *M. punctiformis* life cycle. Assuming the identity of these anamorphs, priority should have been given to the name *Phyllosticta betulina* Saccardo.

### Host-specific species

The following list is arranged according to the plant family of the host species. In cases where more than one *Asteromella* species is associated with a specific host family, the table with main characters allowing to differentiate species is provided.

#### Aceraceae

Single species has been reported in Poland on *Acer*.

#### ***Asteromella platanoidis* (Sacc.) Petr.**

Hedwigia 65: 254 (1925).

≡ *Phyllosticta platanoidis* Sacc., *Michelia* 1: 360 (1879).

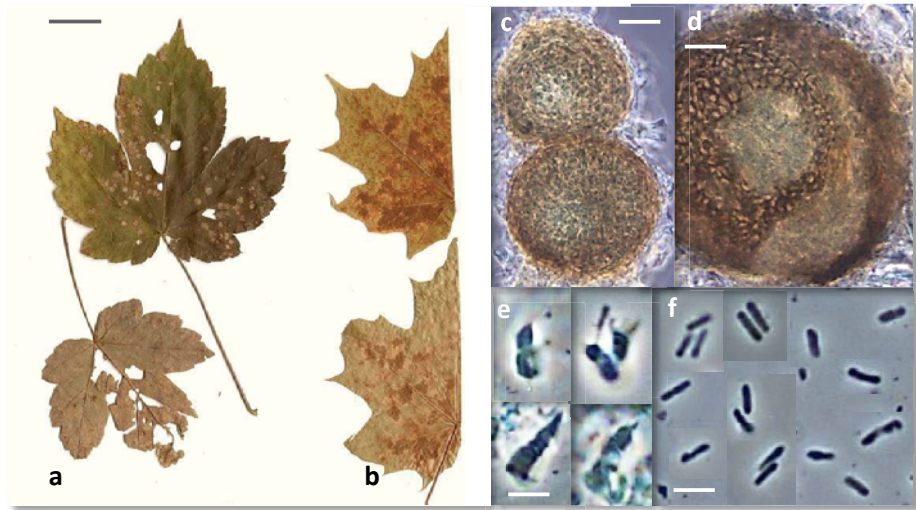
= *Phyllosticta tambowiensis* Bubák & Serebrian., *Hedwigia* 52: 266 (1912).

**Description.** Leaf lesions polygonal, pale brown, limited with main leaf veins or diffuse, surrounding tissue discoloured, yellow. Conidiomata dark grey to black, evenly distributed in the tissue or in dense groups, amphigenous (better visible at the lower side), globose, (49.4–)74.1–123.5 µm in diam. or elliptic, 68.1–74.1 × 74.1–98.8 µm, ostium not always present, up to 36.3 µm in diam. Conidiophores 1–4-celled, 5–20 × 3–4 µm. Conidiogenous cells globose or subglobose, mostly 4–5 µm in diam or cylindrical to conical 5.5 × 2.5 µm. Conidia in gelatinous mass, rod-shape, 2.5–4(4.5) × 0.5–1 µm (Fig. 7).

#### **Host plants and distribution in Poland:**

- *Acer campestre* L.: vicinity of Puławy [111];
- *Acer negundo* L.: Biebrza National Park, Sośnia village, roadside, coll. & ident. M. Dynowska & E. Sucharzewska, deposited in the Fungal Collection of Department of Mycology, University of Warmia and Mazury in Olsztyn;
- *Acer platanoides* L.: Białowieża Primeval Forest, Zwierzyniec, Siemaszko, Fungi Białowiez. Exs., No. 173, coll. W. Siemaszko, Aug. 1923, KRA F-1923-56; Niepruszewo, Grodzisk Wielkopolski district, park [164,165]; Bug River Valley, Derło near Janów





**Fig. 7** *Asteromella platanoidis* on diverse hosts. **a,b** Symptoms of host infection. **a** *Ph. tambowiensis* on *Acer pseudoplatanus* (LOD PF-3665). **b** *Ph. platanoides* on *Acer platanoides* (KRA F-1923-56). **c-f** Microscopic structures (KRAM F-10303). **c** Conidiomata. **d** Ostiolum. **e** Conidiophores and conidigenous cells. **f** Conidia. Scale bars: **a,b** 1 cm; **c** 20 µm; **d** 10 µm; **e,f** 10 µm.

Podlaski, Neple near Terespol, forest [133]; Białowieża National Park, oak-hornbeam forest, *Tilio-Carpineum*, *Circaeo-Alnetum*, coll. W. Mułenko, 6 Oct. 1989, LBL M-23683 [123]; Bolestraszyce, Arboretum, stand No. 19 and stand No. 42, coll. B. Wojdyło, 30 Oct. 1998, LBL M-23684 and LBL M-23738 [159]; Łódź, Łągiwnicki Forest complex, oak forest, coll. M. Ruszkiewicz-Michalska, 21 Oct. 2007, co-occurring with *Sawadaea bicornis* (Wallr.) Homma, LOD PF-3591; Łódź, Łągiwnicki Forest complex, near a bus terminus, deciduous forest, 10 Oct. 2013, coll. M. Ruszkiewicz-Michalska, LOD PF-3590;

- *Acer pseudoplatanus* L.: Poznań, Dendrological Garden [165]; Bolestraszyce, Arboretum, stand No. 50, coll. B. Wojdyło, 30 Oct. 1998, LBL M-23685 [159]; Częstochowa Upland, Parkowe Reserve, forest district 273g, *Dentario enneaphyllidis-Fagetum*, coll. M. Ruszkiewicz-Michalska, 18 Sep. 2003, LOD PF-3031; same locality and collector, 8 Oct. 2004, LOD PF-3665; same locality and collector, 15 May 2005, LOD PF-3690; same locality and collector, 10 Oct. 2005, LOD PF-3691; Łódź, Łódź-Widzew housing estate, park, coll. D. Papierz, 12 Oct. 2006, LOD PF-3681; Łódź, Łągiwnicki Forest complex, near the forest parking, coll. M. Ruszkiewicz-Michalska, 28 Aug. 2007, LOD PF-3707;
- *Acer* sp.: no locality [114];
- *Acer tataricum* L.: Bydgoszcz, IHAR Botanical Garden, coll. A. Michalski, 29 Sep. 1960, WA 28509; Łódź, municipal park, mixed forest, coll. D. Papierz, 12 Oct. 2006, LOD PF-3031.

**Additional specimens studied.** BELARUS. *Phyllosticta platanoidis* Sacc. on *Acer platanoides* L., Dworzec, Łuniniec district, Polesie, coll. H. Jur.(aszkówna?), 20 Sep. 1930, WA 21972. CZECH REPUBLIC. *Asteromella platanoidis* Sacc. on *Acer campestre* (?), Hranice, coll. Petrak, 1925, B 700015184. GERMANY. *Phyllosticta platanoidis* Sacc. on *Acer platanoides*

L., Schandauer Kurtgarten, coll. W. Krieger, 17 Oct. 1897, Krieger, Fungi Saxon. Exs., No. 1635, WRSL; *Phyllosticta platanoidis* Sacc. on *Acer pseudoplatanus* L., Bredower Forst near Nauen, Brandenburg, coll. H. Sydow, 13 Oct. 1909, Sydow, Mycoth. Germ., No. 912, KRAM F-10303 and WRSL; as *Phyllosticta acericola* Mig. sp. nov. on *Acer platanoides* L., Thüringen, Eisenach, at Madelstein, coll./ident. W. Migula, rev. H. Rupprecht, W. Migula, 17 Sep. 1933, Migula, Krypt. Germ., Austr. Helv. Exs. (Pilze), Fasc. 56 and 57, No. 392, B 700015181; *Asteromella platanoidis* (Sacc.) Petr. on *Acer platanoides* L., Oberförsterei Kunersdorf, Kr. Zauch-Belzig, leg. E. Fahrendorff, 4 Sep. 1938, Flora der Mark Brandenburg, No. 541, B 700015182. LATVIA. As *Phloeospora apatela* (Allesch.) Moesz & Smarods on *Acer platanoides* L., Krāslava, near Latgale, coll./ident. K. Starcs, rev. H. Rupprecht, 10 Oct. 1938, Herbarium K. Starcs. Riga, Latvia, No. 6170, B 700015183; *Asteromella platanoidis* (Sacc.) Petr. on *Acer platanoides* L., Auce, Auce district, prov. Zemgale, m. Oct. 1938, Petrak, Crypt. Exs., No. 3540, B 700015185; *Asteromella platanoidis* (Sacc.) Petr. on *Acer platanoides* L., Gauja National Park, vicinity of Krimulda, mixed forest, 24 Sep. 2005, coll. M. Ruszkiewicz-Michalska, LOD PF-3592. UKRAINE. *Phyllosticta platanoidis* Sacc. on *Acer negundo* L., Podhorec, Stryj district, Lviv, Zbiory (?) 1932, with handnote "from the Garbowski's collection", WA 21973.

**World distribution.** Belarus, Bulgaria [166], China, Czech Republic, France, Germany, Great Britain, Italy, Japan, Korea, Latvia, Poland, Romania, Russia, Ukraine (Zaleszczyki near Tarnopol [102]), USA.

**Synanamorphs and teleomorph.** Unknown.

**Notes.** Two species were synonymized under the name *A. platanoidis* [167] that differ in size of conidia, namely *Ph. platanoidis* ( $3 \times 0.5 \mu\text{m}$ ) and *Ph. tambowiensis* ( $4\text{--}7.5 \times 1 \mu\text{m}$ ). In a single collection (LOD PF-3031), the conidia of both size ranges occurred in two conidiomata on a single leaf.

## Adoxaceae

Single species has been reported in Poland on *Adoxa*.

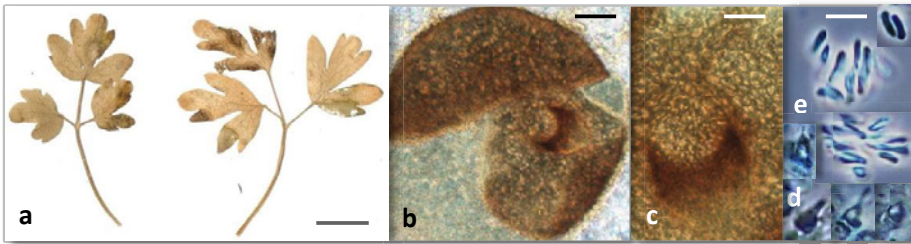
### *Asteromella adoxicola* (Lasch) Ruszkiewicz-Michalska, comb. nov.

Mycobank No. MB 818106.

Basionym: *Depazea adoxaeola* Lasch, Rabenhorst, Klotzschii Herb. Viv. Mycol. Ed. No. 1648 (1850).

= *Phyllosticta adoxae* Seaver, N. Am. Fl. 6, 1: 65 (1922).

**Description.** Leaf lesions yellowish, irregular, without margin, becoming pale to medium brown with age. Conidiomata very scarce, spread in leaf spots, dark black, globose, 64–108.1  $\mu\text{m}$  in diam., ostiolum up to 48.4  $\mu\text{m}$  in diam. Conidiophores absent. Conidiogenous cells scarce or not well preserved, globose, 3.4–4  $\mu\text{m}$  in diam. Conidia in very viscous mass, rod-shaped, slightly curved,  $5\text{--}6 \times 1\text{--}1.2 \mu\text{m}$  (Fig. 8).



**Fig. 8** *Asteromella adoxicola* on *Adoxa moschatellina* (*Depazea adoxaeola*, lectotype, WRSL). **a** Symptoms of host infection. **b** Conidioma. **c** Ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 1 cm; **b** 20 µm; **c** 10 µm; **d,e** 10 µm.

#### Host plant and distribution in Poland:

- *Adoxa moschatellina* L.: as *Depazea adoxaeola* Lasch, Drezdenko, Rabenhorst, Klotzschii Herb. Viv. Mycol. Ed., No. 1648 coll. Lasch, WRSL, **lectotype designated here**; as *Asteromella* sp., Częstochowa Upland, Parkowe Reserve, *Dentario enneaphyllidis-Fagetum*, coll. M. Ruszkiewicz, 16 Jul. 1998, LOD PF-1923, [136]; as *Asteromella* sp., same locality and collector, 25 Jul. 1999, LOD PF-1933, [136]; same locality and collector, 7 May 2004, LOD PF-3685.

**Notes.** In the scarce material of LOD PF-1923 and LOD PF-1933 no *Asteromella* conidiomata are present although they are preserved in the corresponding permanent slides. In addition, in both specimens the presence of a *Phoma* species was revealed, forming brown conidiomata, 98.8–172.9 µm in diam., with black apex and ostiolum up to 3.7 µm in diam., conidiogenous cells globose, up to 4 µm long, conidia elliptical to cylindrical, (4–)5.4–7.3 × 1.5–2 µm.

**World distribution.** Poland, USA.

**Synanamorphs and teleomorph.** Unknown. The only mycosphaerellaeen species on Adoxaceae species is *Sphaerella adoxae* Fuckel [63], described from Germany in association with *Ramularia adoxae* (Rabenh.) P. Karst. (= *Fusidium adoxae* Rabenh.) The latter was reported in Poland from a few localities [168].

### Apiaceae

Five *Asteromella* species have been reported on five genera of Apiaceae in Poland (Tab. 3). Four species, *A. aegopodii*, *A. cicutae*, *A. huubii* and *A. pleurospermi*, are very similar morphologically, while *A. chaerophylli*, has considerably smaller conidia.



Tab. 3 *Asteromella* species on Apiaceae (dimensions in  $\mu\text{m}$ ).

Taxon	Conidioma	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. aegopodii</i>	(98.8–)123.5–220 or up to 197 $\times$ 271	1–2-celled; 6–12 $\times$ (2–)3–4	5–6 $\times$ 2.5	(3.5–)4–5.5 $\times$ (0.7–)1–1.5(–1.7)	<i>Aegopodium</i>
<i>A. chaerophylli</i>	Up to 104 $\times$ 144	1–2-celled; 8–9 $\times$ 4–5	5 $\times$ 4	2–2.5 $\times$ 0.9–1	<i>Chaerophyllum</i> , <i>Heracleum</i>
<i>A. cicutae</i>	74.1–111.2	1–6-celled; 5–20 $\times$ 2–4	(4.5–)5–5.5 $\times$ (2–)2.5–3	4–4.5(–5) $\times$ 1	<i>Cicuta</i>
<i>A. huutbii</i>	98.8–104.1	1-celled; 7–12 $\times$ 2.5–4	5.5–6 $\times$ 2.5–4	4–4.5 $\times$ 1(–1.3)	<i>Angelica</i>
<i>A. pleurospermi</i>	42–49.4 $\times$ 74.1–123.5	1-celled; 6–8 $\times$ 4	4.5–5.5 $\times$ 2–4.5	3.5–4.5 $\times$ 1–1.2	<i>Pleurospermum</i>

***Asteromella aegopodii* (Curr.) Petr.**

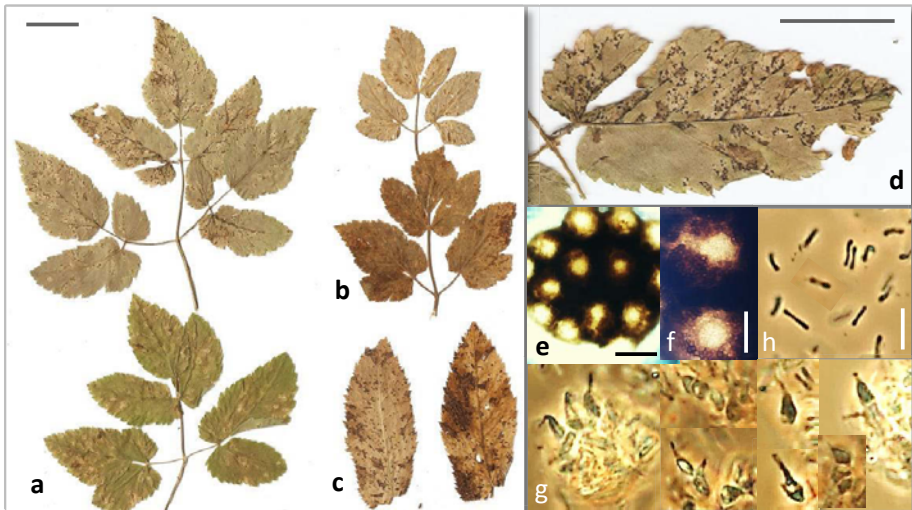
Sydowia 4: 25 (1950).

≡ *Phyllosticta aegopodii* (Curr.) Allesch., Hedwigia 34: 256 (1895).≡ *Sphaeria aegopodii* Curr., Trans. Linn. Soc. London 22: 332 (1859).

**Description.** Leaf lesions small, pale, whitish, later confluent and covering larger parts of the leaf. Conidiomata dark brown to black, single or aggregating in groups composed of conidiomata in diverse state of maturing, papillate, globose to multiform, (98.8–)123–220  $\mu\text{m}$  in diam. or up to  $197 \times 271 \mu\text{m}$ , ostiolum regular, surrounded with ring of dark cells at the leaf surface, up to 37  $\mu\text{m}$  in diam., mostly 24.7  $\mu\text{m}$ . Conidiophores 1–2-celled, 6–12  $\times$  (2–)3–4  $\mu\text{m}$ , unbranched. Conidiogenous cells 5–6  $\times$  2.5  $\mu\text{m}$ . Conidia in viscous mass, rod-shaped, straight, (3.5–)4–5.5  $\times$  (0.7–)1–1.5(–1.7)  $\mu\text{m}$  (Fig. 9).

**Host plant and distribution in Poland:**

- *Aegopodium podagraria* L.: Ciecocińska Lowland, coll. K. Rouppert, Sep. 1907, with *Septoria podagrariae* Lasch, KRAM F-1907-71 [104]; Hrubieszów, garden, coll. S. Waśniewski, 19 Aug. 1911, KRAM F-7936 [169]; Żółków, coll. A. Wodziczko, Sep. 1910, KRAM F-7935 [170]; Sikornik, Panieńskie Skały, Bielany, Tyniec near Cracow, coll. B. Namysłowski, 16 Jul., without year, with *Septoria podagrariae* Lasch, KRAM F-7937 [102,103]; Jasło, coll. A. Wodziczko, 20 Sep. 1909, with *Septoria podagrariae* Lasch, KRAM F-7938; Kazimierz nad Wisłą, coll. W. Konopacka, 28 Sep. 1923, WAUF [171]; Białowieża Primeval Forest, coll. W. Siemaszko, Aug. 1923, Siemaszko, Fungi Białowiez. Exs., Centuria 2, No.



**Fig. 9** *Asteromella aegopodii* on *Aegopodium podagraria*. **a–d** Symptoms of host infection. **a,d** (LOD PF-1119). **b** (KRAM F-7935). **c** (KRA F-1923-55). **e–h** Microscopic structures. **e** Dense group of conidiomata. **f** Ostiolum. **g** Conidiogenous cells. **h** Conidia. Scale bars: **a–d** 1 cm; **e** 120  $\mu\text{m}$ ; **f** 50  $\mu\text{m}$ ; **g,h** 5  $\mu\text{m}$ .

172, KRA F-1923-55 [107]; Łódź, municipal forest, coll. H. Juraszkówna, 25 Oct. 1931, WA 21880; Samostrzel near Nakło nad Notecią, coll. A. Michalski, 20 Aug. 1954, WA 28508 [115]; Łęczna-Włodawa Lake District, Długie Lake, *Tilio-Carpinetum*, coll. W. Mułenko, 19 Sep. 1983, LBL M-23686 [128]; Bug River Valley, Derło, forest, Sep.–Oct. [133]; Bug River Valley, Janów Podlaski, Wygoda, coll. M. Danilkiewicz, 5 Oct. 1980, LBL M-23687 [133]; Roztocze National Park [172,173]; Częstochowa Upland, road between Janów and Złoty Potok, mixed forest edge, coll. M. Ruszkiewicz, 29 Sep. 1998, LOD PF-1111; Częstochowa Upland, Parkowe Reserve, forest section 274a, beech forest, roadside, coll. M. Ruszkiewicz, 30 Sep. 1998, LOD PF-1119 [136]; Częstochowa Upland, Parkowe Reserve, forest section 273d, beech forest, roadside, coll. M. Ruszkiewicz, 30 Sep. 1998, LOD PF-1039 [136]; Częstochowa Upland, Janów, mixed forest edge, coll. M. Ruszkiewicz, 16 Jul. 1998, LOD PF-1110 [136]; Częstochowa Upland, Parkowe Reserve, *Carici-Fagetum*, roadside, coll. M. Ruszkiewicz, 24 Aug. 1999, LOD PF-1087 [136]; Łódź, Kopcińskiego Str., roadside, coll. M. Ruszkiewicz, 15 Sep. 1996, LOD PF-495; Łódź City, J. Piłsudski Culture and Recreation Park, park lawn, coll./ident. E. Połec, 16 Sep. 2007, LOD PF-3593; Biebrza National Park, Grzędy Protective Unit, deciduous forest, glade, 29 Aug. 2012, coll. MRM, LOD PF-3594; Silesian Upland, Jaworzno-Wygoda, near the Zbiornik Dzieńkowice artificial reservoir, deciduous forest edge, coll. M. Ruszkiewicz-Michalska, 22 Jul. 2016, LOD PF-3666.

**Notes.** *Asteromella aegopodii* (as *Phyllosticta aegopodii*) was also erroneously reported on *Pimpinella saxifraga* L. by Ruszkiewicz-Michalska [136]. This species is often co-occurring with *Septoria podagrariae* Lasch, in some cases only *Septoria* conidiomata or ascomatal primordia were observed (KRAM F-7937, KRAM F-7938; LOD PF-1119). In a specimen WA 28508 *Asteromella* and *Septoria* spores occurred in a single conidioma.

**Additional specimens examined.** AUSTRIA. *Phyllosticta aegopodii* (Curr.) Allesch. on *Aegopodium podagraria* L., Salisburia, pr. Grödig, m. Oct., coll. J. Dörfler, det. F. Petrak, with *Septoria podagrariae* Lasch and *Mycosphaerella podagrariae* (Roth.) Petr., Petrak, Crypt. Exs., No. 3287, B 700015058. GERMANY. *Phyllosticta aegopodii* (Curr.) Allesch. on *Aegopodium podagraria* L., Brandenburg: Kremmen, Kreis Osthavelland, 16 Sep. 1941, coll. H. Sydow, with *Mycosphaerella podagrariae* (Roth.) Petr., Sydow, Mycoth. Germ., No. 3555. KRA F-1941-190. LATVIA. *Asteromella aegopodii* (Curr.) Petr. on *Aegopodium podagraria* L., Gauja National Park, vicinity of Krimulda, mixed forest, coll. M. Ruszkiewicz-Michalska, 24 Sep. 2005, LOD PF-3595. LITHUANIA. “*Phyllosticta aegopodii* All.” on *Aegopodium podagraria* L., Blinstrubiszki, Kowno district, coll. E. Janczewski, summer 1897, KRAM F-7939. UKRAINE. “*Phyllosticta aegopodii* All.”, Eastern Carpathians, Zawojela near Kolomya, coll. B. Namysłowski, Jul. 1907, with *Septoria podagrariae* Lasch, KRAM F-7940 [102,103].

**World distribution.** Austria, former Czechoslovakia, Germany, Great Britain (Scotland), Latvia, Lithuania, Poland, Ukraine.

**Synanamorphs and teleomorph.** *Septoria podagrariae* Lasch, *Mycosphaerella aegopodii* Potebnia [63]. Both known from Poland [174].

**Notes.** The most probably *Septoria podagrariae* Lasch is the proper name for the species as the spores of *Asteromella* and *Septoria* morphs are observed as produced in the same conidioma. The verification of the type or secondary collection that was the base of Allescher's reallocation of *Sphaeria aegopodii* Curr. into *Phyllosticta* is necessary for the final decision.

***Asteromella chaerophylli* (C. Massal.) Petr.**

Annals mycol. 38: 264 (1940).

≡ *Phyllosticta chaerophylli* C. Massal., Memorie Accad. Agric. Sci. Verona 65: 83 (1889).

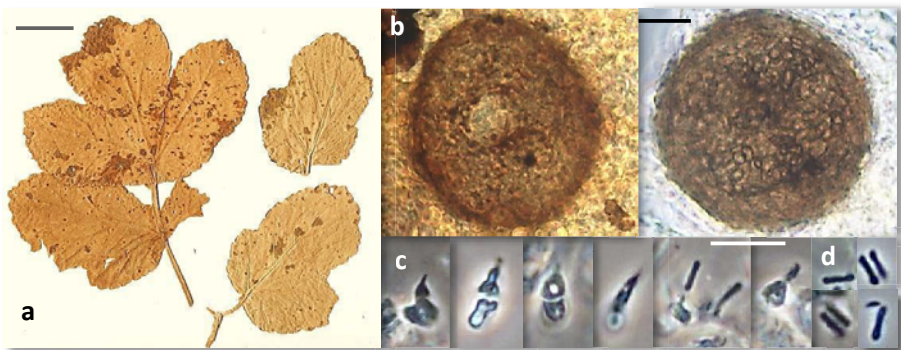
= *Phyllosticta stevenii* Gucevič, Izv. Akad. Nauk Armyan. SSR. Biol. Nauki 15(12): 72 (1962).

**Description.** Leaf lesions up to 2–3 cm, roundish, greyish, with irregular edge, without margin. Conidiomata single, pale brown, up to  $104 \times 144 \mu\text{m}$ , immersed in the leaf spots and beyond them. Conidiophores 1-celled,  $8\text{--}9 \times 4\text{--}5 \mu\text{m}$ . Conidigenous cells scarce, cylindrical,  $5 \times 4 \mu\text{m}$ . Conidia cylindrical,  $2\text{--}2.5 \times 0.9\text{--}1 \mu\text{m}$  (Fig. 10).

**Host plants and distribution in Poland:**

- *Chaerophyllum aromaticum* L.: Zagošciniec, coll. S. Waśniewski, 2 Sep. 1911, KRAM F-8953;
- *Heracleum sibiricum* L.: as *Phyllosticta* sp., Bydgoszcz, Botanical Garden, coll. A. Michalski (?), 20 Aug. 1949, WA 28519;
- *Heracleum sphondylium* L.: Częstochowa Upland, Złoty Potok forest district, forest section 263a, roadside, coll. M. Ruszkiewicz, 20 Oct. 1998, accompanied by a 1–2-celled *Phoma* species, LOD PF-1075 [136]; Gorce National Park, near Jaszczce Małe, roadside, coll. M. Ruszkiewicz-Michalska, 12 Sep. 2005, LOD PF-3596.

**Notes.** This species was also reported from two other localities but it was not confirmed in the corresponding exsiccata. In the material from Skierniewice [108] (park, *Chaerophyllum*



**Fig. 10** *Asteromella chaerophylli* on *Heracleum sibiricum* (WA 28519). **a** Symptoms of host infection. **b** Conidiomata. **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 2 cm; **b** 20  $\mu\text{m}$ ; **c,d** 5  $\mu\text{m}$ .

*aromaticum*, coll. W. Siemaszko, ident. Z. Zweigbaumówna, 6 Sep. 1924, WAUF) only immature ascomata and *Septoria* spores in the *Asteromella*-like conidiomata are present. In the re-examined specimen of Ruszkiewicz-Michalska's [136] record (Częstochowa Upland, Parkowe Reserve, forest section 274g, roadside, *Heracleum sphondylium* L., coll. M. Ruszkiewicz, 23 Sep. 1998, LOD PF-1041) only a *Phoma* species was revealed (conidiomata pale brown, up to 185.3  $\mu\text{m}$  diam., ostiolum up to 7.41  $\mu\text{m}$ , with ring of darker cells, conidia 1-celled, of various shapes, from ovoid to cylindrical, mostly curved, 5–7.4  $\times$  2.5  $\mu\text{m}$ ).

**World distribution.** Armenia, Germany [176], Italy, Poland, Ukraine.

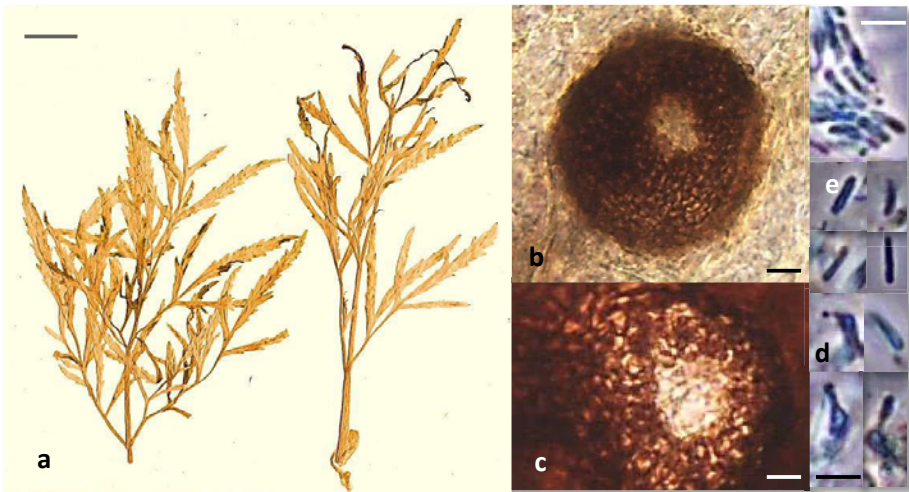
**Synanamorphs and teleomorph.** *Mycosphaerella morthieri* (Fuckel) Petr., not reported from Poland [163].

### *Asteromella cicutae* (Lind) Aa

in Aa & Vanev, A revision of the species described in *Phyllosticta*: 144 (2002).

$\equiv$  *Phyllosticta cicutae* Lind, Annals Mycol. 5: 275 (1907).

**Description.** Leaf lesions irregular, oblong, yellowish, with indefinite margins. Conidiomata brown to black, evenly distributed in leaf spots or aggregated, papillate, emerged above the epidermis (1/3 to 1/2 of the conidioma), 74.1–111.2  $\mu\text{m}$  in diam., ostiolum irregular, 12.3–29.6  $\mu\text{m}$  in diam. Conidiophores 1–6-celled, the longer conidiophores branched at the base, 5–20  $\times$  2–4  $\mu\text{m}$ . Conidiogenous cells (4.5–)5–5.5  $\times$  (2–)2.5–3  $\mu\text{m}$ . Conidia rod-shaped, mostly straight, rarely slightly curved, 4–4.5(–5)  $\times$  1  $\mu\text{m}$  (Fig. 11).



**Fig. 11** *Asteromella cicutae* on *Heracleum sibiricum* (LBL M-23689). **a** Symptoms of host infection. **b** Conidioma. **c** Ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 10  $\mu\text{m}$ ; **c** 20  $\mu\text{m}$ ; **d,e** 5  $\mu\text{m}$ .

**Host plant and distribution in Poland:**

- *Cicuta virosa* L.: as *Phyllosticta* sp., Sobibór, alder forest, coll. W. Mułenko, 26 Oct. 1982, with *Ramularia cicutae* Karst., LBL M-23689; Łęczna-Włodawa Lake District, Durne Bagno Reseve, *Carici elongatae-Alnetum* [128]; Białowieża National Park, V-100 plot, *Carici elongatae-Alnetum*, coll. W. Mułenko, 4 Oct. 1989, LBL M-23690 [123].

**Additional specimen studied.** DENMARK. *Phyllosticta cicutae* Lind on *Cicuta virosa* L., Jutlandia, Rindsholm prope Viborg, coll. J. Lind, 11 Oct. 1904, Vestergren, Micromyc. Rar. Sel. Praec. Scand., No. 1339, isotype, with note by van der Aa (“*Asteromella* spermatial state of *Mycosphaerella* spec., from which the unripe ascomata occur in the same spots; March 1977”), B 700015074.

**World distribution.** Denmark, Poland.

**Synanamorphs and teleomorph.** Unknown.

***Asteromella huubii* Ruszkiewicz-Michalska nom. nov.**

Index Fungorum No. IF 552451.

= *Asteromella angelicae* (Sacc.) Moesz ex Bat. & Peres, Mem. Soc. Broteriana 14: 6 (1961), nom. illegit., Art. 53.1 (replaced synonym); non *Asteromella angelicae* Sawada, Bull. Govt Forest Exp. Stn Meguro 105: 46 (1958).

= *Phyllosticta angelicae* Sacc., Michelia 2 (No. 8): 621 (1882).

Etymology: in reference to Huub van der Aa, in recognition of his outstanding contribution to the systematics of coelomycetous fungi.

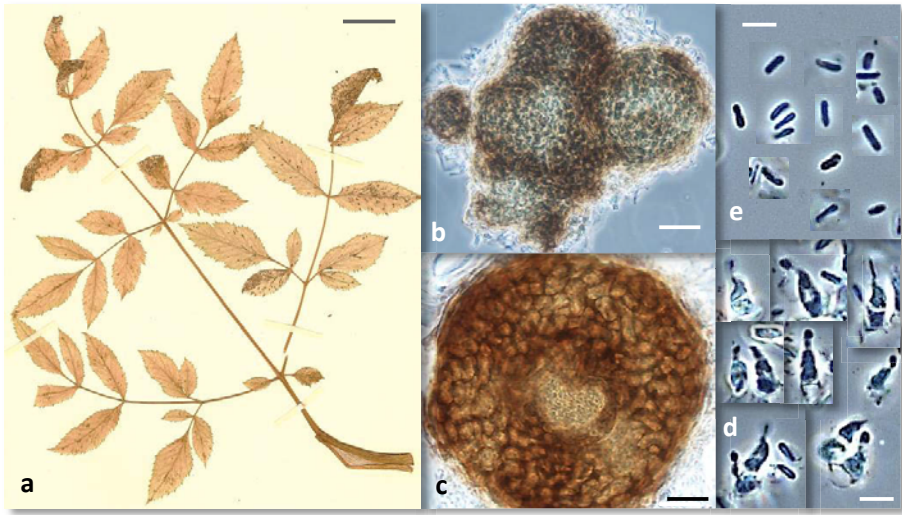
**Description.** Leaf lesions small, first pale, whitish, leaf vein-limited, later drying, confluent and covering larger parts of the leaf, very similar to symptoms caused by *Asteromella aegopodii*. Conidiomata rigid, dark brown to black, rarely single, mainly in dense groups and then connected with pale brown hyphae, papillate, globose to multiform, 98.8–104.1 µm in diam., ostiolum regular, surrounded with ring of dark cells at the leaf surface, up to 53.2 µm in diam. Conidiophores 1–2-celled, 7–12 × 2.5–4 µm, unbranched. Conidiogenous cells 5.5–6 × 2.5–4 µm. Conidia in viscous mass, rod-shaped, straight, 4–5.5 × 1(–1.3) µm (Fig. 12).

**Host plants and distribution in Poland:**

- *Angelica sylvestris* L: Pieniny Mts, road from Krościenko to Sokolica, swampy meadows, coll. J. Kućmierz, 15 Sep. 1973 [126].

**Notes.** The species was also reported from valleys of two rivers: Noteć [115] and Bug [132], but it was not confirmed in the corresponding specimens. In one of the specimens from Noteć River valley [Anieliny, meadows, coll. A. Michalski (?), 1972, WA 28505, [115]] no anamorphic fungus was found. In the second specimen [Samostrzel, Anieliny, wet meadows, drainage ditches, thickets, coll. A. Michalski (?), 2 Aug. 1972, WA 28516, [115]] only a *Phoma* species is present. Young stromata and single sporodochia of *Passalora depressa* (Berk. & Broome) Sacc. are only present in the material from Bug River Valley (Melnik, Górze Zamkowa Hill, thicket, coll. W. Mułenko, 1 Nov. 1980, LBL M-23688 [132]).





**Fig. 12** *Asteromella huubii* on *Angelica sylvestris*. **a** Symptoms of host infection (M-0142485). **b–e** Microscopic structures (KRA-AR). **b** Group of conidiomata. **c** Conidioma. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 1 cm; **b** 50  $\mu\text{m}$ ; **c** 10  $\mu\text{m}$ ; **d,e** 5  $\mu\text{m}$ .

**World distribution.** China [175], France, Germany [176], Italy, Russia [177], Ukraine [150], USA.

**Synanamorphs and teleomorph.** According to Saccardo [178], *Phyllosticta angelicae* is a spermatial stage of *Phyllachora angelicae* (Fr.) Fuckel, synonym of *M. acilegna* M. Morelet [nom. nov. for *Mycosphaerella angelicae* (Fr.) Petr.].

### *Asteromella pleurospermi* (Died.) Petr.

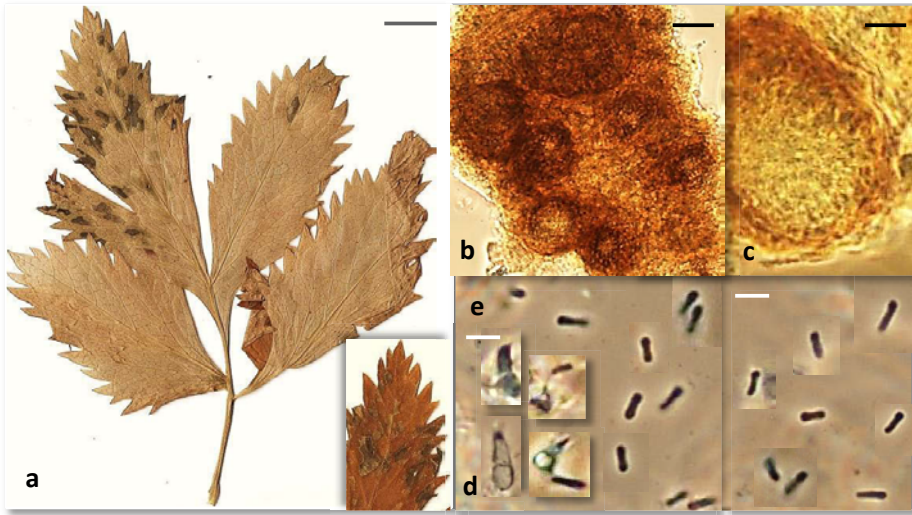
Sydowia 13: 82 (1959).

≡ *Phyllosticta pleurospermi* Died., Hedwigia 42: 165 (1903).

**Description.** Leaf lesions dark brown to black, oblong, margined, darker along the leaf veins, the veins are lighter than normal ones. Conidiomata abundant, in dense groups, brown to black, mostly elliptic, 42–49.4  $\times$  74.1–123.5  $\mu\text{m}$ , ostiolum up to 12.3  $\mu\text{m}$ . Conidiophores 1-celled, 6–8  $\times$  4  $\mu\text{m}$ . Conidiogenous cells cylindrical to subglobose, 4.5–5.5  $\times$  2–4.5  $\mu\text{m}$ . Conidia rod-shaped, 3.5–4.5  $\times$  1–1.2  $\mu\text{m}$  (Fig. 13).

### Host plant and distribution in Poland:

- *Pleurospermum austriacum* (L.) Hoffm.: Tatry Mts, Dolina Białego, mountain grassland on roadside, 960 m a.s.l., coll. A. Wołczańska, 17 Sep. 1992, LBL M-23691 [131,179,180].



**Fig. 13** *Asteromella pleurospermi* on *Pleurospermum austriacum* (LBL M-23691). **a** Symptoms of host infection. **b** Group of conidiomata. **c** Ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 50  $\mu\text{m}$ ; **c** 10  $\mu\text{m}$ ; **d, e** 5  $\mu\text{m}$ .

**Additional specimen studied.** GERMANY. *Asteromella pleurospermi* (Died.) Ruppr. on *Pleurospermum austriacum* (L.) Hoffm., Thüringen, Sieger near Erfurt, coll. H. Diedicke, rev. H. Ruppr., 29 Oct. 1902, isotype, B 700015187.

**World distribution.** Germany, Poland.

**Synanamorphs and teleomorph.** Unknown.

### Araceae

Single species has been reported in Poland on *Acorus*.

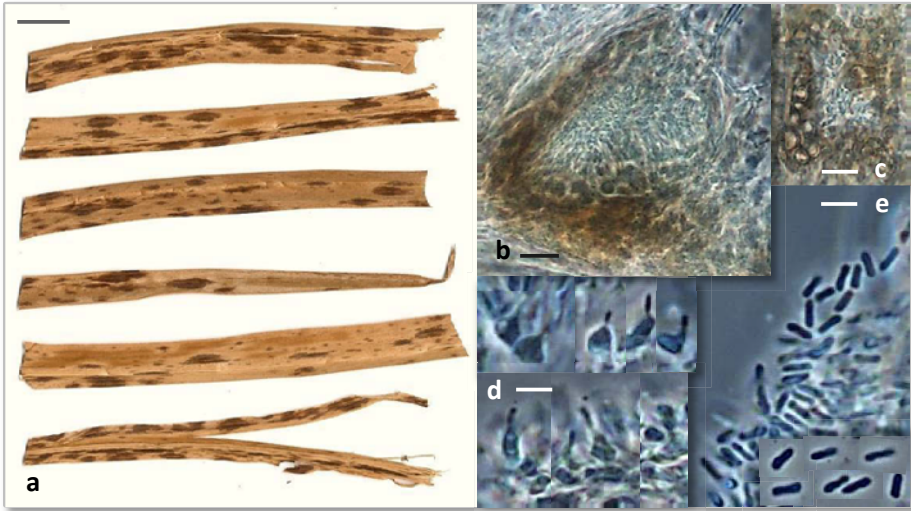
#### *Asteromella acorella* (Sacc. & Penz.) H. Ruppr.

Sydowia 13: 10 (1959).

≡ *Phyllosticta acorella* Sacc. & Penz., Michelia 2: 620 (1882).

**Description.** Leaf lesions pale brown, oblong to multiform, limited with leaf veins. Conidiomata in rows, often adhering to leaf veins, and often beyond the leaf stomata, oval, 74–112  $\times$  74–62  $\mu\text{m}$ , ostiolum lacking. Conidiophores 1-celled, 10–12  $\times$  3–4  $\mu\text{m}$ . Conidiogenous cells cylindrical, 4.7–5.2  $\times$  3.5–4  $\mu\text{m}$ . Conidia rod-shaped, 3.5–4  $\times$  1–1.2  $\mu\text{m}$  (Fig. 14).





**Fig. 14** *Asteromella acorella* on *Acorus calamus* (LOD PF-3597). **a** Symptoms of host infection. **b** Conidioma. **c** Ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 20 µm; **c** 10 µm; **d,e** 5 µm.

**Host plant and distribution in Poland:**

- *Acorus calamus* L.: Skierniewice, Zwierzyniec, coll. W. Siemaszko, 9 Oct. 1921, WAUF [108]; Nowosolna, Kamińska Str., at a pond, coll. M. Michalski, 8 Sep. 2007, LOD PF-3597.

**Additional specimens examined.** GERMANY. *Asteromella acorella* (Sacc. & Penz.) H. Ruppr. on *Acorus calamus*, Kr. Siegen, im Burgholdinghausen, 19 Sep. 1927, coll. A. Ludwig, rev. H. Rupprecht, Herbarium A. Ludwig, Flora von Westfalen, B 700015147.

**World distribution.** Czech Republic, France, Germany, Poland, Russia [177].

**Synanamorphs and teleomorph.** Unknown.

**Araliaceae**

Single species has been reported in Poland on *Hedera*.

***Asteromella hederae* C. Massal.**

Atti Inst. Veneto Sci. Lett. ed Arti 59(2): 684 (1900).

**Description.** Leaf lesions circular, dried, up to 5–7 mm in diam., brown near the edge, whitish toward the centre, zoned, limited with convex margin, tissue around the spots yellowed. Conidiomata black, shiny, evenly distributed in the central part of leaf spot and in concentric lines at its periphery, amphigenous, more abundant on the upper leaf surface,

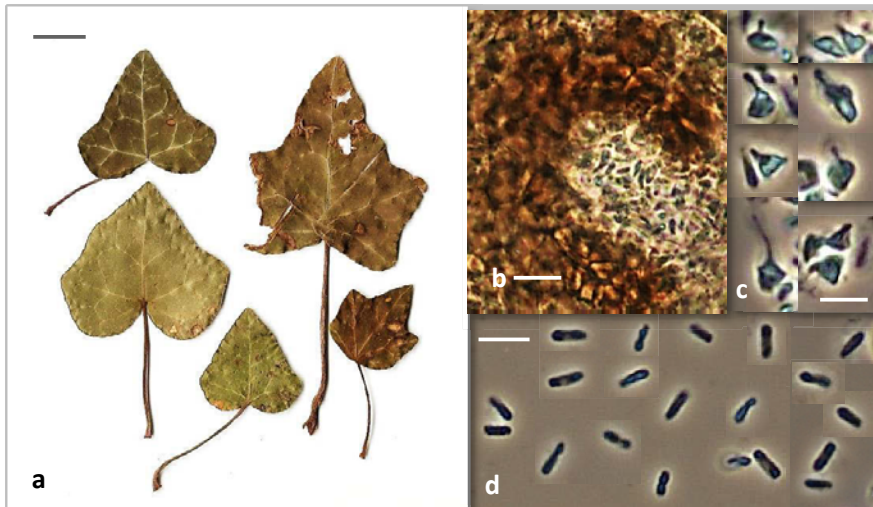
86.5–111.2  $\mu\text{m}$  in diam., ostiolum up to 19.8  $\mu\text{m}$  in diam. Conidiophores 1–2-celled,  $8\text{--}10 \times 3.5\text{--}4$   $\mu\text{m}$ . Conidiogenous cells subglobose to conical,  $4.5\text{--}5 \times 3.5\text{--}4$   $\mu\text{m}$ . Conidia cylindrical to rod-shaped,  $(2.5\text{--})3\text{--}3.5 \times 1\text{--}1.3$   $\mu\text{m}$  (Fig. 15).

#### Host plant and distribution in Poland:

- *Hedera helix* L.: Bydgoszcz, IHAR Botanical Garden, coll. A. Michalski, 10 Apr. 1957, WA 18341 [116]; Częstochowa Upland, Dąbrowa forest district, *Carici-Fagetum*, coll. M. Ruszkiewicz, 23 Sep. 1999, LOD PF-2031 [136]; Częstochowa Upland, Parkowe Reserve, forest section 273g, *Dentario enneaphyllidis-Fagetum*, coll. M. Ruszkiewicz-Michalska, 15 May 2005, LOD PF-3598.

**Notes.** The species was reported from Poland [139] as *Asteromella hederaceae* (Sacc. & Roum.) Petr., a homonym replaced with *A. hederacea* Petr. However, the corresponding specimen LOD PF-2031 does not exactly match this species. All Polish specimens are classified into *A. hederaceae* C. Massal. (conidia  $2\text{--}3 \times 1$   $\mu\text{m}$ ) as currently noted spore dimensions are closer to this species than to *A. hederacea* Petr. ( $4 \times 1$   $\mu\text{m}$ ), although the difference in size is small. The dimensions observed in Polish (WA 18341, LOD PF-2031, LOD PF-3598) and Turkish (M-0142468, see below) specimens were intermediate (see above). Verification of types is necessary to establish whether *A. hederaceae* and *A. hederacea* are not congeneric.

The record of Diedicke [96] erroneously included by Ruszkiewicz-Michalska [139] into distributional data of *Asteromella hederaceae* (Sacc. & Roum.) Petr. concerns *Phyllosticta hedericola* Durieu & Mont. [= *Boeremia hedericola* (Durieu & Mont.) Aveskamp, Gruyter & Verkley].



**Fig. 15** *Asteromella hederaceae* on *Hedera helix* (LOD PF-3598). **a** Symptoms of host infection. **b** Ostiolar part of conidioma, conidia visible inside. **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 1 cm; **b** 10  $\mu\text{m}$ ; **c,d** 5  $\mu\text{m}$ .

**Additional specimens examined.** TURKEY. *Asteromella hederæ* (Sacc. & Roum.) Petr. on *Hedera helix* L., Istanbul, coll. H. Breму (?), Nov. 1945, F. Petrak Pilzherbarium, M-0142468.

**World distribution.** Austria, Belgium, former Czechoslovakia, Denmark, France, Germany, Great Britain, Greece, Ireland, Italy, Pakistan, Poland, Portugal, Romania, Spain, Sicily, Sweden [181], Switzerland, Turkey [182], Ukraine, USA, former USSR, former Yugoslavia.

**Synanamorphs and teleomorph.** Unknown.

### Asteraceae

Seven *Asteromella* species have been reported on eight genera of Asteraceae in Poland. No significant differences in morphology could distinguish these species (Tab. 4).

#### *Asteromella austriaca* (Sacc.) H. Ruppr.

Sydowia 11: 426 (1957).

≡ *Phyllosticta austriaca* Sacc., Malpighia 11: 305 (1897).

= *Phyllosticta aronici* Sacc., Syll. Fung. 3: 3 (1884).

= *Phyllosticta daronicigena* Bubák, Növény. Közl. 6(4): 37 (1907).

≡ *Asteromella daronicigena* (Bubák) Petr., in Murashk. & Ziling, Mater. Pilzfl. Altaj & Sajany: 20 (1929).

**Description.** Leaf lesions initially small, later expanding up to 2–3 cm, vein-limited, brown, blackening with age, leaf tissue overgrown with mycelium composed of brown, branched hyphae, which intertwine to form pseudoplectenchymatic stroma; lesions densely filled with conidiomata. Conidiomata mainly epiphyllous, immersed in host tissue, in very dense groups, often fused, globose to multiform, conformed to leaf veins limiting the lesion, brown, blackening with age, 98.8–172.9 µm in diam., with indistinct ostiolum, up to 37.1 µm in diam. Conidiophores 1–6-celled, branched at the base, 10–32 × 4–5 µm. Conidiogenous cells subglobose, 5 × 5.5 µm. Conidia rod-shaped, 3.5–5 × 1–1.2(–1.5) µm (Fig. 16).

#### Host plants and distribution in Poland:

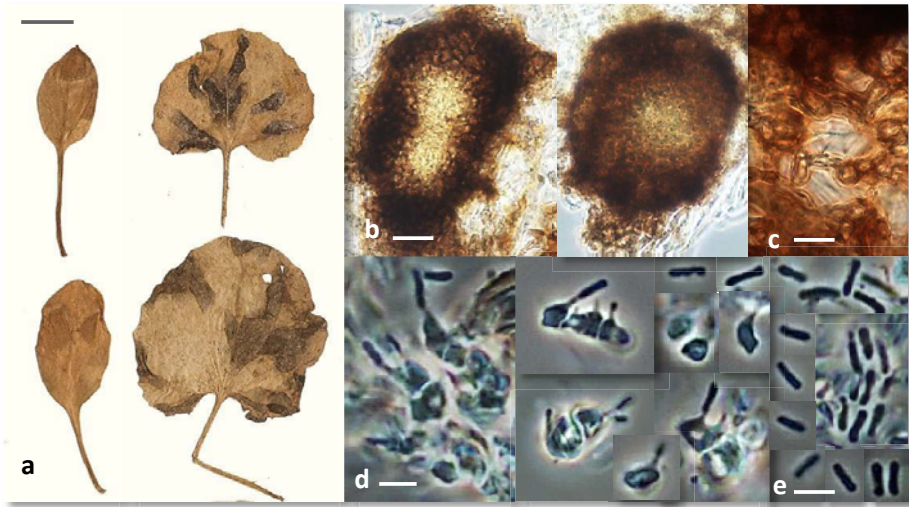
- *Doronicum clusii* (All.) Tausch.: Tatry Mts, Błyszcz, coll. K. Rouppert, Aug. 1909, KRAM F-7944 [102,106,117].

**Additional specimens examined.** AUSTRIA. *Asteromella austriaca* (Sacc.) Ruppr. on *Doronicum clusii* (All.) W. D. J. Koch, Obere Mädelalpe, coll. C. Haussknecht, ident. Ludwig & Rupprecht (?), 6 Aug. 1893, B 700015150. HUNGARY. *Asteromella daronicigena* (Bubák) Petr. on *Doronicum austriacum* Jacq., Budapest, May 1926, coll. G. v. Moesz, with *Passalora aronici* (Sacc.) Petr., F. Petrak Pilzherbarium, M-0142467. ITALY. *Phyllosticta aronici* Sacc. on *Aronicum clusii* (All.) W. D. J. Koch, Gressoney St. Jean (Aosta), coll. A. Carestia, Sep. 1898, Saccardo, Mycoth. Ital., No. 540, B 700015066. SLOVAKIA. *Phyllosticta aronici* Sacc. on *Aronicum clusii* (All.) W. D. J. Koch, Tatra Mts, Staroleśná Valley, coll. K. Rouppert, Sep. 1909, KRAM F-7943 [102,106,117]. TURKEY. *Phyllosticta aronici* (Fuck.) Sacc.

Tab. 4 *Asteromella* species on Asteraceae (dimensions in  $\mu\text{m}$ ).

Taxon	Conidioma	Conidiophore	Conidigenous cell	Conidium	Host
<i>A. austriaca</i>	98.8–172.9	1–6-celled; 10–32 $\times$ 4–5	5 $\times$ 5.5	3.5–5 $\times$ 1–1.2(–1.5)	<i>Doronicum</i>
<i>A. carlinae</i>	49.4–98.8	1–2-celled; 7–8 $\times$ 2.5–3	5–6.5 $\times$ 3–3.6	3.5–4.5 $\times$ (0.8–)1–1.2	<i>Carlina</i>
<i>A. corconitica</i>	61.8–111.2	1-celled; 5–9 $\times$ 3–4	5.7–7.2 $\times$ 3–4	(2.8–)4(–5.5) $\times$ (0.6–)0.8–1	<i>Hieracium</i>
<i>A. eupatoriicola</i>	65–104	1-celled; 7–9 $\times$ 3	4.4–5.2(–6) $\times$ (2.2–)2.7–3	2.5–3.5(–4) $\times$ (0.6–)0.8–1	<i>Eupatorium</i>
<i>A. petasitidis</i>	61.8–111.2	1–3-celled; 7–15 $\times$ 3.5	4.5–5.7 $\times$ 3–3.5	3.5–4 $\times$ 1	<i>Petasites</i>
<i>A. scorzonerae</i> *	60.5–100	-	nd	3.5 $\times$ 1	<i>Scorzonera</i>
<i>A. senecionis-nemorensis</i>	123.5–135.9	1–2-celled; 6–12 $\times$ 3–4.5	4.5–5.9 $\times$ 3–4.5	4.5–5 $\times$ 1–1.2	<i>Senecio</i>

\* Species included into insufficiently-studied and doubtful species (Chapter 4.5). nd – no data available.



**Fig. 16** *Asteromella austriaca* on *Aronicum clusii*. **a** Symptoms of host infection (B 700015066). **b–e** Microscopic structures. **b** Conidiomata. **c** Hyphae at leaf tissue. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 1 cm; **b** 20  $\mu\text{m}$ ; **c–e** 5  $\mu\text{m}$ .

on *Doronicum caucasicum* M. Bieb., Lydia, in regione pinetorum montis “Takhtalidagh” ditionis urbis “Smyrna”, 26 May 1906, coll. J. Bornmüller & P. Magnus, Bornmüller, Pl. Lyd. Cariae Exs., No. 9981, WRSL; *Phyllosticta aronici* (Fuck.) Sacc. on *Doronicum caucasicum* M. Bieb., Phrygia: Akscheher (Wilajet Konia), in regione alpina montis Sultandagh, coll. J. Bornmüller & P. Magnus, 16 Jun. 1899, J. Bornmüller: Iter Anatomicum tertium, 1899, No. 2043, WRSL. UKRAINE. *Phyllosticta aronici* (Fuck.) Sacc. on *Aronicum clusii* (All.) W. D. J. Koch (as *Doronicum columnae* Ten.), Czarnohora, Pietros Mt, 1800 m a.s.l., coll. Z. Chmielewski, rev. B. Namysłowski, Sep. 1909, KRAM F-8945 [102]; *Phyllosticta aronici* (Fuck.) Sacc. on *Doronicum austriacum* Jacq., Czarnohora, Howerla Koźmieska, 1500 m a.s.l., coll. Z. Chmielewski, Sep. 1909, with *Fusicladium aronici* Sacc., KRAM F-7945.

**World distribution.** Austria, Bulgaria, Hungary, Italy, Poland, Romania, Slovakia (Velická Dolina [117]), Turkey, Ukraine.

**Synanamorphs and teleomorph.** *Mycosphaerella aronici* Volkart, unknown in Poland [163].

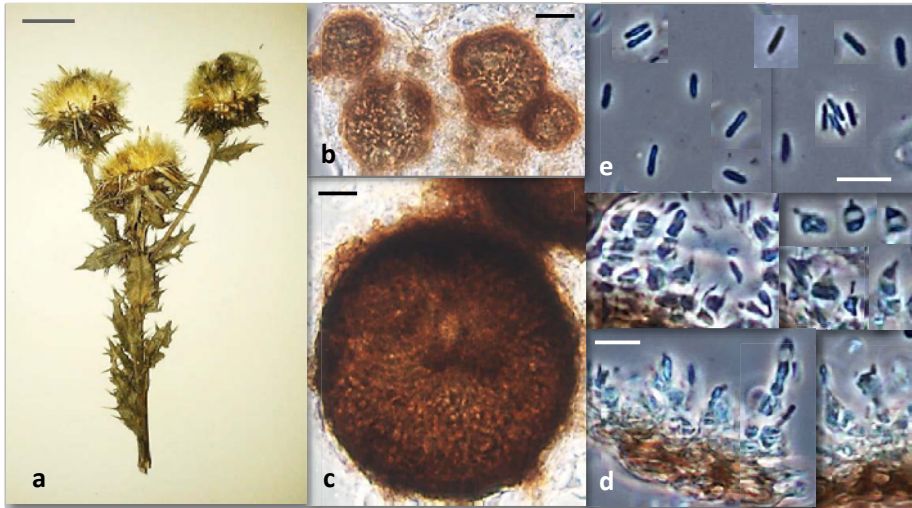
### ***Asteromella carlinae* Petr.**

Annals Mycol. 25: 270 (1927).

= *Phyllosticta carlinae* Unamuno, Asoc. Españ. Progr. Cienc. Congr. Lisboa: 39 (1932).

**Description.** Leaf lesions are lacking. Mycelium brown to dark brown, immersed in the host tissue, hyphae branched, slightly geniculate, 3.6–4.8  $\mu\text{m}$  wide. Conidiomata black, in dense





**Fig. 17** *Asteromella carlinae* on *Carlina vulgaris* (LOD PF-3599). **a** Symptoms of host infection. **b** Group of conidiomata. **c** Conidioma. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 50  $\mu\text{m}$ ; **c** 10  $\mu\text{m}$ ; **d,e** 5  $\mu\text{m}$ .

groups, immersed in host tissue, covering almost all, systematically inhabited, colourless or pearl grey dead leaves located under inflorescences, 49.4–98.8  $\mu\text{m}$  in diam., ostiolum up to 24.7  $\mu\text{m}$ . Conidiophores 1–2-celled, 7–8  $\times$  2.5–3  $\mu\text{m}$ . Conidiogenous cells cylindrical to subglobose, 5–6.5  $\times$  3–3.6  $\mu\text{m}$ . Conidia rod-shaped to cylindrical, 3.5–4.5  $\times$  (0.8–)1–1.2  $\mu\text{m}$  (Fig. 17).

#### Host plant and distribution in Poland:

- *Carlina vulgaris* L.: Częstochowa Upland, Olsztyn near Częstochowa, Bliskie Lipówki Hill, NE slope of limestone hill, xerothermic grassland, coll. M. Ruszkiewicz, 27 Sep. 1998, LOD PF-1059 [136]; same locality, coll. M. Ruszkiewicz-Michalska, 17 Nov. 2011, LOD PF-3599.

**Additional specimen studied.** CZECH REPUBLIC. *Asteromella carlinae* Petr. sp. nov. on *Carlina vulgaris* L., Mähr. Weisskirchen, Hrabůvka, coll. F. Petrak, Oct. 1926, Petrak, Fl. Bohem. Morav. Exs., Serie II, 1 Abteilung: Pilze, No. 2465, isotype, M-0142465. GERMANY. *Asteromella carlinae* Petr. on *Carlina vulgaris* L., near Wetzlar, meadow, coll. M. Ruszkiewicz-Michalska, 25 Nov. 2009, LOD PF-3689.

**World distribution.** Czech Republic, Germany, Poland, Spain.

**Synanamorphs and teleomorph.** *Mycosphaerella carlinae* (G. Winter) Lindau, not reported from Poland [163].

***Asteromella corcontica* (Kabát & Bubák) Moesz ex Bat. & Peres**

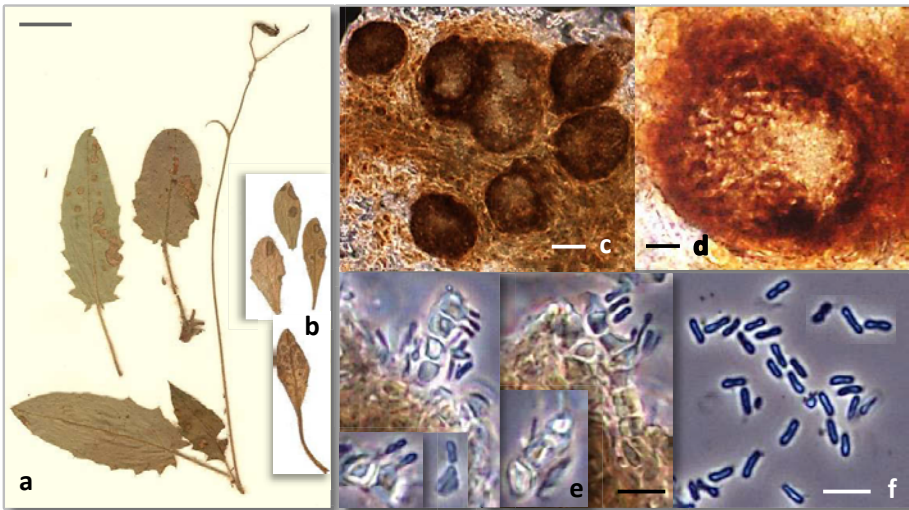
Mems Soc. Broteriana 14: 12 (1961).

≡ *Phyllosticta corcontica* Kabát & Bubák, Sber. K. böhm. Ges. Wiss. Math.-Naturw. Kl. 11: 2 (1903).

**Description.** Leaf lesions circular or subcircular, pale brown, with distinct, purple to violet, later brownish, thin margin. Conidiomata pale grey to greyish brown or black, scarce, in small groups, 61.8–111.2 µm in diam., ostiolum up to 20 µm in diam. Conidiophores 1-celled, 5–9 × 3–4 µm. Conidiogenous cells subglobose to cylindrical, 3–5.7 × (2.5)3–4 µm. Conidia cylindrical or cylindrical-bacterioid, (2.8–)3.5–4(–5.5) × (0.6–)0.8–1 µm (Fig. 18).

**Host plants and distribution in Poland:**

- *Hieracium alpinum* L.: Karkonosze Mts, Strzecha Akademicka mountain shelter near Karpacz (orig. Hampelbaude bei Krummhübel), 30 Aug. 1908, coll. H. Sydow, Mycoth. Germ., No. 709, KRAM F-8775; Tatra Mts, Przełęcz Goryczkowa nad Zakosy, alpine grassland, and south facing slope of Sucha Czuba [179,180];
- *Hieracium lachenalii* C. C. Gmel. subsp. *cruentifolium* (Dahlst. & Lübeck) Zahn (= *Hieracium vulgatum* Fr.): Tatra Mts, Zakopane, Chyców Potok, in spruce forest, coll. W. Mułenko, 16 Sep. 1987 [131,180,183];
- *Hieracium murorum* L.: Częstochowa Upland, Parkowe Reserve, *Luzulo pilosae*-Fagetum, coll. M. Ruszkiewicz, 24 Jul. 1999, LOD PF-1826 [136];
- *Hieracium* sp.: Western Pomerania, Ińsko Landscape Park, Perłówkowe Buki Reserve, beech forest, coll. M. Ruszkiewicz-Michalska, 7 Sep. 2007, with *Ramularia inaequalis* (Preuss) U. Braun, LOD PF-3686; Lasy Spalskie Refuge (PLH100003), Konewka Reserve,



**Fig. 18** *Asteromella corcontica* on *Hieracium* spp. **a, b** Symptoms of host infection. **a** (LOD PF-1826). **b** (KRAM F- 8775). **c–f** Microscopic structures (LOD PF-3686). **c** Group of conidiomata. **d** Conidioma. **e** Conidiogenous cells. **f** Conidia. Scale bars: **a, b** 2 cm; **c** 50 µm; **d** 10 µm; **e, f** 5 µm.

coll. A. Łaska-Dziąg, 24 Sep. 2011, LOD PF-3600; Biebrza National Park, Grzędy Protective Unit, dune, sand grassland, 30 Aug. 2012, coll. M. Dynowska, ident. M. Ruszkiewicz-Michalska & E. Sucharzewska, with *Ramularia inaequalis* (Preuss) U. Braun, deposited in the Fungal Collection of Department of Mycology, University of Warmia and Mazury in Olsztyn;

- *Hieracium umbellatum* L.: as *Phyllosticta hieracii* Allesch., Łęczna-Włodawa Lake District, *Vaccinio myrtilli-Pinetum*, Długie Lake, coll. W. Mułenko, 4 Sep. 1980, LBL M-23692 [123].

**Notes.** Ruszkiewicz-Michalska [136] reported that species also from Częstochowa Upland, but in the re-examined specimen from LOD (Olsztyn near Częstochowa, *Origano-Brachypodietum*, on *Hieracium pilosella* L., coll. M. Ruszkiewicz, 21 Jun. 1999, LOD PF-2016) only a *Phoma* species with ovoid to cylindrical conidia ( $5 \times 3.7 \mu\text{m}$ ) was revealed.

**Additional specimens studied.** CZECH REPUBLIC. *Phyllosticta corcontica* Kabát & Bubák on *Hieracium laevigatum* subsp. *tridentatum* (Fr.) Čelak. [= *Hieracium tridentatum* (Fr.) Fr.], vicinity of Tabor (Böhmen), coll. Fr. Bubák, 1 Aug. 1905, Kabát & Bubák, Fungi Imperf. Exs. No. 303, B 700015076. SWITZERLAND. *Asteromella corcontica* (Kabát & Bubák) Moesz on *Hieracium pilosella* L., Fryburg Canton, Saaneboden bei Düdingen, coll. M. Ruszkiewicz-Michalska & B. Senn-Irlet, 7 Nov. 2008, LOD PF-3601.

**World distribution.** Austria, Czech Republic, Germany, Poland, Switzerland.

**Synanamorphs and teleomorph.** *Ramularia inaequalis* (Preuss) U. Braun, repeatedly recorded from Poland [168]; teleomorph unknown.

### ***Asteromella eupatoriicola* (Kabát & Bubák) H. Ruppr.**

Sydowia 11: 122 (1957).

≡ *Phyllosticta eupatoriicola* Kabát & Bubák, Hedwigia 66: 288 (1907).

**Description.** Leaf lesions dark olive, circular to oblong. Conidiomata pale greyish brown, scarce, evenly distributed in the lesions, completely immersed in plant tissue, 65–104  $\mu\text{m}$  in diam., ostiolum up to 12.3  $\mu\text{m}$  in diam. Conidiomata are surrounded with more numerous ascomatal primordia and immature, mycosphaerella-like ascomata. Conidiophores 1-celled, 7–9  $\times$  3  $\mu\text{m}$ . Conidiogenous cells cylindrical 4.4–5.2(–6)  $\times$  (2.2–)2.7–3  $\mu\text{m}$ . Conidia cylindrical to rod-shaped, 2.5–3.5(–4)  $\times$  (0.6–)0.8–1  $\mu\text{m}$  (Fig. 19).

### **Host plant and distribution in Poland:**

- *Eupatorium cannabinum* L.: Częstochowa Upland, Złoty Potok, thicket at a stream, coll. M. Ruszkiewicz, 17 Oct. 1998, LOD PF-1055 [136]; Biebrza National Park, Grzędy Protective Unit, continental swamp/bog pine forest (*Vaccinio uliginosi-Pinetum*), roadside, 29 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3602 [140]; Kampinos National Park, Lasocin, herb community *Valeriano-Filipenduletum*, coll. M. Ruszkiewicz-Michalska & D. Michalska-Hejduk, 10 Jul. 2012, LOD PF-3506; Silesian Upland,





**Fig. 19** *Asteromella eupatoriicola* on *Eupatorium cannabinum*. **a,b** Symptoms of host infection. **a** (B 700015159). **b** (LOD PF-1055). **c-e** Microscopic structures (LOD PF-3602). **c** Conidioma. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a,b** 2 cm; **c** 20 µm; **d,e** 5 µm.

Jaworzno-Wygoda, near the Zbiornik Dzieńkowice pond, deciduous thicket, coll. M. Ruszkiewicz-Michalska, 22 Jul. 2016, LOD PF-3667.

**Additional specimens examined.** CZECH REPUBLIC. *Phyllosticta eupatoriicola* Kabát & Bubák on *Eupatorium cannabinum* L., vicinity of Turnov (orig. Turnau in Böhmen), coll. Jos. Em. Kabát, 9 Oct. 1902, Kabát & Bubák, Fungi Imperf. Exs., No. 402, isotype, B 700015080. GERMANY. *Asteromella eupatoriicola* (Kabát & Bubák) H. Ruppr. on *Eupatorium cannabinum* L., Kr. Meschede, coll. A. Ludwig, ident. H. Rupprecht, rev. H. Rupprecht, 29 Sep. 1935, Herbarium A. Ludwig, Flora von Westfalen, B 700015159. LATVIA. *Asteromella eupatoriicola* (Kabát & Bubák) H. Ruppr. on *Eupatorium cannabinum* L., prov. Vidzeme, Riga, 8 Oct. 1933, coll. K. Starcs, ident. H. Rupprecht, rev. H. Rupprecht, Herbarium K. Starcs, No. 1286, B 700015159. SWITZERLAND. *Asteromella eupatoriicola* (Kabát & Bubák) H. Ruppr. on *Eupatorium cannabinum* L., Fryburg Canton, Saaneboden bei Düdingen, coll. M. Ruszkiewicz-Michalska & B. Senn-Irlet, 7 Nov. 2008, LOD PF-3603 [162].

**World distribution.** Austria, Brazil, Caribbean, Czech Republic, Germany, Latvia, Malaysia, Poland, Puerto Rico, Romania, Russia [177], Switzerland, Virgin Islands.

**Synanamorphs and teleomorph.** *Mycosphaerella* sp.

### ***Asteromella petasitidis* Petr.**

Annals Mycol. 21: 282 (1923).

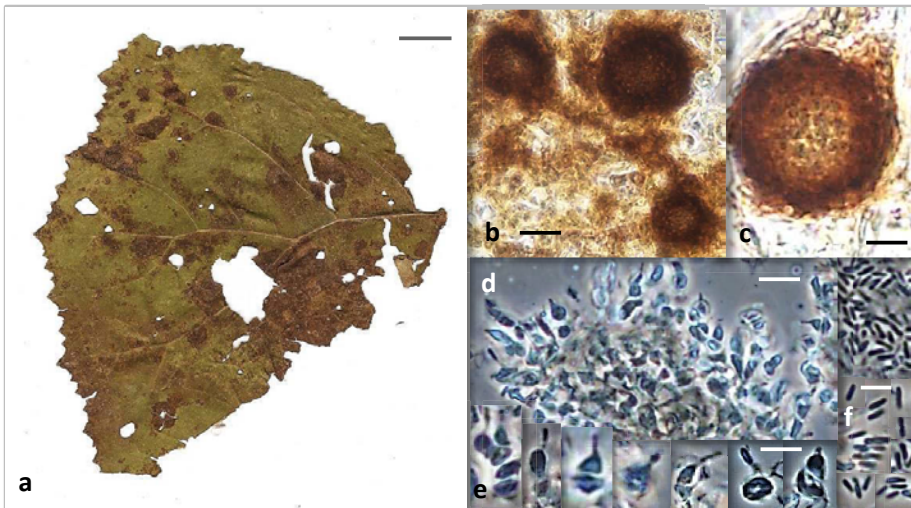
= *Phyllosticta petasitidis* Ellis & Everh. f. *petasitidis-officinalis* Allesch., Rabenh. Kryptog.-Fl. 1: 136 (1898).

**Description.** Leaf lesions polygonal, brown, small or confluent, covering greater part of the leaves (up to 80%). Conidiomata brown to black, evenly distributed in the lesions, papillate, 61.8–111.2  $\mu\text{m}$  in diam., ostiolum erected above the leaf epidermis (constituting up to 1/4 size of conidioma). Conidiophores 1–3-celled, branched at the base,  $7\text{--}15 \times 3.5 \mu\text{m}$ . Conidiogenous cells subglobose to conical,  $4.5\text{--}5.7 \times 3\text{--}3.5 \mu\text{m}$ . Conidia rod-shaped,  $3.5\text{--}4 \times 1 \mu\text{m}$  (Fig. 20).

**Host plant and distribution in Poland:**

- *Petasites hybridus* (L.) P. Gaertn., B. Mey. & Scherb. (= *P. officinalis* Moench): Botanical Garden in Kraków [100,102]; Sudety Mts [97];
- *Petasites kablikianus* Tausch ex Bercht.: Zakopane, near Bristol hotel, coll. W. Mufenko, 14 Sep. 1987, with *Coleosporium tussilaginis* (Pers.) Lév., LBL M-23693 [183];
- *Petasites spurius* (Retz.) Rchb.: as *Phyllosticta petasitis* Ellis & Everhart, Bug River Valley, Gnojno, edge of the river, coll. M. Danilkiewicz, 12 Oct. 1981, LBL M-23694 [133].

**Additional specimens studied.** CZECH REPUBLIC. *Asteromella petasitidis* Petr. n. sp. on *Petasites hybridus* (L.) P. Gaertn., B. Mey. & Scherb. (= *P. officinalis* Moench), Hranice (orig. Mahr-Wiesskirchen, Moravia), coll. F. Petrak, Oct. 1923, Petrak, Mycoth. Gen., No. 4, two isotypes, B 700015175; *Asteromella petasitidis* Petr. on *Petasites hybridus* (L.) P. Gaertn., B. Mey. & Scherb. (= *P. officinalis* Moench), Mähr. Weisskirchen, Hustopetsch, coll. F. Petrak, Oct. 1926, Petrak, Mycoth. Gen., No. 1402, M-0142470. GERMANY. *Asteromella petasitidis* Petr. on *Petasites officinalis* Moench, Kummro near Neuzelle, Guben district, coll. E. Fahrensdorff, 11 Sep. 1938, with associated immature *Mycosphaerella* indicated at the label, Sydow, Mycoth. Germ., No. 3558, KRA F-1938-67.



**Fig. 20** *Asteromella petasitidis* on *Petasites kablikianus* (LBL M-23693). **a** Symptoms of host infection (leaf fragment). **b** Group of conidiomata. **c** Conidioma. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 50  $\mu\text{m}$ ; **c** 20  $\mu\text{m}$ ; **d,e** 5  $\mu\text{m}$ .

**World distribution.** Brazil, Czech Republic, Germany, Poland.

**Synanamorphs and teleomorph.** *Ramularia* sp., *Mycosphaerella* sp.

**Notes.** In the two isotypes housed in B (Petraik, Mycoth. Gen., No. 4 and specimen in series Flora Moravica, both at the sheet No. B 700015175) all *Asteromella* conidiomata were observed in the sori of *Puccinia poarum* Nielsen, exclusively.

***Asteromella senecionis-nemorensis* (Sävul. & Sandu) Vanev & Aa**

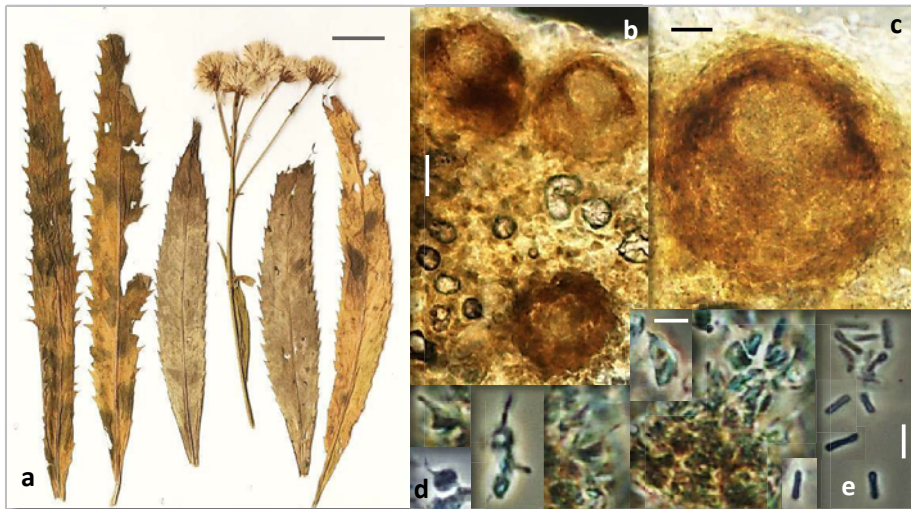
in Aa & Vanev, A revision of the species described in *Phyllosticta*: 421 (2002).

≡ *Phyllosticta senecionis-nemorensis* Sävil. & Sandu, Herb. Mycol. Roman. Fasc. 12 No. 578 (1934).

**Description.** Leaf lesions big, up to 1 cm long, irregular, oblong, partly limited with major leaf-veins. Conidiomata apricot, blackening with age, evenly distributed, amphigenous, 123.5–135.9 µm in diam. Conidiophores discrete, 1–2-celled, 6–12 × 3–4.5 µm. Conidiogenous cells cylindrical to flask-shaped, 4.5–5.9 × 3–4.5 µm. Conidia rod-shaped, 4.5–5 × 1–1.2 µm (Fig. 21).

**Host plant and distribution in Poland:**

- *Senecio paludosus* L.: Białowieża National Park, plot V-100, *Circaeo-Alnetum*, coll. W. Mułenko, 3 Oct. 1990, LBL M-23695 [123].



**Fig. 21** *Asteromella senecionis-nemorensis* on *Senecio paludosus* (LBL M- 23695). **a** Symptoms of host infection. **b** Group of conidiomata. **c** Conidioma. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 50 µm; **c** 10 µm; **d,e** 5 µm.

**Additional specimen studied.** ROMANIA. *Phyllosticta senecionis-nemorensis* Săvul. & Sandu nov. spec. on *Senecio nemorensis* L., Muntenia, district of Prahova, Bușteni, coll. Tr. Săvulescu & C. Sandu, 4 Sep. 1932, Săvulescu, Herb. Mycol. Roman. Fasc. XII, No. 578, isotype, KRA F-1932-122.

**World distribution.** Bulgaria, Poland, Romania.

**Synanamorphs and teleomorph.** Unknown.

### Berberidaceae

Single *Asteromella* species has been reported on *Berberis* in Poland.

#### ***Asteromella garbowskii* (Gucevič) Ruszkiewicz-Michalska, comb. nov.**

Mycobank No. MB 817736

Basionym: *Phyllosticta garbowskii* Gucevič, Učen. Zap. Leningradsk. Gosud. Univ., Ser. Biol. Nauk 49: 71 (1962).

Synonym: *Phyllosticta berberidicola* Garb., Bull. Soc. Mycol. Fr. 39(4): 243 (1923); non *Phyllosticta berberidicola* Speg. (1912); nec *Phyllosticta berberidicola* Lobik (1928).

**Description.** Leaf lesions absent or invisible due to the dried and yellowed plant material. Conidiomata in dense groups, amphigenous, with about 1/4 emerged above the plant epidermis, this part is completely white to whitish grey, 61.8–74.1 μm in diam. Conidiomatal wall 2-layered, outer layer composed of textura epidermoidea. Conidiophores 1-celled, 4–8 × 3–3.5 μm. Conidiogenous cells globose to subglobose, 3.7–4 × 3–3.5 μm. Conidia rod-shaped, 3–4 × 1 μm (3.5–7 × 1–1.5 μm according to Garbowski [184]) (Fig. 22).

#### **Host plant and distribution in Poland:**

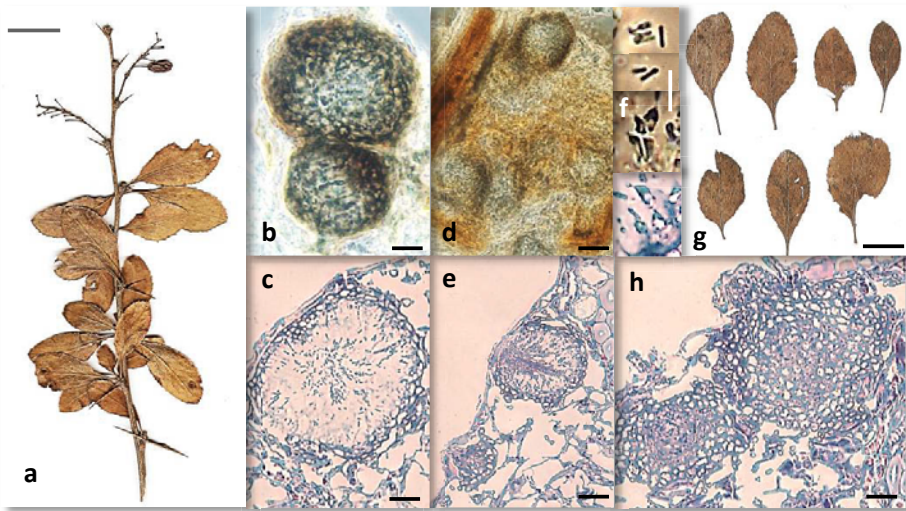
- *Berberis vulgaris* L.: Wąwóz Cienisty near Puławy, coll. M. Konopacka, ident. M. Ruszkiewicz-Michalska, 16 Sep. 1923, with *Phyllosticta berberidis* Rabenh., WAUF; as ?*Phyllosticta berberidicola* Speg., Bolestraszyce, Arboretum, stand No. 21, coll. B. Wojdyło, 30 Oct. 1998, LBL M-23696 [159]; Łódź, Botanical Garden, park greenery (Section VI), 11 Oct. 2002, coll. M. Ruszkiewicz-Michalska & M. Siennicka, LOD PF-3604.

**Notes.** In another specimen from Arboretum Bolestraszyce (stand No. 21, coll. B. Wojdyło, 26 Jul. 1999, LBL M-23697 [159]) only a *Phoma* species is present.

**Additional specimen studied.** GERMANY. *Mycosphaerella berberidis* (Auersw.) Lindau on *Berberis vulgaris* L., Brandenburg, Lebus district, between Dahmsdorf and Münchehofe, coll. H. Sydow, 15 Apr. 1941, Sydow, Mycoth. Germ., No. 3502, KRA F-1941-17.

**World distribution.** Poland, Russia, Ukraine.





**Fig. 22** *Asteromella garbowskii* (LOD PF-3604) and *Mycosphaerella berberidis* on *Berberis vulgaris*. **a–f** *A. garbowskii*. **a** Symptoms of host infection. **b,d** Conidiomata. **c,e** Conidioma cross section. **f** Conidiogenous cells and conidia. **g,h** *M. berberidis* (KRA F-1941-17). **g** Symptoms of host infection. **h** Ascomata cross section. Scale bars: **a,g** 1 cm; **b,c** 10  $\mu$ m; **d,e,h** 50  $\mu$ m; **f** 5  $\mu$ m.

**Synanamorphs and teleomorph.** Worldwide, five *Mycosphaerella/Sphaerella* species are known from *Berberis* [63] including *M. berberidis* (Auersw.) Lindau described on *B. vulgaris* L. from Germany. Aa and Vanev [5] hypothesized that both *Phyllosticta garbowskii* Gucevič (described on *B. vulgaris* from Crimean Peninsula) and *Ph. berberidicola* Speg. (described on *B. laurina* Thunb. from Uruguay [77]) could be a microconidial state of this *Mycosphaerella* species. The characters of *Asteromella* (= *Phyllosticta*) *garbowskii* presented here differ in conidial size from *Asteromella*-state of *M. berberidis* described based on German specimen by von Arx [58] (conidiomata 75–105 in diam., spores 2.5–3.5  $\times$  1–1.5  $\mu$ m). Nevertheless, examination of the type of *A. garbowskii* as well as molecular analyses of corresponding species are necessary to solve this matter.

### Betulaceae

Two *Asteromella* species has been reported on hosts in the Betulaceae in Poland: one host-specific species on *Alnus* (see below), and one polyphagous species on *Betula* (see above).

#### ***Asteromella alnicola* (C. Massal.) Ruszkiewicz-Michalska, comb. nov.**

Index Fungorum No. IF 552452.

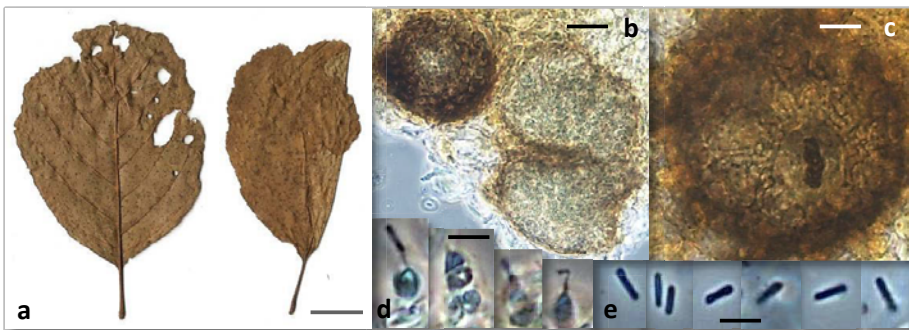
Basionym: *Phyllosticta alnicola* C. Massal., Memorie Accad. Agric. Sci. Verona, Ser. 3,65: 80 (1889).

**Description.** Leaf lesions dark brown to olive brown, limited with minor leaf veins, polygonal. Conidiomata evenly distributed or aggregated in groups, amphigenous, globose, brown to black, papillate, 49.4–98.8  $\mu\text{m}$  in diam., ended with erected ostiolum, up to 17.3–24.7  $\mu\text{m}$  in diam. Conidiophores 1–3-celled, unbranched,  $10 \times 4 \mu\text{m}$ . Conidiogenous cells subglobose,  $3.5 \times 4 \mu\text{m}$ . Conidia rod-shaped,  $(2.5\text{--})3.5\text{--}4 \times 0.8\text{--}1 \mu\text{m}$  (Fig. 23).

**Host plant and distribution in Poland:**

- *Alnus glutinosa* (L.) Gaertn.: as *Phyllosticta alni-glutinosa* P. Syd., Skierniewice, Zwierzyniec, coll. W. Siemaszko, ident. Z. Zweigbaumówna, rev. M. Ruszkiewicz-Michalska, 28 Sep. 1923, WAUF [108]; Łęczna-Włodawa Lake District, Czarne Sosnowickie Lake, *Carici elongatae-Alnetum*, coll. W. Mułenko, 16 Nov. 1982, LBL M-23698 [128]; Łęczna-Włodawa Lake District, Brudzieniec Lake [128]; Białowieża National Park, plot V-100, *Tilio-Carpinetum*, *Circaeo-Alnetum*, *Quercu-Piceetum*, *Carici elongatae-Alnetum*, coll. W. Mułenko, Jul.–Oct. 1989, with *Septoria carisolensis* Kabát & Bubák and *Passalora bacilligera* (Mont. & Fr.) Fresen., LBL M-23699 [123]; Białowieża National Park, plot V-100, *Tilio-Carpinetum*, *Circaeo-Alnetum*, *Quercu-Piceetum*, *Carici elongatae-Alnetum*, coll. W. Mułenko, Jul.–Oct. 1989, with *Asteroma alni* Allesch., LBL M-23736 [123]; Dobromierz near Przedbórz, close to Murawy Dobromierskie Reserve, coll. M. Ruszkiewicz-Michalska, 10 Oct. 2008, LOD PF-3696; Kampinos National Park, Bromierzyk, fresh meadow of alliance *Calthion*, coll. M. Ruszkiewicz-Michalska, 21 Jul. 2009, LOD PF-3605; Biebrza National Park, Brzeziny Protective Unit, Grobla Honczarowska causeway, deciduous thicket, coll. M. Ruszkiewicz-Michalska, 26 Aug. 2013, with *Septoria alni* Sacc., LOD PF-3606.

**Additional specimens studied.** GERMANY. *Phyllosticta alnicola* C. Massal. on *Alnus glutinosa* (L.) Gaertn., Mecklenburg, Groß-Lüsewitz, coll. Buhr, 10 Sep. 1953, B700015062. SWITZERLAND. *Phyllosticta alnicola* C. Massal. on *Alnus viridis* (Chaix) DC., Fryburg Canton, Saaneboden bei Düdingen, coll. M. Ruszkiewicz-Michalska & B. Senn-Irlet, 6 Nov. 2008, LOD PF-3607 [162]; *Phyllosticta alnicola* C. Massal. on *Alnus viridis* (Chaix) DC.,



**Fig. 23** *Asteromella alnicola* on *Alnus glutinosa* (LBL M-23699). **a** Symptoms of host infection. **b** Group of conidiomata. **c** Conidioma below stomata. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 50  $\mu\text{m}$ ; **c** 10  $\mu\text{m}$ ; **d,e** 5  $\mu\text{m}$ .

Lauterbrunnen Grütschalp, coll. M. Ruszkiewicz-Michalska & B. Senn-Irlet, 9 Nov. 2008, LOD PF-3608.

**World distribution.** Germany, Italy, Poland, Switzerland, Ukraine.

**Synanamorphs and teleomorph.** Unknown.

**Notes.** Hitherto no *Asteromella* state was indicated in 16 *Mycosphaerella* species occurring on *Alnus* [63].

## Boraginaceae

Single *Asteromella* species has been reported on *Pulmonaria* in Poland.

### ***Asteromella moeszii* Ruszkiewicz-Michalska & Mułenko, spec. nov.**

Index Fungorum No. IF 552453.

Etymology: in reference to Gustav von Moesz, in recognition of his outstanding contribution to the study of anamorphic fungi.

**Description.** Leaf lesions indistinct, pale brown, circular, without margin. Conidiomata forming  $\pm$  concentric rows, particularly in the central part of the lesion, epiphyllous, dark brown to nearly black, globose, 61.8–74.1(–86.5)  $\mu\text{m}$  in diam. or elliptical, up to 74.1  $\times$  98.8  $\mu\text{m}$ . Ostiolum indistinct, small. Conidiophores 0–1-celled. Conidiogenous cells cylindrical to conical, thin-walled, 5.6–8  $\times$  2.5–3  $\mu\text{m}$ . Conidia rod-shaped, straight, 4–4.5(–5)  $\times$  1  $\mu\text{m}$  (Fig. 24).

### **Host plant and distribution in Poland:**

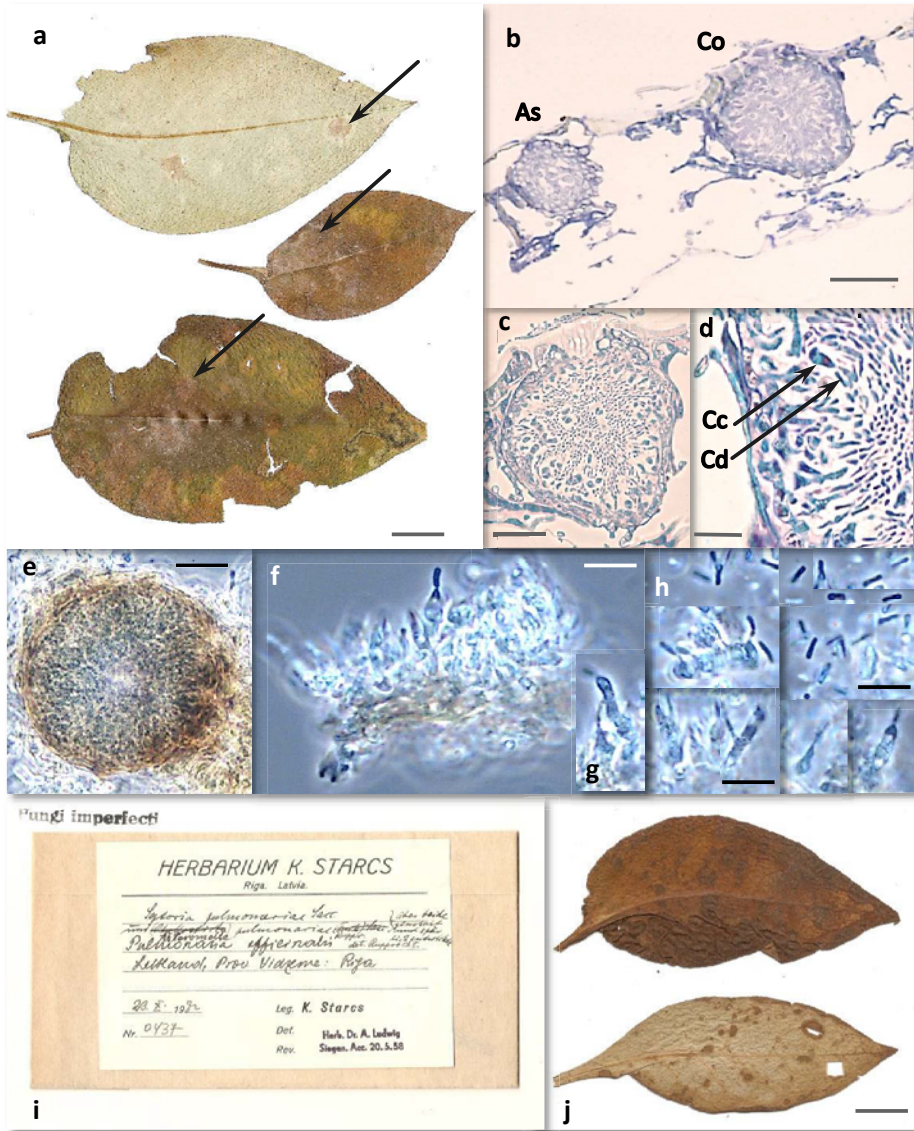
- *Pulmonaria obscura* Dumort.: as “*Phyllosticta pulmonariae* Moesz ex Batista”, Bachus Reserve near Chełm, coll. K. Jędrak, 20 Sep. 1981, LBL M-23700, **type designated here.**

**Notes.** The species on *Pulmonaria obscura* was previously assigned to *Asteromella pulmonariae* Moesz ex Batista & Peres, Mems Soc. Broteriana 14: 21 (1961), nom. invalid., Art. 39.1. The authority of this species was ascribed to Gusztáv von Moesz [12] who collected the type specimen in Hungary in 1940. Moesz died 15 years before the species was described and in the paper by Batista and Peres [12] there is neither acknowledgment to Moesz, nor indication of his role in the preparation of the description.

The name proposed by Batista and Peres [12] is, however, invalid as the species description was given in Portuguese that is in discordance with the rules of ICN [57]. Therefore, the species on *Pulmonaria obscura* is described here as new based on the Polish specimen.

**Additional specimen studied.** LATVIA. as “*Asteromella pulmonariae* H. Ruppr.”, on *Pulmonaria officinalis* L., prov. Vidzeme, Ruga, coll. K. Starcs, ident. A. Ludwig, rev. H. Rupprecht, 23 Oct. 1932 (?), with *Septoria pulmonariae* Sacc., Herbarium K. Starcs. Riga, Latvia, No. 437, B 700015191.





**Fig. 24** *Asteromella* on *Pulmonaria* spp. **a–h** *Asteromella moeszii* on *Pulmonaria obscura* (type, LBL M-23700). **a** Symptoms of host infection. **b** Young ascoma (As) and mature conidioma (Co) in leaf tissue (cross section). **c** Conidioma cross section. **d** Conidiogenous cells (Cc) and conidia (Cd). **e** Conidioma. **f** Layer of conidiogenous cells. **g** Conidiogenous cells. **h** Conidia. **i,j** *Asteromella pulmonariae* Ruppr. nom. herb. on *Pulmonaria officinalis* (B 700015191). **i** Hand-written label. **j** Symptoms of host infection. Scale bars: **a,j** 2 cm; **b** 50 µm; **c,e** 20 µm; **d,f–h** 10 µm.

**World distribution.** Hungary, Latvia, Poland.

**Synanamorphs and teleomorph.** Unknown. In the type collection the species co-occurs with *Ramularia cylindroides* Sacc. but genetic connection of the morphs was not tested. On host genus *Pulmonaria* a single *Mycosphaerella* species was described, *M. pulmonariae* Fakirova. No anamorphic and spermatial states of the fungus were indicated in the diagnosis [185].

### Brassicaceae

Single *Asteromella* species has been reported on *Brassica* in Poland.

#### *Asteromella brassicae* (Chevall.) Boerema & Kesteren

Persoonia 3: 18 (1964).

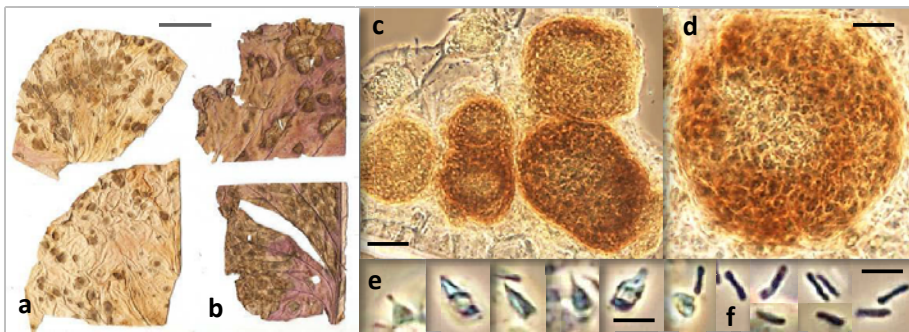
= *Phyllosticta brassicicola* McAlpine, Bull. Victoria Agric. Dept.: 27 (1901).

= *Phyllosticta napi* Sacc., Michelia 1: 532 (1879).

**Description.** Leaf lesions pale straw, cover substantial part of the leaves, which beside the lesions are lightly pink-violet; the infected tissue is overgrown with black hyphae forming irregular net. Conidiomata black, completely immersed in the host tissue, irregular, in dense groups, confluent,  $49.4\text{--}74.1 \times 61.8\text{--}148.2 \mu\text{m}$  or up to  $85 \mu\text{m}$  in diam., ostiolum up to  $37.1 \mu\text{m}$  in diam. Conidiophores 1-celled,  $6\text{--}7 \times 4 \mu\text{m}$ . Conidiogenous cells subglobose to conical,  $3\text{--}4 \times 3\text{--}3.5 \mu\text{m}$ . Conidia cylindrical to rod-shaped,  $(3\text{--})4\text{--}4.5 \times 1 \mu\text{m}$  (Fig. 25).

#### Host plant and distribution in Poland:

- *Brassica oleracea* L.: Olszyna, Ostrzesz district, 1927 (?), with handwritten note “from the Garbowski’s collection”, with *Cercospora brassicicola* Henn. (= *C. bloxamii* Berk. & Broome), WA 21942; Szczecin-Wzgórze Hetmańskie [186]; Szczecin [160].



**Fig. 25** *Asteromella brassicae* on *Brassica oleracea*. **a,b** Symptoms of host infection (leaf fragments). **a** (WA 21942). **b** (WRSL). **c-f** Microscopic structures (WRSL). **c** Group of conidiomata. **d** Conidioma. **e** Conidiogenous cells. **f** Conidia. Scale bars: **a,b** 2 cm; **c** 50  $\mu\text{m}$ ; **d** 10  $\mu\text{m}$ ; **e,f** 5  $\mu\text{m}$ .

**Additional specimens studied.** PORTUGAL. *Phyllosticta brassicae* Westend. f. *brassicae oleraceae* on *Brassica oleracea* L., near Coimbra, coll. A. F. Moller, Jun. 1879, Thümen, Herb. Mycol. Oecon., No. 653, WRSL, two specimens.

**World distribution.** Australia, Brazil, Cambodia, Colombia, Canada, China, Denmark, Dominican Republic, Ecuador, France, Germany, Ghana, Great Britain, Greenland, Haiti, India, Ireland, Italy, Jamaica, Kenya, Malaysia, Mexico, Panama, Poland, Portugal, New Zealand, Portugal, Sicily, South Africa, Sweden [181], Taiwan, Venezuela, Ukraine, USA.

**Synanamorphs and teleomorph.** *Mycosphaerella brassicicola* (Duby) Oudem., not recorded in Poland [163].

### Caprifoliaceae

Two *Asteromella* species have been reported on *Sambucus* and *Viburnum* in Poland. They differ in the dimensions of conidia (Tab. 5).

#### *Asteromella adeana* Petr.

Annls Mycol. 29(1/2): 122 (1931).

**Description.** Leaf lesions polygonal, delimited with leaf veins, brown at first, becoming beige and grey due to epidermis detachment, with brown margin, around some lesions leaf tissue with red pinkish tinge. Conidiomata mainly epiphyllous, in loose groups, globose, very diverse in colour: young – greyish and glassy, overmatured (or ascomatal primordia?) – black, dull; up to 98.8 µm in diam. or elliptical, 74.1–111.2 × 48.4–74.1 µm, both kinds topped with a ring of darker cells, up to 37 µm in diam. surrounding ostiolum that is 9.88–19.8 µm in diam. Conidiophores 1-celled, 6–11 × (3–)3.5–4 µm. Conidiogenous cells cylindrical, 5–5.4 × 3–3.5 µm. Conidia cylindrical to rod-shaped, (3.5–)4–5 × 0.8(–1) µm [according to Petrak [187]: 3–4(–5) × 0.5–0.8 µm] (Fig. 26).

#### Host plants and distribution in Poland:

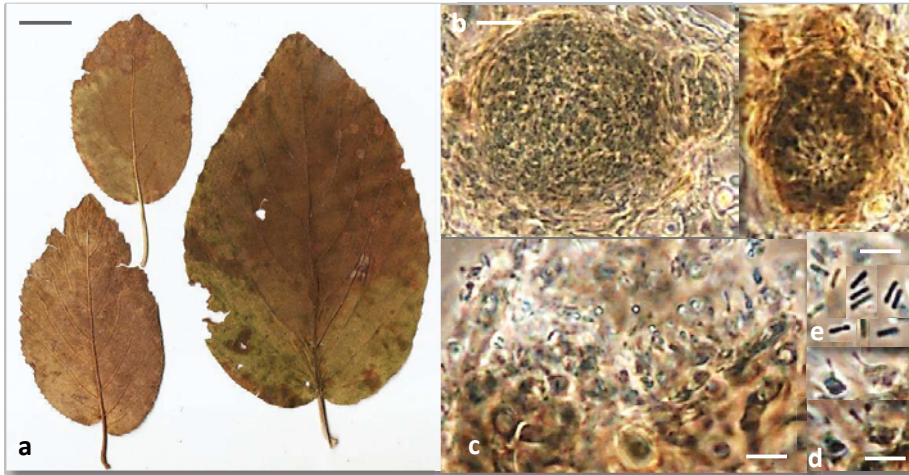
- *Viburnum lantana* L.: as *Phyllosticta tineae* Sacc., Bolestraszyce, Arboretum, stand No. 36, 30 Oct. 1998, LBL M-23701 [159]; same locality and collector, stand No. 23, coll. B. Wojdyło, 29 Sep. 1999, LBL M-23702 [159];
- *Viburnum opulus* L.: as *Phyllosticta tineae* Sacc., Białowieża National Park, plot V-100, *Carrici elongatae-Alnetum*, coll. W. Mułenko, Oct. 1989, LBL M-23703 [123]; Bolestraszyce, Arboretum, stand No. 33, coll. B. Wojdyło, 30 Oct. 1998, LBL M-23704 [159].

**Additional specimen studied.** SWITZERLAND. *Asteromella adeana* Petr. on *Viburnum lantana* L., Fryburg Canton, Saaneboden bei Düdingen, coll. M. Ruszkiewicz-Michalska & B. Senn-Irlet, 7 Nov. 2008, LOD PF-3613.

**World distribution.** Poland, Spain, Switzerland.

**Tab. 5** *Asteromella* species on Caprifoliaceae (dimensions in  $\mu\text{m}$ ).

Taxon	Conidioma	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. adaeana</i>	98.8 $\mu\text{m}$ diam. or 74.1–111.2 $\times$ 48.4–74.1	1-celled; 6–11 $\times$ (3–)3.5–4	5–5.4 $\times$ 3–3.5	(3.5–)4–5 $\times$ 0.8(–1)	<i>Viburnum</i>
<i>A. ebuli</i>	74.1–98.8(–118.5)	1-celled; 7–10 $\times$ 2–3	3.5–5.4(–6) $\times$ 2–2.8(–3)	5–7.5 $\times$ 0.7–1(–1.2)	<i>Sambucus</i>



**Fig. 26** *Asteromella adeana* on *Viburnum lantana* (LBL M-23701). **a** Symptoms of host infection. **b** Conidioma. **c** Papilla. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 3 cm; **b** 20  $\mu$ m; **c** 10  $\mu$ m; **d, e** 5  $\mu$ m.

**Synanamorphs and teleomorph.** Unknown.

**Notes.** The species is morphologically indistinguishable from *Phyllosticta tineae* Sacc. described from leaves of *Viburnum tinus* from Europe (Selva). However, *Ph. tineae* causes other symptoms in host leaves: conidiomata are formed in drying, whitened lesions.

#### ***Asteromella ebuli* (Fuckel) Moesz ex Bat. & Peres**

Mems Soc. Broteriana 14: 14 (1961).

≡ *Phyllosticta ebuli* (Fuckel) Sacc., Syll. Fung. 3: 57 (1884).

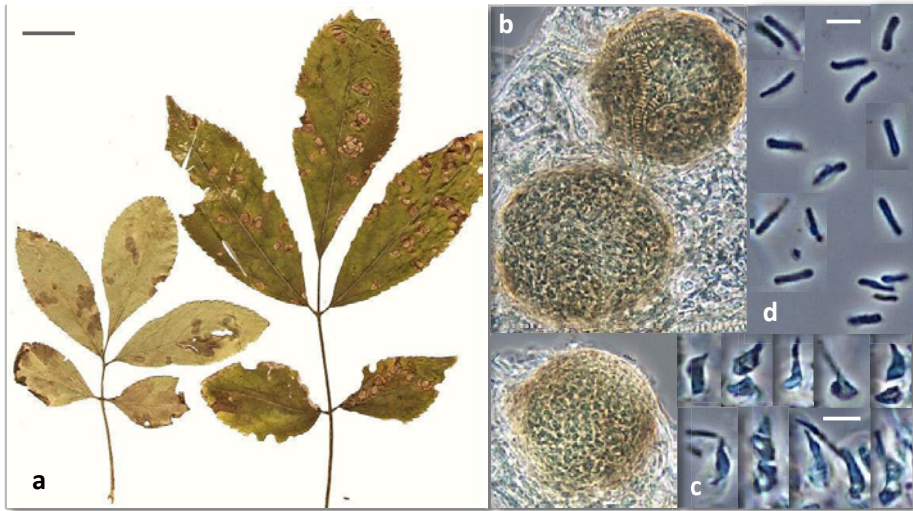
≡ *Ascochyta ebuli* Fuckel, Symb. Mycol. 386 (1869).

**Description.** Leaf lesions oblong-elliptical, olive-grayish, bordered by a darker outline, dried, always adjacent to the brown to dark brown lesion covered with a hyphomycete conidiomata. *Asteromella* conidiomata evenly distributed in the lesion, brown, amphigenous, 74.1–98.8(–118.5)  $\mu$ m in diam., ostium up to 24.7  $\mu$ m in diam. Conidiophores 1-celled, cylindrical, 7–10  $\times$  2–3  $\mu$ m. Conidiogenous cells subglobose to pear-shaped, 3.5–5.4(–6)  $\times$  2–2.8(–3)  $\mu$ m. Conidia rod-shaped, slightly curved, 5–7.5  $\times$  0.7–1(–1.2)  $\mu$ m (Fig. 27).

#### **Host plant and distribution in Poland:**

- *Sambucus ebulus* L.: Biała Góra near Tomaszów Lubelski, thicket in a ravine, coll. A. Wołczańska, ident. M. Ruszkiewicz-Michalska, with *Ramularia sambucina* Sacc., LBL M-23705;





**Fig. 27** *Asteromella ebuli* on *Sambucus nigra*. **a** Symptoms of host infection (LOD PF-3609). **b–d** Microscopic structures. **b** Conidiomata. **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 3 cm; **b** 10  $\mu$ m; **c,d** 5  $\mu$ m.

- *Sambucus nigra* L.: Poznań, Dendrological Garden [165]; Bolestraszyce, Arboretum [159]; Częstochowa Upland, Złoty Potok village, Major Wrzosek Str., roadside, coll. M. Ruszkiewicz, 24 Oct. 1999, with *Ramularia sambucina* Sacc., LOD PF-943; Częstochowa Upland, Parkowe Reserve, forest section 273g, *Dentario enneaphyllidis-Fagetum*, 18 Sep. 2003, coll. M. Ruszkiewicz-Michalska, with *Cercospora prolifigans* (Ell. & Holway) Sacc., LOD PF-3609; Częstochowa Upland, Jaskrów, deciduous forest, coll. M. Ruszkiewicz-Michalska, 6 Oct. 2004, LOD PF-3610; Łódź, Łągiewnicki Forest complex, *Tilio-Carpinetum typicum*, pathway, coll. A. Kuchnik, 8 Sep. 2007, with *Cercospora prolifigans* (Ell. & Holway) Sacc., LOD PF-3290; Łódź, Łągiewnicki Forest complex, roadside, coll. M. Ruszkiewicz-Michalska, 12 Oct. 2008, LOD PF-3611;
- *Sambucus racemosa* L.: Łódź, Łągiewnicki Forest complex, near a bus terminus, deciduous forest, 10 Oct. 2013, coll. M. Ruszkiewicz-Michalska, LOD PF-3612;
- *Sambucus* sp.: as *Phyllosticta maculiformis* Sacc. on *Fraxinus excelsior* L., Skierniewice, park, coll. W. Siemaszko, ident. Z. Zweigbaumówna, rev. M. Ruszkiewicz-Michalska, 7 Oct. 1922, WAUF [108].

**Additional specimens examined.** AUSTRIA. *Phyllosticta ebuli* Sacc. on *Sambucus ebulus* L., Flösselberg near Perchtoldsdorf, coll. C. de Keissler, Aug., with *Ramularia sambucina* Sacc., Zahlbruckner, Krypt. Exs., No. 2322, B 700015079. GERMANY. *Ascochyta ebuli* Fuckel on *Sambucus ebulus* L., Schienberg near Freiburg, coll. J. Schroeter, Aug. 1876, WRSL.

**World distribution.** Austria, Brazil, former Czechoslovakia, Germany, Italy, Poland.

**Synanamorphs and teleomorph.** *Ramularia* sp., ?*Mycosphaerella ebuli* Petr., not reported in Poland [163].



**Notes.** Probably to the same species belongs *Depazea sambucicola* Kalchbr. Mspt. distributed in Rabenhorst, Fungi Europaei, cent. VII, No. 668. The specimen examined (M-0142475, no place, date of collection and collector given at the label; with handnote with the species name, probably made by Allescher) contains only empty ascomata and *Asteromella*-like pycnidia, with indistinct, irregular ostiola. However, outer layer of pycnidial wall is composed of *textura dermoidea*, with thickened and darkened cell walls, characters absent in *A. ebuli* specimens studied. No other specimen of *D. sambucicola* was found in available reference collections.

## Celastraceae

Single *Asteromella* species has been reported on *Euonymus* in Poland.

### *Asteromella euonymella* (Sacc.) Aa & Vanev

in Aa & Vanev, A revision of the species described in *Phyllosticta*: 207 (2002).

≡ *Phyllosticta euonymella* Sacc., Michelia 1: 138 (1878).

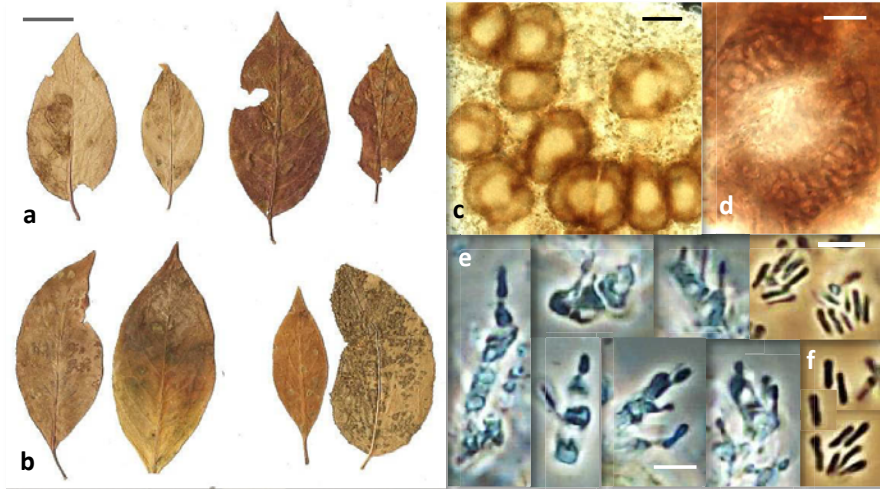
**Description.** Leaf lesions yellowish, limited with leaf veins, with no definite margin. Conidiomata first pale brown, becoming darker brown with age, hypophyllous, single to aggregated, papillate, small, 42.3–77.4 µm in diam. or bigger, up to 101.6 × 116.1 µm, ostiolum up to 24.7 µm. Conidiophores 1–4-celled, 10–15 × 2.5–4 µm. Conidiogenous cells 4–4.5 × 2.5–4 µm. Conidia, bacterioid, rod-shaped, (2.5–)3.5–4 × 0.6–0.8(–1) µm (Fig. 28).

### Host plant and distribution in Poland:

- *Euonymus europaea* L.: Białowieża National Park, *Circaeao-Alnetum*, *Carici elongatae-Alnetum*, coll. W. Mułenko, Oct. 1989, with *Microsphaera euonymi* (DC.) Sacc., LBL M-4246 ([123] in *Circaeao-Alnetum*); as *Phyllosticta euonymicola* Tognini, Bolestraszyce, Arboretum, stand No. 13, coll. B. Wojdyło, 29 Sep. 1999, with *Phyllosticta euonymi* Sacc., LBL M-23706 [159]; Dąbrowa Grotnicka Reserve, thermophilous oak forest, coll. & ident. E. Połec & M. Ruszkiewicz-Michalska, 16 Oct. 2008, LOD PF-3700; Biebrza National Park, Kapice Protective Unit, subcontinental lime-oak-hornbeam forest (*Tilio-Carpinetum*), 53°32'14" N, 22°43'13" E, 28 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3451, together with *Ramularia celastri* Ellis & G. Martin and *Septogloeum carthusianum* (Sacc.) Sacc. [188].

**Notes.** In specimen LBL M-23706 no conidiophores, conidiogenous cells and conidia were found. That specimen is therefore provisionally included into *A. euonymella*, mainly because of the characters of the conidiomata.

**Additional specimens studied.** CZECH REPUBLIC. *Phyllosticta euonymella* Sacc. on *Euonymus vulgaris* Mill. (= *E. europaea* L.), vicinity of Turnov (orig. Turnau in Böhmen), coll. Jos. Em. Kabát, 18 Oct. 1902, Kabát & Bubák, Fungi Imperf. Exs., No. 4, B 700015081.



**Fig. 28** *Asteromella euonymella* on *Euonymus europaea*. **a,b** Symptoms of host infection. **a** (B 700015081). **b** (LBL M-4246). **c–f** Microscopic structures (LBL M-4246). **c** Group of conidiomata. **d** Conidiomatal tip with ostiolum. **e** Conidiogenous cells. **f** Conidia. Scale bars: **a,b** 2 cm; **c** 50  $\mu\text{m}$ ; **d** 10  $\mu\text{m}$ ; **e,f** 5  $\mu\text{m}$ .

**World distribution.** China [175], Czech Republic, France, Germany, Italy, Poland, Sicily, Spain.

**Synanamorphs and teleomorph.** Unknown. Two *Mycosphaerella* species were described in association with *Euonymus* but without spermatial state indicated [63].

### Dipsacaceae

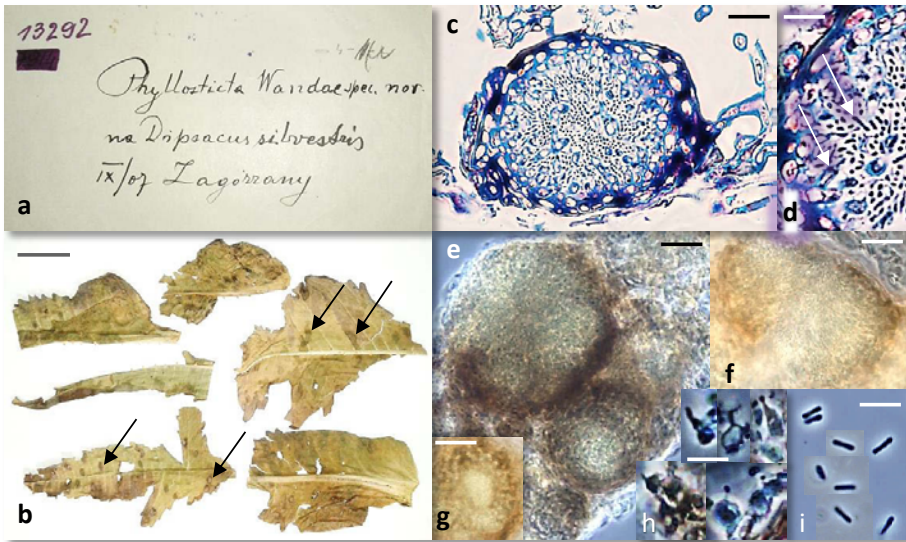
Two *Asteromella* species have been reported on *Dipsacus* and *Scabiosa* in Poland. They can be distinguished by the lack of conidiophores in conidiomata of *A. scabiosae* in Polish material (Tab. 6) that is, however, badly preserved. The importance of that character is not yet confirmed in taxonomy of the genus. Aa and Vanev [5] characterized conidiogenous cells of the type collection of *A. scabiosae* as single or in rows protruding into cavity. The character should be confirmed with verification of greater number of specimens.

#### *Asteromella wandae* (Namysl.) H. Ruppr.

Sydowia 13: 14 (1959).

≡ *Phyllosticta wandae* Namysl., Kosmos 33: 329 (1908).

**Description.** Leaf lesions light brownish-yellow, graying, first round, then of various shapes, limited with tiny veins, occupying a large part of the leaf. Conidiomata immersed in host tissue, distributed evenly or in linear groups along the veins limiting leaf spots, light



**Fig. 29** *Asteromella wandae* on *Dipsacus sylvestris* (type, KRAM F-13292). **a** Envelope with hand written name. **b** Symptoms of host infection. **c–i** Microscopic structures. **c, d** Conidioma cross section; arrows indicate conidiogenous cell (lower) and conidium (upper). **e, f** Conidiomata. **g** Conidiomatal tip with ostiolum. **h** Conidiogenous cells. **i** Conidia. Scale bars: **b** 2 cm; **c, e** 20  $\mu\text{m}$ ; **d, f, g** 50  $\mu\text{m}$ ; **h, i** 5  $\mu\text{m}$ .

brown-gray to dark brown-black, (58–)61.8–86.5  $\mu\text{m}$  in diam., ostiolum up to 17.3  $\mu\text{m}$  in diam. Conidiophores cylindrical, 1–4-celled, 8–15  $\times$  3–3.5  $\mu\text{m}$ . Conidiogenous cells cylindrical to conical, 5–5.4  $\times$  3–3.5  $\mu\text{m}$ . Conidia cylindrical, with base slightly narrower than apex, 3.5–4.5  $\times$  1  $\mu\text{m}$  (Fig. 29).

#### Host plant and distribution in Poland:

- *Dipsacus sylvestris* Huds.: Zagórzany near Gorlice, coll. B. Namysłowski, Sep. 1907, type, KRAM F-13287 [101,102]; same locality and collector, Sep. 1907, KRAM F-13292 [101,102]; Stróże, Grybów district, coll. B. Namysłowski, Sep. 1908, KRAM F-13294 and KRAM F-13283 [102,189]; near Raciążek, Ciechocińska Lowland, coll. K. Rouppert, Sep. 1908, KRA F-0-5433 and KRAM F-13284 [105]; Raciążek, Sep. 1908, coll. K. Rouppert, KRAM F-13291 [105]; Niegłowice near Jasło, Dec. 1908 and Jan. 1909, coll. A. Wodziczko, ident. B. Namysłowski, KRAM F-13285 [102,170,189]; Dębica, coll. B. Namysłowski, Sep. 1909, Raciborski, Mycoth. Polon., No. 189, KRAM F-13283 [102,103]; Dębica, coll. B. Namysłowski, Sep. 1909, KRAM F-13295 [102,103]; Wolica, coll. B. Namysłowski, Sep. 1909, KRAM F-13293; Podzamcze at Wisłoka, Niegłowice, Topolin, Jasło, Sep. 1910, coll. A. Wodziczko, KRAM F-13289 [102,170]; Kędzycz, Łatoszyn near Dębica [102,103]; Deszno near Rymanów-Zdrój [102,190]; Sobniów, Góra św. Marcina near Tarnów [102,170].

**Additional specimens examined.** ROMANIA. as “*Phyllosticta vandae* Namy.” on *Dipsacus sylvestris* Huds., Ponoare, Suceava district, coll. M. Mititiuc, 13 Aug. 1964, Flora Romaniae,

Herbarium M. Toma, M-0142548. UKRAINE. *Phyllosticta wandae* Namysl. on *Dipsacus silvestris* L., Zaleszczyki, Tarnopol district, right slope of the Dniester River, coll. A. Wróblewski, 18 Apr. 1910, KRAM F-13286 [102,191]; *Phyllosticta wandae* Namysl. on *Dipsacus silvestris* L., Dublany near Lviv, coll. P. Wiśniewski, ident. B. Namysłowski, Jan. 1909, KRAM F-13288 [102,189]; *Phyllosticta wandae* Namysl. on *Dipsacus silvestris* L., Petrycze near Krasne, coll. K. Janczewska, Oct. 1908, KRAM F-13290 [102,189].

**World distribution.** France, Germany [36], Poland, Romania, Ukraine.

**Synanamorphs and teleomorph.** Unknown.

### Fabaceae

Two *Asteromella* species have been reported on *Astragalus* and *Caragana* in Poland (Tab. 7). They cannot be differentiated based on morphology itself.

#### *Asteromella astragalicola* (C. Massal.) Petr.

Annals Mycol. 21: 300 (1923).

≡ *Phyllosticta astragalicola* C. Massal., Bot. Centbl. 26: 386 (1890).

**Description.** Leaf lesions at first small, 4–5 mm in diam. and yellowish, later covering a majority of leaf area, pale brown. Conidiomata pale to dark brown, evenly distributed or aggregated in confluent groups in the bigger lesions, 41.6–78.4(–133,1) μm in diam., ostiolum distinct, irregularly limited with darker cells, 9.88–12.3 μm in diam. Conidiophores 1–3-celled, 6–12(–16) × (3–)4–4.5 μm. Conidiogenous cells 5.7–6 × 4–4.3 μm. Conidia rod-shaped, (3–)4–5(–7) × 1–1.3(–1.5) μm (Fig. 30).

#### Host plant and distribution in Poland:

- *Astragalus glycyphyllos* L.: *Phyllosticta astragalicola* C. Massal., Zagórzany, coll. B. Namysłowski, Sep. 1907, KRAM F-8946, with *Septoria astragali* Desm. [102,103]; *Phyllosticta astragalicola* C. Massal., Gorajowice near Jasło, coll. A. Wodziczko, Sep. 1910, KRAM F-8947 [102,170]; Kazimierz nad Wisłą, coll. W. Konopacka, 28 Sep. 1923, WAUF [171]; Częstochowa Upland, Olsztyn near Częstochowa, slope of quarry, coll. M. Ruszkiewicz, 21 Oct. 1998, with *Microsphaera astragali* (DC.) Trevis., *Uromyces punctatus* J. Schröt. and *Alternaria tenuissima* (Kunze) Wiltshire, LOD PF-961 [136]; Dąbrowa Grotnicka Reserve, *Potentillo albae-Quercetum*, coll. E. Połec, 10 Aug. 2006, LOD PF-3614.

**World distribution.** Armenia, China [175], f. Czechoslovakia, Italy, Poland, Ukraine.

**Synanamorphs and teleomorph.** Unknown.

**Notes.** Often together with *Septoria astragali* Desm., in the single specimen (KRAM F-8947) both *Asteromella* and *Septoria* present in a single conidioma.

Tab. 6 *Asteromella* species on Dipsacaceae (dimensions in  $\mu\text{m}$ ).

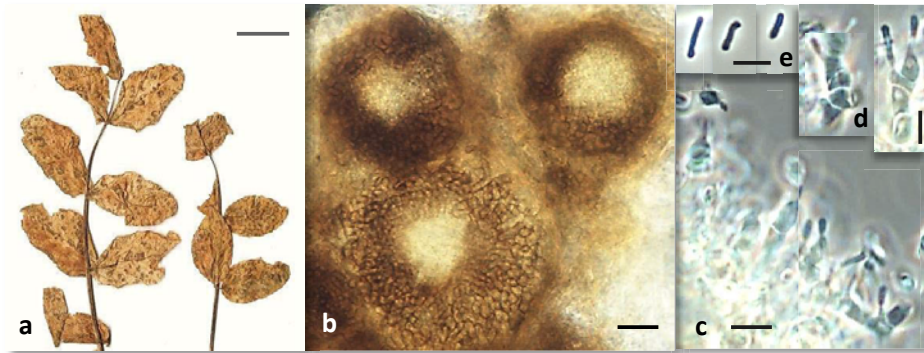
Taxon	Conidioma	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. scabiosae</i> *	74.1–98.8	-	nd	3–5.5 × 0.8–1	<i>Scabiosa</i>
<i>A. wandae</i>	61.8–86.5	1–4-celled; 8–15 × 3–3.5	5–5.4 × 3–3.5	3.5–4.5 × 1	<i>Dipsacus</i>

\* Species included into insufficiently-studied and doubtful species (Chapter 4.5). nd – no data available.

Tab. 7 *Asteromella* species on Fabaceae (dimensions in  $\mu\text{m}$ ).

Taxon	Conidioma	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. astragalicola</i>	41.6–78.4(–133.1)	1–3-celled; 6–12(–16) × (3)–4–4.5	5.7–6 × 4–4.3	(3)–4–5(–7) × 1–1.3(–1.5)	<i>Astragalus</i>
<i>A. borszczowii</i>	49–67.7(–121)	1-celled; 8 × 3–3.5	(4)–4.5–5 × (2.5)–3–3.5	3.5–4.5 × 1.2	<i>Caragana</i>





**Fig. 30** *Asteromella astragalicola* on *Astragalus glycyphyllos*. **a** Symptoms of host infection (WAUF). **b–e** Microscopic structures (KRAM F-8947). **b** Conidiomata with ostiolum. **c** Layer of conidiogenous cells. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 1 cm; **b** 20 µm; **c–e** 5 µm.

### *Asteromella borszczowii* (Thüm.) Aa

in Aa & Vanev, A revision of the species described in *Phyllosticta*: 109 (2002).

≡ *Phyllosticta borszczowii* Thüm., Byull. Mosk. Obshch. Ispyt. Prir. 55: 229 (1880).

**Description.** Leaf lesions brownish, polygonal, vein-limited, at first small, later covering greater part of leaf area, amphigenous. Conidiomata dark brown, subglobose, abundant, aggregated in groups, hypophyllous, 49–67.7(–121) µm in diam., ostiolum up to 15 µm in diam. Conidiophores 1-celled, 8 × 3–3.5 µm. Conidiogenous cells very similar to cells of inner wall layer, conical or subglobose, monophialidic, (4–)4.5–5 × (2.5–)3–3.5 µm. Conidia elliptical, slightly curved, scarce, 3.5–4.5 × 1.2 µm (Fig. 31).

#### Host plant and distribution in Poland:

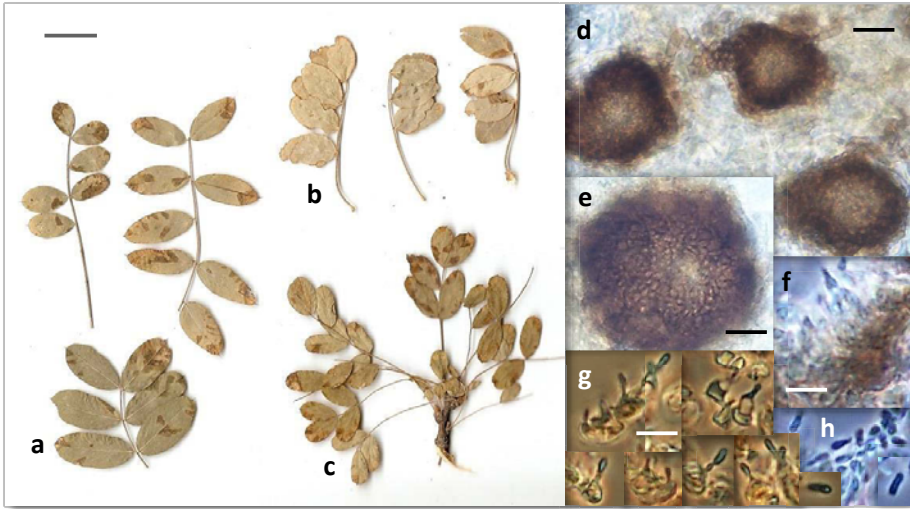
- *Caragana arborescens* Lam.: as *Phyllosticta advena* Pass., Podębie, Skierniewice district, coll. Z. Zweigbaumówna, 1 Sep. 1922, with *Septoria caraganae* (Jacz.) Died., WAUF, reported as *Phyllosticta caraganae* P. Syd. in [108]; Bug River Valley, Janów Podlaski, road edge, Sep.–Oct. [133].

**Additional specimens studied.** RUSSIA. *Phyllosticta borszczowii* Thüm. nov. spec. on *Caragana arborescens* Lam., Western Siberia, Maidaschi, Sep. 1879, coll. N. Martianoff, Thümen, Mycoth. Univ., No. 1894, isotypes from WRSI and B 700015069 with note of van der Aa (“*Asteromella* state of *Mycosphaerella* spec., from which the unripe ascomata are also present; March 1977”). UKRAINE. *Phyllosticta borszczowii* Thüm. on *Caragana arborescens* Lam., Stryj, near Podhorce, 1917, coll. Petrak, Allgem. Myc. Tauschverein, two specimens, B 700015068.

**World distribution.** Armenia, Canada, China, Poland, Romania, Russia, Ukraine, USA.

**Synanamorphs and teleomorph.** *Mycosphaerella jaczewskii* Potebnia [27], not reported in Poland [163]. Often co-occurs with *Septoria caraganae* (Jacz.) Died. [27].





**Fig. 31** *Asteromella borszczowii* on *Caragana arborescens*. **a–c** Symptoms of host infection. **a** (B 700015068). **b** (WRSL). **c** (WAUF). **d–h** Microscopic structures (WRSL). **d** Group of conidiomata. **e** Conidioma. **f** Layer of conidiogenous cells. **g** Conidiogenous cells. **h** Conidia. Scale bars: **a–c** 1 cm; **d** 50  $\mu$ m; **e** 20  $\mu$ m; **f** 10  $\mu$ m; **g,h** 5  $\mu$ m.

## Fagaceae

Single *Asteromella* species has been reported on *Quercus* in Poland.

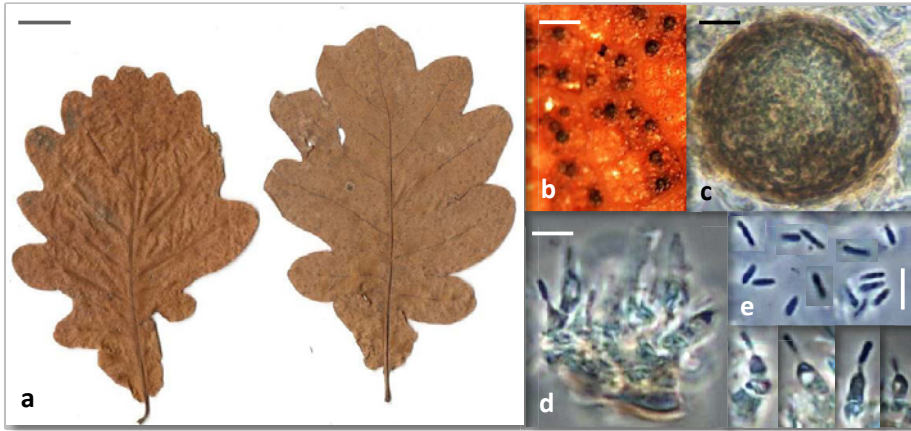
### *Asteromella quercifolii* C. Massal.

Memorie Accad. Agric. Sci. Verona, Sér. 3, 65: 131 (1889).

**Description.** Leaf lesions pale brown, irregular, vein-limited, without margin. Conidiomata pale to dark grey, evenly distributed, hypophyllous, globose, 74.1–86.5  $\mu$ m or elliptical, up to 123.4  $\times$  148.2  $\mu$ m, ostiolum up to 24.7  $\mu$ m in diam. Conidiophores 1–5-celled, polyphialidic, 5–16  $\times$  (2–)3.5–4  $\mu$ m. Conidiogenous cells 2–4  $\times$  2–2.5  $\mu$ m. Conidia rod-shaped, 2–3(–4)  $\times$  0.8–1(–1.2)  $\mu$ m (Fig. 32).

#### Host plant and distribution in Poland:

- *Quercus robur* L.: as *Phyllosticta* sp., Kartuzy district, Owczarnia, no collector's name, with handnote "from the Garbowski's collection", 29 Feb. 1927, WA 21871; Białowieża National Park, *Carici elongatae*-Alnetum, *Circaeo*-Alnetum, *Tilio*-*Carpinetum*, *Pino*-*Quercetum*, coll. W. Mułenko, Oct. 1990, LBL M-23707 [123]; Częstochowa Upland, Parkowe Reserve, forest roadside, forest section 273d, coll. M. Ruszkiewicz, 30 Sep. 1998, LOD PF- 1375 [136]; Częstochowa Upland, Złoty Potok forest district, forest section 275b, beech forest edge, coll. M. Ruszkiewicz, 19 Oct. 1998, LOD PF-1305 [136]; Bolestraszyce, Arboretum, stand No. 43, coll. B. Wojdyło, 29 Sep. 1999, with *Phyllosticta*



**Fig. 32** *Asteromella quercifolii* on *Quercus robur*. **a** Symptoms of host infection (LBL M-23707). **b–e** Microscopic structures. **b** Conidiomata at a leaf (LOD PF-3624). **c** Conidioma. **d** Conidiogenous cells (B 700015193). **e** Conidia (LBL M-23707). Scale bars: **a** 2 cm; **b** 1 mm; **c** 20 µm; **d, e** 5 µm.

*quernea* Thüm, LBL M-23708 [159]; Łódź, Las Łągiewnicki Reserve, *Tilio-Carpinetum typicum*, coll. A. Stachurska, 10 Jul. 2007, with *Phyllosticta quernea* Thüm., LOD PF-3668; Dąbrowa Grotnicka Reserve, *Potentillo albae-Quercetum*, coll. E. Połec, 16 Oct. 2006, LOD PF-3621; Łódź, Łągiewnicki Forest complex, parking in the forest, coll. M. Ruszkiewicz-Michalska, 21 Oct. 2007, LOD PF-3620; Dąbrowa Grotnicka Reserve, *Potentillo albae-Quercetum*, 22 Sep. 2008, coll. E. Połec, LOD PF-3622; Lasy Spalskie Refuge (PLH100003), Konewka Reserve near Spała, *Potentillo albae-Quercetum*, 21 Aug. 2011, coll. A. Łaska-Dziąg, rev. M. Ruszkiewicz-Michalska, LOD PF-3615; Biebrza National Park, Grzędzki Protective Unit, deciduous forest, 29 Aug. 2012, coll. & ident. E. Sucharzewska, deposited in the Fungal Collection of Department of Mycology, University of Warmia and Mazury in Olsztyn [140];

- *Quercus petraea* (Matt.) Liebl.: Wola near Pszczyna, *Molinio-Pinetum*, coll. & ident. A. Mysza, 11 Oct. 2006, rev. M. Ruszkiewicz-Michalska, LOD PF-2930; Łódź, municipal park, coll. D. Papier, 9 Oct. 2006, LOD PF-3064; Łódź, Las Łągiewnicki Reserve, *Potentillo albae-Quercetum*, coll. M. Ruszkiewicz-Michalska & A. Stachurska, 12 Aug. 2006, LOD PF-3669;
- *Quercus petraea* (Matt.) Liebl. × *Q. robur* L.: Załęcze Landscape Park near Wieluń, Stawiska Reserve, 19 Sep. 1997, coll. M. Ruszkiewicz, LOD PF-3616; Łódź, Botanical Garden, park greenery (Section VI), coll. M. Siennicka, ident. M. Ruszkiewicz-Michalska & M. Siennicka, 18 Aug. 2002, LOD PF-2294; Lasy Spalskie Refuge (PLH100003), Konewka Reserve near Spała, *Potentillo albae-Quercetum*, 15 Aug. 2004, coll. A. Kotynia, rev. M. Ruszkiewicz-Michalska, LOD PF-2640; Częstochowa Upland, Jaskrów, deciduous forest, coll. M. Ruszkiewicz-Michalska, 6 Oct. 2004, LOD PF-3617; Dąbrowa Grotnicka Reserve, *Potentillo albae-Quercetum*, 29 Sep. 2006, coll. M. Ruszkiewicz-Michalska, LOD PF-3618; Łódź, Łągiewnicki Forest complex, *Calamagrostio-Quercetum typicum*, coll. A. Kuchnik, 30 Sep. 2007, LOD PF-3670; Łódź, Łągiewnicki Forest complex, *Potentillo albae-Quercetum*, roadside, coll. K. Brózio, 30 Sep. 2007, LOD PF-3671; Łódź, Las

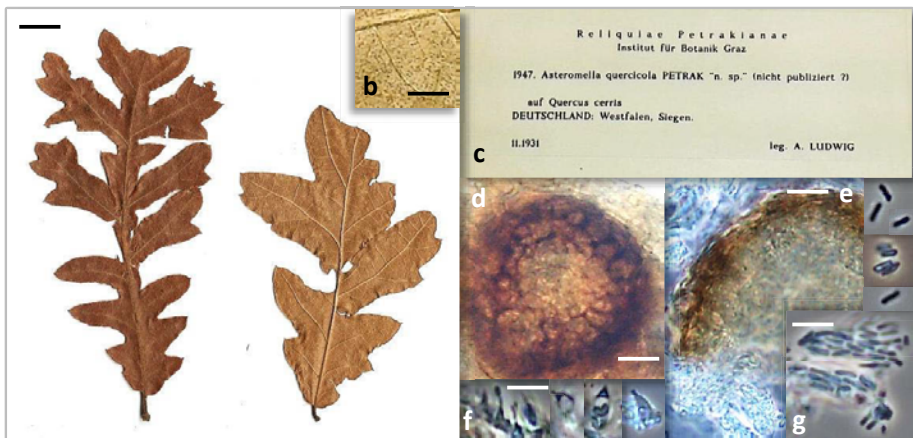
Łągiewnicki Reserve, *Calamagrostio-Quercetum typicum*, coll. K. Brózio, 28 Jul. 2007, LOD PF-3619;

**Additional specimens studied.** GERMANY. *Asteromella quercifolii* C. Massal. on *Quercus robur* L. (= *Q. pedunculata* Hoffm.), Westphalia, Siegen district, at Hermelsbacher pond (am Hermlsbacher Weicher bei Siegen), coll. A. Ludwig, det. H. Rupprecht, 18 Oct. 1950, Herbarium Dr. A. Ludwig. Flora von Westfalen, B 700015193; *Asteromella quercifolii* C. Massal. on *Quercus robur* L. (= *Q. pedunculata* Hoffm.), Westphalia, Siegen district, locality illegibile, coll. A. Ludwig, det. H. Rupprecht, 6 Oct. 1939, Herbarium Dr. A. Ludwig. Flora von Westfalen, B 700015193. LATVIA. *Asteromella quercifolii* C. Massal. on *Quercus robur* L., Gauja National Park, vicinity of Krimulda, mixed forest, coll. M. Ruszkiewicz-Michalska, 24 Sep. 2005, LOD PF-3623. SWITZERLAND. *Asteromella quercifolii* C. Massal. on *Quercus robur* L., Fryburg Canton, Saaneboden bei Düdingen, coll. M. Ruszkiewicz-Michalska & B. Senn-Irlet, 6 Nov. 2008, LOD PF-3624.

**World distribution.** Bulgaria [166], Germany, India, Italy, Latvia, Myanmar, Poland, Russia [177], Sicily, Switzerland.

**Synanamorphs and teleomorph.** Unknown.

**Notes.** Two other species are listed on *Quercus* from Europe [13]: *Asteromella hrancensis* Petr. and *A. quercicola* Petr. The second species was probably never described although its specimen is housed in B reference collection (B 700015192). Infection symptoms of host leaves (*Quercus cerris*) and morphological characters of the fungus are identical with *A. quercifolii* except for lack of conidiophores in the specimen studied (Fig. 33). However, conidiogenous cells and conidia are badly preserved in that specimen.



**Fig. 33** *Asteromella quercicola* Petr. nom. herb. on *Quercus cerris* (B 700015192). **a,b** Symptoms of host infection. **c** Envelope. **d–f** Microscopic structures. **d** Conidiomatal tip. **e** Conidioma (cracked) with widely open ostiolum. **f** Conidiogenous cells. **g** Conidia. Scale bars: **a** 1 cm; **b** 0.5 cm; **d,e** 10  $\mu$ m; **f,g** 5  $\mu$ m.

## Hippocastanaceae

Single *Asteromella* species has been reported on *Aesculus* in Poland.

### *Asteromella aesculicola* (Sacc.) Petr.

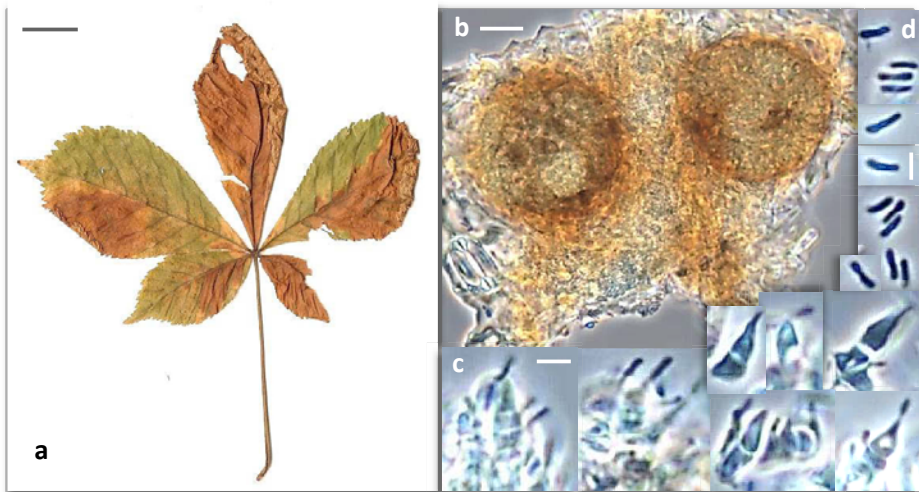
Sydowia 10: 266 (1956).

≡ *Phyllosticta aesculicola* Sacc., Michelia 1: 134 (1879).

**Description.** Leaf lesions brown, oblong, slightly zonate, in older lesions the centre is whitening. Conidiomata globose, brown, hypophyllous, with dark apices emerging, 74–86  $\mu\text{m}$  in diam. or up to 118.6  $\times$  135.5  $\mu\text{m}$ . Conidiophores cylindrical, 2-celled, 10–18  $\times$  2–3  $\mu\text{m}$ . Conidiogenous cells scarce, 4–5.6(–6)  $\times$  2–3  $\mu\text{m}$ . Conidia in dense, gelatinous mass, intermixed and sealed around conidiophores, 3–3.5  $\times$  0.6–0.7(–1)  $\mu\text{m}$  (Fig. 34).

### Host plants and distribution in Poland:

- *Aesculus hippocastanum* L.: Rataje near Kalisz, coll. H. Nelkenówna, 1 Nov. 1931, WAUF; Szczecin [160]; Załęcze Landscape Park near Wieluń, Stawiska Reserve, 19 Sep. 1997, coll. M. Ruszkiewicz, LOD PF-3625; Częstochowa Upland, Olsztyn near Częstochowa, roadside, coll. M. Ruszkiewicz, 27 Sep. 1998, with *Phyllosticta paviaecola* Brunaud, LOD PF-945 [136]; Łódź, Smulsko housing estate, Bokszerska Str., coll. M. Ruszkiewicz-Michalska, 3 Jun. 2011, LOD PF-3679;
- *Aesculus pavia* L.: Szczecin [160].



**Fig. 34** *Asteromella aesculicola* on *Aesculus hippocastanum*. **a** Symptoms of host infection (LOD PF-3625). **b–d** Microscopic structures (WAUF). **b** Conidiomata. **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 3 cm; **b** 50  $\mu\text{m}$ ; **c,d** 5  $\mu\text{m}$ .

**Additional specimens studied.** AUSTRIA. *Asteromella aesculicola* (Sacc.) Petr. on *Aesculus hippocastanum* L., Flora Austriae Inferioris, Wien, coll. F. Petrak, Aug. 1960, B 700015148.

**World distribution.** Austria, Italy, Poland, Ukraine.

**Synanamorphs and teleomorph.** *Septoria* sp., teleomorph unknown.

**Notes.** In another specimen from Częstochowa Upland (Olsztyn near Częstochowa, roadside, coll. M. Ruszkiewicz, 27 Sep. 1997, LOD PF-976 [136]) no *Asteromella* conidiomata were found.

*Asteromella aesculicola* (Sacc.) Petr. is treated as a synonym of *Leptodothiorella aesculicola* (Sacc.) Sivan. by some authors, e.g. Punithalingham [192] and it is followed by Index Fungorum database [13]. Both names are included into synonyms of *Guignardia aesculi* (Peck) V. B. Stewart. As emphasized by Punithalingham [192], for clarification of the taxonomic status of *A. aesculicola* examination of the type material is required.

## Lamiaceae

Single *Asteromella* species has been reported on *Prunella* in Poland.

### ***Asteromella prunellae* (Ellis & Everh.) Ruszkiewicz-Michalska, comb. nov.**

Index Fungorum No. IF 552454.

Basionym: *Phyllosticta prunellae* Ellis & Everh. (as “*brunellae*”), Proc. Acad. Nat. Sci. Philad.: 355 (1894).

**Description.** Lesions absent. Conidiomata dark brown, globose, 98.8–123.5 µm in diam., a few at straw-coloured, dried parts of inflorescences. Conidiophores 2–3-celled, cylindrical, 10–12 × 4 µm. Conidiogenous cells subglobose to cylindrical, 5–5.5 × 3.5–4 µm. Conidia rod-shaped, bacterioid, 3.5(–4) × 0.7–1 µm (Fig. 35).

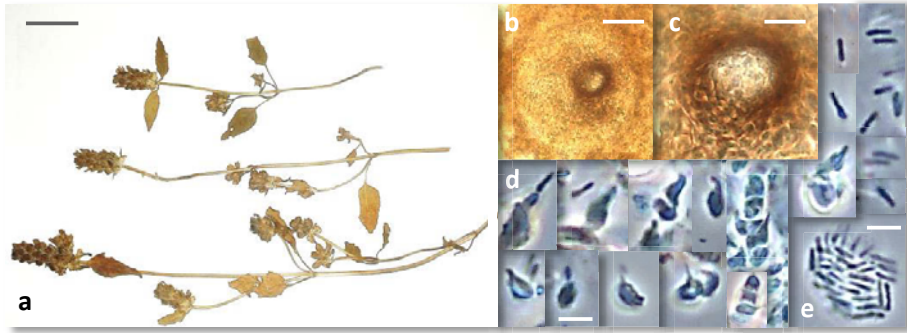
#### **Host plant and distribution in Poland:**

- *Prunella vulgaris* L.: Roztocze National Park, Ścieżka na Bukową Górę path, beech forest, coll. M. Ruszkiewicz-Michalska, 29 May 2005, LOD PF-3626; Gorce National Park, Przełęcz pod Przysłopem, forest roadside, coll. M. Ruszkiewicz-Michalska, 10 Sep. 2005, LOD PF-3627; Łódź, Łagiewnicki Forest complex, lawn at forest parking, coll. M. Ruszkiewicz-Michalska, 21 Oct. 2007, LOD PF-3628; Biebrza National Park, Grzędy Protective Unit, mixed forest edge, coll. M. Ruszkiewicz-Michalska, 29 Aug. 2012, LOD PF-3629.

**World distribution.** Poland, USA.

**Synanamorphs and teleomorph.** Unknown. On the *Prunella* hosts no *Asteromella* or *Mycosphaerella* were reported [63].





**Fig. 35** *Asteromella prunellae* on *Prunella vulgaris* (LOD PF-3629). **a** Symptoms of host infection. **b** Conidioma. **c** Conidiomatal tip with ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 1 cm; **b** 50  $\mu$ m; **c** 20  $\mu$ m; **d,e** 5  $\mu$ m.

### Liliaceae

Single *Asteromella* species has been reported on *Convallaria* and *Polygonatum* in Poland.

#### *Asteromella convallariae* (Cavara) Petr.

Annals Mycol. 21: 205 (1923).

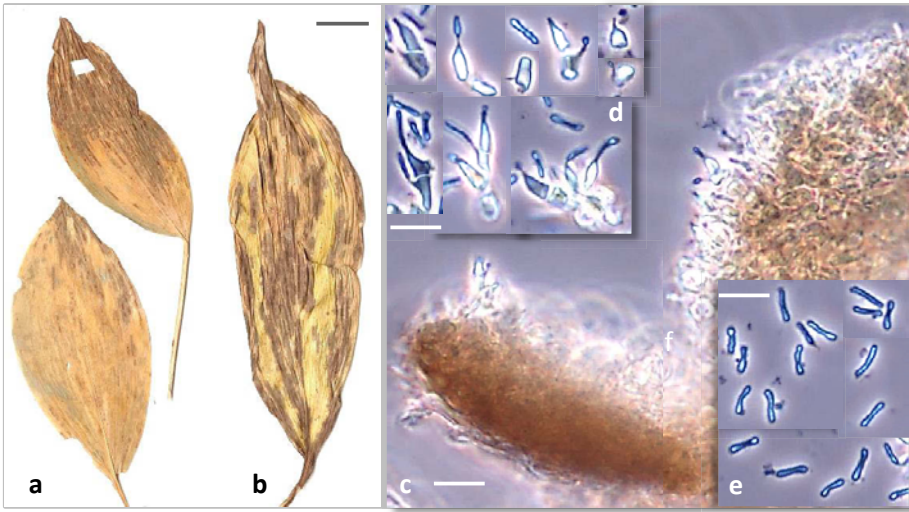
$\equiv$  *Dendrophoma convallariae* Cavara, Revue Mycol., Toulouse 11: 188 (1889); Sacc. Syll. Fung. 10: 211 (1892).

**Description.** Leaf lesions brown to brown redish, without margin, oblong to elliptical. Conidiomata amphigenous, in loose groups, slightly emerged above leaf epidermis, grey-brown, glassy, globose, up to 98.8  $\mu$ m in diam. or elliptical, flattened, up to 86.5  $\times$  148.2  $\mu$ m, ostiolum up to 24.7  $\mu$ m in diam. Sometimes conidiomata interconnected with dark hyphae visible in the upper part of leaf blade. Conidiophores 3–4-celled, 7–11  $\times$  2–3  $\mu$ m. Conidiogenous cells cylindrical to conical (2–)4.5–5  $\times$  1.3–2(–3)  $\mu$ m. Conidia cylindrical, (3.5–)4–4.5(–6)  $\times$  1  $\mu$ m (Fig. 36).

#### Host plants and distribution in Poland:

- *Convallaria majalis* L.: province of Poznań and West Prussia (orig. Provinz Posen and Westpreussen), no locality specified [95]; vicinity of Dąbroszyn near Kostrzyn nad Odrą (orig. Berganlagen bei Tamsel) [96]; Tuszowskie Forests, vicinity of Babule near Tarnobrzeg, coll. W. Siemaszko, ident. K. Jankowska, Aug. 1924, WAUF; Silesia, near Stronie Śląskie, Bystrzyca Kłodzka district (orig. Eulenberg bei Seitenberg, Bezirk Habelschwerdt), 24 Aug. 1929, coll. H. Sydow, Sydow, Mycoth. Germ., No. 2553, KRA F-1929-59; Rataje-Zadara, Konin district, coll. H. Nelkenówna, 17 Jul. 1931, WAUF; Łódź, Łagiewnicki Forest complex, mixed forest, roadside, coll. E. Połec & M. Ruszkiewicz-Michalska, 6 Oct. 2006, LOD PF-3630; Biebrza National Park, Osowiec Protective Unit, Sośnia, Scots pine forest, coll. M. Wrzosek, 29 Aug. 2013, LOD PF-3672;





**Fig. 36** *Asteromella convallariae* on *Convallaria majalis*. **a,b** Symptoms of host infection. **a** (WAUF, Rataje-Zadara). **b** (LOD PF-3672). **c-f** Microscopic structures (LOD PF-3672). **c** Conidiomatal wall with layer of conidiogenous cells. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a,b** 2 cm; **c** 20  $\mu$ m; **d,e** 5  $\mu$ m.

- *Polygonatum odoratum* (Mill) Druce: Pułtusk, Sosnowa Str., monoculture of Scots pine, 29 Sep. 2007, coll. M. Ruszkiewicz-Michalska, LOD PF-3631.

**Additional specimens studied.** FINLAND. *Asteromella convallariae* (Cavara) Petr. on *Convallaria majalis* L., Tavastia australis, Valkeakoski, Iivarinkorpi, 17 Aug. 1936, coll. Lauri E. Kari, Plantae Fennicae, B 700015156. GERMANY. *Asteromella convallariae* (Cavara) Petr. on *Convallaria majalis* L., Brandenburg, bei Stolpe, Kreis Angermünde, 14 Sep. 1932, coll. H. Sydow, Sydow, Mycoth. Germ., No. 2732, KRA F-1932-80. ITALY. *Dendrophoma convallariae* Cavara on *Convallaria majalis* L., Jardin botanique de Pavie, summer–autumn, coll. F. Cavara, Roumeguère, Fungi Sel. Gall. Exs., No. 5174, B 700015208. ROMANIA. *Dendrophoma convallariae* Cavara on *Convallaria majalis* L., Chicira, 3 Jul. 1957, coll. & ident. illegible, Herbarul Micologic al Institutului Agronomic IASI, WAUF.

**World distribution.** China, Finland, Germany, Hungary, Italy, Poland, Romania, Russia [177], Sweden [181].

**Synanamorphs and teleomorph.** ?*Mycosphaerella brunneola* (Fr.) Johanson ex Oudem., unknown from Poland [163].

### Myrsinaceae

Single *Asteromella* species has been reported on *Lysimachia* in Poland.

***Asteromella lysimachiae* (Allesch.) Ruszkiewicz-Michalska, comb. nov.**

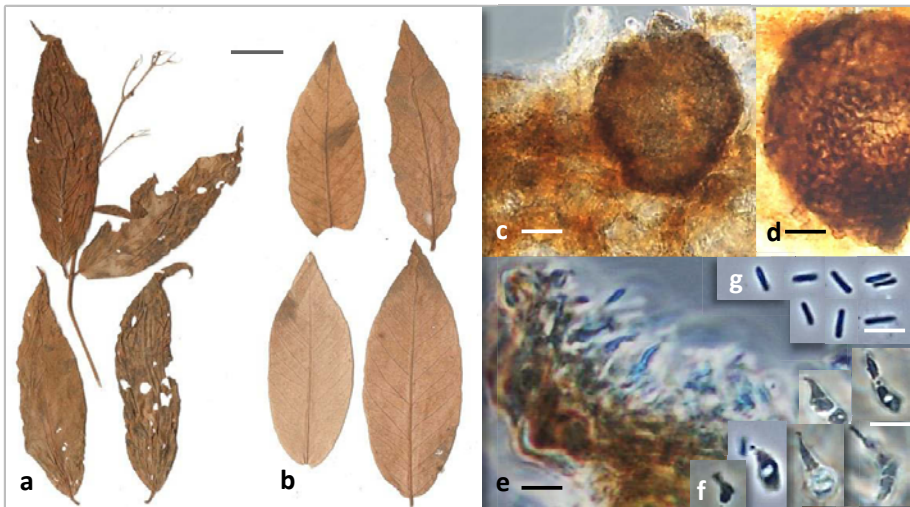
Index Fungorum No. IF 552455.

Basionym: *Phyllosticta lysimachiae* Allesch., Ber. Bayer. Bot. Ges. 4: 31 (1896).

**Description.** Leaf lesions polygonal, major vein-limited, olive at first, later chestnut-coloured, occupying larger areas of withering leaves. Conidiomata amphigenous, evenly and densely distributed in lesions or arranged linearly along the veins, 1/2 of conidiomata emerged above the leaf epidermis, dark brown to black, 61.8–135.9  $\mu\text{m}$  in diam. or elliptical, up to 84.7  $\times$  96.8  $\mu\text{m}$ , with irregular, large, ostiolum, up to 37  $\mu\text{m}$  in diam. Conidiophores absent. Conidiogenous cells conical to square-shaped, 3.4–4.9  $\times$  3.5–5  $\mu\text{m}$ . Conidia minute, bacterioid, cylindrical to rod-shaped, 2.5–3–5(–4.5)  $\times$  0.6–1(–1.2)  $\mu\text{m}$  (Fig. 37).

**Host plant and distribution in Poland:**

- *Lysimachia vulgaris* L.: Omelno Reserve near Radzyń Podlaski, *Tilio-Carpinetum* [191]; Łęczna-Włodawa Lake District, Durne Bagno Reserve, *Carici elongatae-Alnetum*, coll. W. Mułenko, 20 Oct. 1983, LBL M-23709 [128]; no locality (?Białowieża National Park), riparian forest, coll. W. Mułenko, 25 Aug. 1987, with *Ramularia lysimachiae* Thüm., LBL M-23710 [128]; Białowieża National Park, *Tilio-Carpinetum*, *Circaeo-Alnetum*, *Carici elongatae-Alnetum*, coll. W. Mułenko, Jul.–Oct. 1989, LBL M-23711 [123]; the same locality and collector, Jul.–Oct. 1990, LBL M-23712 [123]; Częstochowa Upland, Parkowe Reserve, forest district 270g, Scots pine monoculture, 30 Sep. 1998, coll. M. Ruszkiewicz, LOD PF-1044 [136]; as *Asteromella* sp., Słowiński National Park, Kluki, *Vaccinio*



**Fig. 37** *Asteromella lysimachiae* on *Lysimachia vulgaris*. **a,b** Symptoms of host infection. **a** (LBL M-23712). **b** (KRA F-1937-75). **c–f** Microscopic structures (collection of I. Adamska, Słowiński National Park). **c** Conidioma. **d** Conidiomatal tip. **e** Layer of conidiogenous cells. **f** Conidiogenous cells. **g** Conidia. Scale bars: **a,b** 2 cm; **c** 50  $\mu\text{m}$ ; **d** 10  $\mu\text{m}$ ; **e** 20  $\mu\text{m}$ ; **f,g** 5  $\mu\text{m}$ .

*uliginosi-Betuletum pubescentis*, coll. I. Adamska, Oct. 2003, deposited in Fungal Collection of West Pomeranian University of Technology in Szczecin [142]; as *Phyllosticta letendrei* (Sacc.) Allesch., Słowiński National Park, Kluki, *Vaccinio uliginosi-Betuletum pubescentis*, Sep. 2003, coll. I. Adamska, deposited in Fungal Collection of West Pomeranian University of Technology in Szczecin [142]; Łuk Mużakowa Landscape Park, Żary district, Uroczysko Węglińskie Reserve near Węgliny, acidophilic oak forest, coll. M. Ruszkiewicz-Michalska, 28 Aug. 2009, LOD PF-3640; vicinity of Gać Spalska Reserve near Spała, forest pathway near peatbog “Szczurek”, 11 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3641; Biebrza National Park, Kapice Protective Unit, *Tilio-Carpinetum*, coll. M. Ruszkiewicz-Michalska, 28 Aug. 2012, LOD PF-3673 [140].

**Additional specimen studied.** GERMANY. *Phyllosticta lysimachiae* Allesch. on *Lysimachia vulgaris* L., München, Groshosselohe, coll. Schnabl, Sep. 1897, Allescher & Schnabl, Fungi Bav. No. 569, B 700015098; *Phyllosticta lysimachiae* Allesch. on *Lysimachia vulgaris* L., Brandenburg, Gross-Berlin, Plänterwald zu Treptow, coll. G. Fahrenhorff, 21 Oct. 1937, Sydow, Mycoth. Germ., No. 3151, KRA F-1937-75.

**World distribution.** Germany, Poland, USA.

**Synanamorphs and teleomorph.** *Septoria lysimachiae* Westend., *Ramularia lysimachiae* Thüm., both recorded in Poland [168,194]. Teleomorph – *Mycosphaerella lysimachiae* (Höhn.) Höhn.

**Notes.** Aa and Vanev [5] considered *Ph. lysimachiae* Allesch. as the *Asteromella* spermatial state of *Mycosphaerella lysimachiae* (Höhn.) Höhn., based on the co-occurrence of pycnidia and ascomata. However, as there is no unequivocal experimental data to support inclusion of this species in the life cycle of any *Mycosphaerella* species, the new combination is proposed here.

## Onagraceae

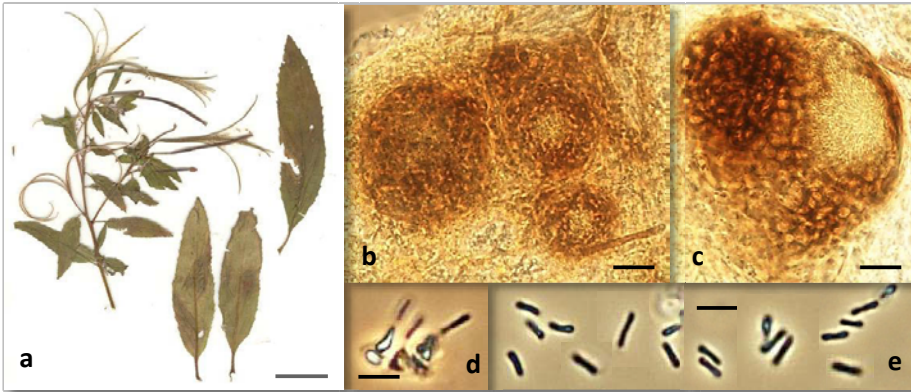
Single *Asteromella* species has been reported on *Epilobium* (incl. *Chamaenerion*) in Poland.

### *Asteromella ludwigii* Petr.

Annals Mycol. 21: 174 (1923).

= *Phyllosticta chamaenerii* Allesch., Ber. Bayer. Bot. Ges. 4: 31 (1896).

**Description.** Conidiomata small, up to 66.7 µm in diam. or 60–75 × 65–90 µm, single or in small groups, black, immersed in tissue of dried, brown to brown-grey lesions, often at the leaf edge, with distinct, dark margin, major vein-limited. Conidiophores 1-celled, 5–5.5 × 1.8–2.2 µm. Conidiogenous cells subglobose to conical, 3–3.5 × 2.2 µm. Conidia in slimy mass, 2.5–3(–4) × 0.7–0.8 µm (Fig. 38).



**Fig. 38** *Asteromella ludwigii* on *Chamaenerion angustifolium* (LOD PF-3633). **a** Symptoms of host infection. **b** Group of conidiomata. **c** Conidioma with ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 1 cm; **b** 50  $\mu$ m; **c** 20  $\mu$ m; **d,e** 5  $\mu$ m.

#### Host plants and distribution in Poland:

- *Chamaenerion angustifolium* (L.) Scop.: Tatra Mts, Zakopane-Skibówki II, thicket at a roadside, coll. W. Mułenko, 8 Oct. 1986, with *Phaeoramularia punctiformis* (Schltld.) U. Braun, LBL M-23713 [183]; Beskid Żywiecki, Góra Grojec Hill near Żywiec, spruce forest edge, coll. M. Ruszkiewicz-Michalska, 5 Sep. 2006, LOD PF-3632; Biebrza National Park, Werykle Protective Unit, Carska Droga near Grobla Honczarowska causeway, roadside, 26 Aug. 2013, coll. M. Ruszkiewicz-Michalska, with *Seimatosporium kriegeri-anum* (Bres.) Morgan-Jones & B. Sutton, LOD PF-3633 [141];
- *Epilobium hirsutum* L.: Częstochowa Upland, Parkowe Reserve, riverside thicket, coll. M. Ruszkiewicz, 29 Sep. 1998, LOD PF-1125 [136];
- *Epilobium collinum* C. C. Gmel.: Gorce National Park, near Jaszcze Małe, roadside, coll. M. Ruszkiewicz-Michalska, 12 Sep. 2005, LOD PF-3634;
- *Epilobium roseum* Schreb.: Tatra Mts, Zakopane, near Bristol Hotel, damp thicket, coll. W. Mułenko, 14 Sep. 1987, LBL M-23714 [183].

**Notes.** In the specimens from Kudowa [on *Chamaenerion angustifolium* (L.) Scop., road to Błędne Skały, coll. J. Kućmierz, 6 Aug. 1963, KRA-AR [120]] and from Białowieża National Park (*Quercus-Pinetum*, coll. W. Mułenko, Jul. 1989, LBL M-23715 [123]) no anamorphic fungus was found.

**Additional specimen studied.** GERMANY. *Asteromella ludwigii* Petr. n. sp. on *Chamaenerion angustifolium* (L.) Scop (= *Epilobium angustifolium* L.), Westfalen, district of Siegen, Langenholdinghausen, coll. A. Ludwig, Aug. 1926, isotype, B 700015166. SWEDEN. *Phyllosticta chamaenerii* Allesch. on *Chamaenerion angustifolium* (L.) Scop., Västergötland, Mösseberg Mt, supra sanatorium, coll. A. G. Eliasson, 18 Sep. 1927, B 700015073.

**World distribution.** Germany, Poland, Sweden, Switzerland, USA.

**Synanamorphs and teleomorph.** Unknown.



## Orobanchaceae

Single *Asteromella* species has been reported on *Melampyrum* in Poland.

### *Asteromella melampyrina* (Aksel) Aa & Vanev

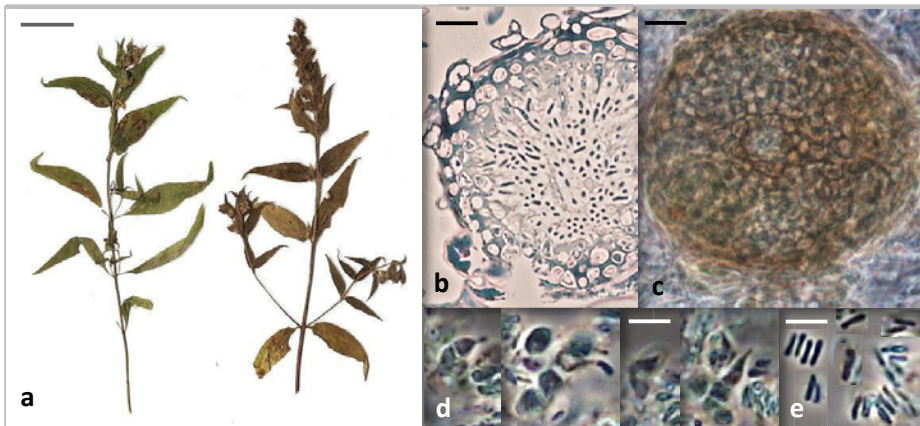
in Aa & Vanev, A revision of the species described in *Phyllosticta*: 310 (2002).

≡ *Phyllosticta melampyrina* Aksel, Trudy Bot. Inst. Acad. Nauk SSSR, Ser. 2, 11: 161 (1956).

**Description.** Leaf lesions of irregular shape, olive, vein-limited, slightly different from surrounding healthy tissue. Conidiomata black, amphigenous but more abundant at the lower leaf surface, in dense groups evenly distributed in the lesion area, confluent, diverse in shape, 98.8–111.2 × 61.8–74.1 μm, or globose, up to 123.5 μm in diam., ostiolum 12.3–37.1 μm in diam, irregular. Conidiophores 1–2-celled, cylindrical, branched at the base, 6–10 × 3–3.5 μm. Conidiogenous cells subglobose or conical, thin-walled, 5–5.6 × 3–3.5 μm. Conidia cylindrical, 3–4 × 1 μm (Fig. 39).

### Host plant and distribution in Poland:

- *Melampyrum nemorosum* L.: Częstochowa Upland, Jaskrów, deciduous forest, coll. M. Ruszkiewicz-Michalska, 6 Oct. 2004, LOD PF-3635; Łódź, Las Łagiewnicki Reserve, *Calamagrostio-Quercetum*, roadside, coll. K. Brózio, 30 Sep. 2007, LOD PF-3682; Biebrza National Park, Kapice Protective Unit, *Tilio-Carpinetum*, 28 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3636; Brzeziny Protective Unit, Grobla Honczarowska causeway, deciduous thicket, 26 Aug. 2013, coll. M. Ruszkiewicz-Michalska, LOD PF-3637.



**Fig. 39** *Asteromella melampyrina* on *Melampyrum nemorosum* (LOD PF-3637). **a** Symptoms of host infection. **b** Conidioma cross section. **c** Conidioma with ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b,c** 20 μm; **d,e** 5 μm.



**Additional specimens studied.** LATVIA. *Asteromella melampyrina* (Aksel) Aa & Vanev on *Melampyrum nemorosum* L., Gauja National Park, vicinity of Krimulda, mixed forest, 24 Sep. 2005, coll. M. Ruszkiewicz-Michalska, LOD PF-3638.

**World distribution.** Estonia, Latvia, Poland, Russia.

**Synanamorphs and teleomorph.** Unknown. On *Melampyrum* hosts single *Mycosphaerella* species was described: *M. winteriana* (Sacc.) Schroet., that is however the synonym of *Didymella winteriana* (Sacc.) Petrak, and in its life cycle only *Phoma* species is known [5,63].

### Paeoniaceae

Single *Asteromella* species has been reported on *Paeonia* in Poland.

#### *Asteromella baldensis* (C. Massal.) H. Ruppr.

Sydowia 13: 11 (1959).

≡ *Phyllosticta baldensis* C. Massal., Memorie Accad. Agr. Sci. Verona, Sér. 3, 65: 82 (1889).

**Description.** Leaf lesions circular to elliptic or oblong, light brown, dried, surrounded with blackening tissue. Conidiomata located in the centre of the lesions or at their edges, grey to greyish brown, in small, becoming large and very dense groups, epiphyllous, (72.6–)86.5–98.8(–123.5) µm in diam., ostiolum up to 20 µm in diam., cells surrounding ostiolum with thickened walls. Conidiomata co-occur with very young ascomata (up to 50 µm in diam.). Conidiophores cylindric, branched at the base, 1–2-celled, 7.5–12 × (2–)3–4.5 µm. Conidiogenous cells 3–3.4 × 1.8–2 µm. Conidia rod-shaped, 2.5–3 × 0.7–1(–1.2) µm (Fig. 40).

#### Host plants and distribution in Poland:

- *Paeonia officinalis* L.: Szczecin-Gocław [119,160]; Wola near Pszczyna, damp meadow with *Molinion coeruleae*, coll. A. Myszka, ident. M. Ruszkiewicz-Michalska & A. Myszka, 16 May 2006, with *Graphiopsis chlorocephala* Trail, LOD PF-2928;
- *Paeonia* sp.: as *Phyllosticta paeoniae* auct., Bydgoszcz, Botanical Garden, coll. A. Michalski (?), 5 Aug. 1953, with *Septoria paeoniae* Westend. and *Cronartium flaccidum* (Alb. & Schwein.) G. Winter, WA 28513; Łódź, Botanical Garden, Alpinarium (Section III), cultivated, 24 Sep. 2002, coll. M. Siennicka, with *Graphiopsis chlorocephala* Trail, LOD PF-2274.

**Additional specimens studied.** GERMANY. *Asteromella baldensis* (C. Massal.) H. Ruppr. on *Paeonia* sp. cult, Thüringen, garten in Weimar, coll. J. Bornmüller, Oct. 1943, Petrak, Mycoth. Gen., No. 2001, M-0142464. ROMANIA. *Phyllosticta baldensis* C. Massal. on *Paeonia romanica* D. Brândză, Muntenia, Vlaşca district, Mihai Bravu, 2 Aug. 1931, coll. & ident. Tr. Săvulescu & C. Sandu, Săvulescu, Herb. Mycol. Roman., Fasc. XII, No. 576, KRA F-1931-77.



**Fig. 40** *Asteromella baldensis* on *Paeonia* spp. **a, b** Symptoms of host infection. **a** *Paeonia officinalis* (LOD PF-2928). **b** *Paeonia romanica* (KRA F-1931-77). **c–f** Microscopic structures (WA 28513). **c** Conidioma surrounded with brownish hyphae. **d** Conidiomatal wall with layer of conidiogenous cells. **e** Conidiogenous cells. **f** Conidia. Scale bars: **a** 2 cm; **b** 50 µm; **c** 20 µm; **d** 10 µm; **e, f** 5 µm.

**World distribution.** Bulgaria, Croatia, Germany, Italy, Poland, Republic of Georgia, Romania, Russia, USA.

**Synanamorphs and teleomorph.** Unknown.

### Polygonaceae

Two *Asteromella* species have been reported on *Polygonum* and *Rumex* in Poland (Tab. 8). They are easily distinguishable due to the extensive black stromata formed by *A. aviculariae* at host leaves.

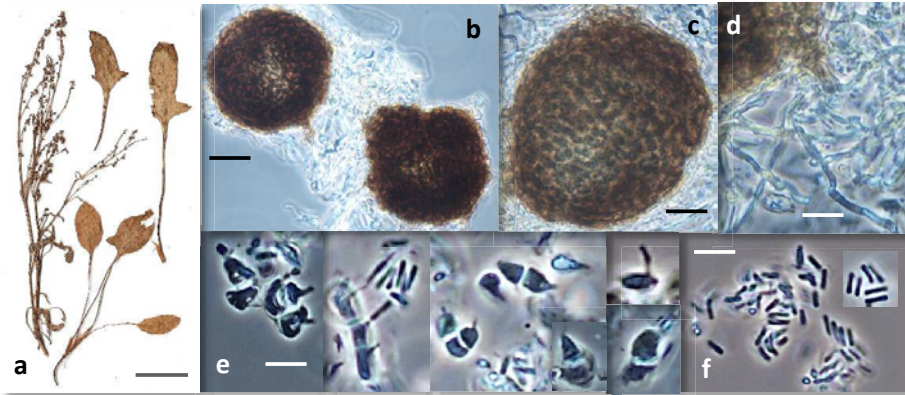
Recently, *Asteromella rumicis* (Bondartsev) Aa and Vanev has been reported by Adamska [142] from the Słowiński National Park. In the corresponding specimen (Gać village, Fraxino-Alnetum, on *Rumex sanguineus* L., May 2005, coll. I. Adamska, deposited in Fungal Collection of West Pomeranian University of Technology in Szczecin) only *Ramularia rubella* (Bonord.) Nannf. and *Mycosphaerella* cf. *insulana* Bubák & Syd. are present.

### *Asteromella acetosae* (Sacc.) Ruszkiewicz-Michalska, comb. nov.

Index Fungorum No. IF 552456.

Basionym: *Phyllosticta acetosae* Sacc., Michelia 1: 151 (1878).

**Description.** Leaf lesions circular, brownish, very small, up to 3–4 mm in diam. Conidiomata very pale, globose, epiphyllous, immersed in host tissue, 136–148 µm in diam.,



**Fig. 41** *Asteromella acetosae* on *Rumex acetosella* (LOD PF-3639). **a** Symptoms of host infection. **b** Conidiomata. **c** Conidiomatal wall. **d** Leaf surface overgrown with brown hyphae. **e** Conidiogenous cells. **f** Conidia. Scale bars: **a** 2 cm; **b** 50 µm; **c,d** 20 µm; **e,f** 5 µm.

ostiolum indistinct, surrounded with slightly darker pale brown cells, 24.7 µm in diam. Conidiophores 3–5-celled, branched, flexuosus, 15–25 × 4 µm. Conidiogenous cells subglobose, 4–4.6 × 4 µm. Conidia rod-shaped, 4–4.5 × 1–1.2 µm (Fig. 41).

#### Host plant and distribution in Poland:

- *Rumex acetosa* L.: Łódź, Retkinia housing estate, Kusocińskiego Str., lawn, coll. M. Ruszkiewicz-Michalska, 3 Aug. 2010, with *Septoria acetosae* Oudem., LOD PF-3639;
- *Rumex* sp. (?*obtusifolius* L.): Mstów near Częstochowa, beech forest, coll. M. Ruszkiewicz, ident. W. Mułenko, rev. M. Ruszkiewicz-Michalska, 15 Nov. 1996, with *Ramularia rubella* (Bonord.) Nannf., LOD PF-287.

**Notes.** The species was also reported on *Rumex acetosella* L. from Częstochowa Upland [136]. In corresponding specimen (Złoty Potok, forest section 271a, forest edge, coll. M. Ruszkiewicz, 29 Sep. 1998, LOD PF-1077) no anamorphic fungus was confirmed.

**World distribution.** Austria, Australia, China [175], former Czechoslovakia, Denmark, India, Italy, Poland, Ukraine.

**Synanamorphs and teleomorph.** *Septoria acetosae* Oudem. [5]; teleomorph unknown. In the specimen LOD PF-287 at the lower leaf surface the lesions caused by *Asteromella acetosae* were covered with conidiomata of *Ramularia rubella* (Bonord.) Nannf. Six *Mycosphaerella* species were described on host from *Rumex* genus but no spermatial state of them is known [63].

### Ranunculaceae

Three *Asteromella* species have been reported on *Helleborus*, *Ranunculus* and *Trollius* in Poland (Tab. 9).

**Tab. 8** *Asteromella* species on Polygonaceae (dimensions in µm).

Taxon	Conidioma	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. acetosae</i>	136–148	3–5-celled; 15–25 × 4	4–4.6 × 4	4–4.5 × 1–1.2	<i>Rumex</i>
<i>A. aviculariae*</i>	(67.7–)148–173	-	4–4.6(-5) × 3.5–4.5	3–5 × (0.9–)1–1.5	<i>Polygonum</i>
<i>A. rumicis**</i>	60–150	-	nd	3.5–4.2 × 0.5–0.8	<i>Rumex</i>

\* Species included into insufficiently-studied and doubtful species (Chapter 4.5). \*\* According to Aa and Vanev [5]. nd – no data available.

**Tab. 9** *Asteromella* species on Ranunculaceae (dimensions in µm).

Taxon	Conidioma	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. helleboricola*</i>	70–100	0–2-celled 4–12 × 2.5–3	2.5–4 × 2.5–3	3–5 × 1–1.5	<i>Helleborus</i>
<i>A. ranunculi</i>	98.8–160.6	1–4-celled; 8–12(-18) × 2.5–3(-4)	4.5–5.8 × 2.5–3	5–5.5(-6) × 1	<i>Ranunculus</i>
<i>A. trollii</i>	74.1–98.8(-123.5)	1–4-celled; 7–14(-20) × (2–)3–4	5.5–6.8 × 2.5–5	(3.5–)4–4.5(-5.5) × 0.8–1	<i>Trollius</i>

\* Species included into insufficiently-studied and doubtful species (Chapter 4.5).

***Asteromella ranunculi* (Fuckel) Vanev & Aa**

in Aa & Vanev, A revision of the species described in *Phyllosticta*: 392 (2002).

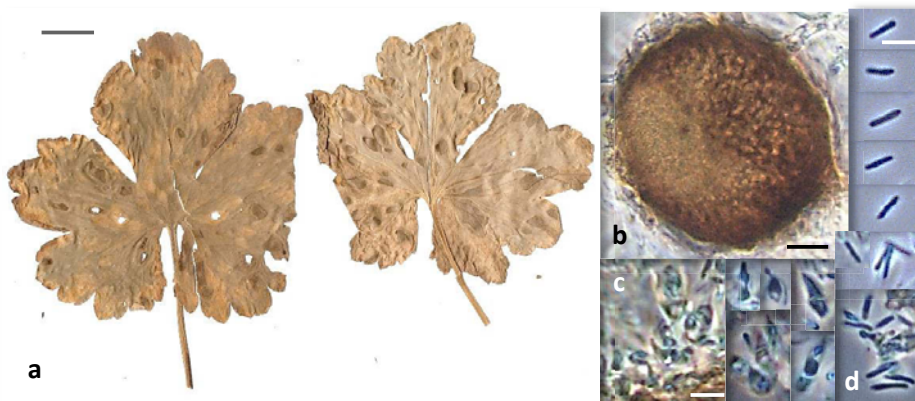
≡ *Phyllosticta ranunculi* (Fuckel) Sacc., Syll. Fung. 3: 37 (1884), nom. illegit. Art. 53.1, non *Ph. ranunculi* Sacc. & Speg. (1878).

≡ *Ascochyta ranunculi* Fuckel, Symb. Mycol. 1: 387 (1869).

**Description.** Leaf lesions small, up to 5 mm in diam., pale grey or pale brown, limited with minor leaf veins. Conidiomata globose, pale grey, pale brown or blackish, hypophyllous, papillate, 98.8–160.6 µm in diam., up to 3/4 of conidiomata emerged above leaf epidermis, ostiolum up to 48.4 µm in diam, in some specimens it is surrounded with cells with thickened wall. Conidiophores 1–4-celled, cylindric, 8–12(–18) × 2.5–3(–4) µm. Conidiogenous cells cylindrical, 4.5–5.8 × 2.5–3 µm. Conidia cylindric, 5–5.5(–6) × 1 µm (Fig. 42). Conidiomata accompanied by numerous ascomatal primordia and immature ascomata.

**Host plants and distribution in Poland:**

- *Ranunculus acris* L.: near Legnica, coll. Gerhardt, 4 Jan. 1874, WRSL; Ojców National Park, Ojców, at the Prądnik River, meadow, coll. J. Kućmierz, 11 Sep. 1962, KRA-AR [124,125];
- *Ranunculus lanuginosus* L.: Ojców National Park, at the base of Zamkowa Mt, *Tilio-Carpinetum*, coll. J. Kućmierz, 17 Sep. 1964, KRA-AR [124,125]; Ojców National Park, Pieskowa Skała [124];
- *Ranunculus lingua* L.: Łęczna-Włodawa Lake District, Długie Lake, *Salici-Franguletum*, coll. W. Mułenko, 19 Sep. 1982, LBL M-23737 [128]; Łęczna-Włodawa Lake District, Długie Lake, *Salici-Franguletum*, coll. W. Mułenko, 24 Sep. 1983, with *Erysiphe aquilegiae* DC., LBL M-23716 [128]; Łęczna-Włodawa Lake District, Długie Lake, *Salici-Franguletum*, coll. W. Mułenko, 24 Sep. 1983, with *Erysiphe aquilegiae* DC., LBL M-23716 [128]; Łęczna-Włodawa Lake District, Bikcze Lake, *Scirpo-Phragmitetum* [128]; as *Phyllosticta*



**Fig. 42** *Asteromella ranunculi* on *Ranunculus* spp. **a** Symptoms of host infection (*Ranunculus lanuginosus*, KRA-AR). **b–d** Microscopic structures (*Ranunculus lingua*, LBL M-23716). **b** Conidioma with ostiolum. **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 2 cm; **b** 10 µm; **c, d** 5 µm.



*ranuncolorum* Sacc. & Spæg., Białowieża National Park, plot V-100, *Tilio-Carpinetum*, coll. W. Mułenko, Jul. 1988, LBL M-23717 [123].

**Notes.** *Asteromella ranunculi* was also reported from two other localities: from Huzary Mt in Beskid Sądecki by Starmachowa [118] and from Słowiński National Park by Adamska [142]. In the scanty specimen from Huzary Mt near Krynica-Zdrój (*Phyllosticta ranunculi* on *Ranunculus repens* L., coll. B. Starmachowa, 8 Aug. 1962, KRAM F-9829) the two pieces of *R. repens* leaves host no anamorphic fungus. Re-examination of the specimen from the Słowiński National Park (*Asteromella ranunculi* on *Ranunculus acris* L., Kluki, *Vaccinio uliginosi-Betuletum pubescentis*, coll. I. Adamska, Sep. 2004, deposited in Fungal Collection of West Pomeranian University of Technology in Szczecin) revealed only conidiomata of *Sporonema* species intermixed with ascomata of *Leptotrochila ranunculi* (Fr.) Schüëpp.

**Additional specimen studied.** AUSTRIA. as *Phyllosticta ranuncolorum* Sacc. & Spæg. on *Ranunculus aconitifolius* L., Kleinwalsertal, locality illegibile, coll. A. Ludwig, 17 Aug. 1929, Herbarium Dr. A. Ludwig, Flora von Bayern, B 700015121.

**World distribution.** Austria, Germany, Poland.

**Synanamorphs and teleomorph.** Unknown.

### ***Asteromella trollii* (Trail) H. Ruppr.**

Sydowia 13: 14 (1959).

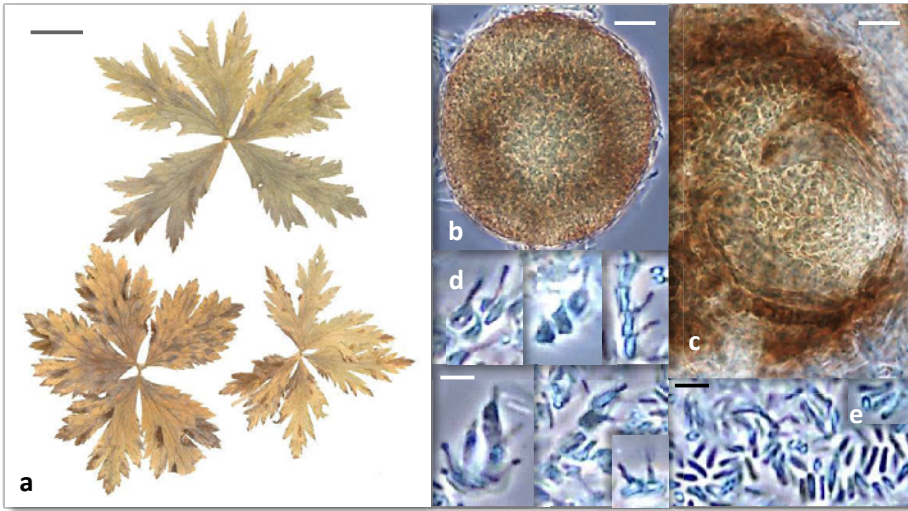
≡ *Phyllosticta trollii* Trail, Scott. Nat. N.S. 4: 70 (1889).

**Description.** Leaf lesions oblong, dark brown, greying over time, limited with minor leaf veins. Conidiomata hypophyllous, “attached” to lower epidermis, pale to dark brown, glassy, slightly whitening in centre, 74.1–98.8(–123.5)  $\mu\text{m}$  in diam., the erected part of conidiomata surrounded with clypeus-like structure built with darker cells. Conidiophores 1–4-celled, branched at the base, 7–14(–20)  $\times$  (2–)3–4  $\mu\text{m}$ . Conidiogenous cells globose, 5.5–6.8  $\times$  2.5–5  $\mu\text{m}$ . Conidia cylindrical, (3.5–)4–4.5(–5.5)  $\times$  0.8–1  $\mu\text{m}$  (Fig. 43). Conidiomata intermixed with young ascomata and ascomatal primordia.

### **Host plant and distribution in Poland:**

- *Trollius europaeus* L.: Ojców National Park, Ojców, “Góra Spalona” Mt, sunny slope, coll. J. Kućmierz, 11 Sep. 1962, KRA-AR [124,125].

**Additional specimens studied.** GERMANY. *Phyllosticta trollii* Trail on *Trollius europaeus* L., Westphalia, Siegen district, at Winterbach near Oberdresselndorf, coll. A. Ludwig, 18 Aug. 1926, with *Septoria trollii* Sacc. & G. Winter, Sydow, Mycoth. Germ., No. 2731, KRA F-1926-55; *Asteromella trollii* (Trail) H. Ruppr. on *Trollius europaeus* L., Westphalia, Siegen district, at Winterbach near Oberdresselndorf, coll. A. Ludwig, rev. H. Rupprecht, 1 Sep. 1931, with *Septoria trollii* Sacc. & G. Winter, Herbarium Dr. A. Ludwig, Flora von Westfalen, B 700015200; *Asteromella trollii* (Trail) H. Ruppr. on *Trollius europaeus* L., Stegskopf, district



**Fig. 43** *Asteromella trollii* on *Trollius europaeus*. **a** Symptoms of host infection (KRA-AR). **b–d** Microscopic structures (B 700015200). **b** Conidioma with ostiolum. **c** Conidiomatal tip below leaf stomata. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 20 µm; **c** 10 µm; **d,e** 5 µm.

of Altenkirchen, coll. A. Ludwig, rev. H. Rupprecht, 3 Aug. 1932, with *Septoria trollii* Sacc. & G. Winter, Herbarium Dr. A. Ludwig, Flora von Westfalen, B 700015201. UKRAINE. *Phyllosticta trollii* Trail on *Trollius europaeus* L., Czarnochora, Szpyc Mt, coll. B. Namysłowski, 25 Jul. 1907, KRAM F-13281 [102,103].

**World distribution.** Germany, Great Britain (Scotland), Italy, Montenegro, Poland, Republic of Georgia, Russia [177], Ukraine, USA.

**Synanamorphs and teleomorph.** Unknown.

## Rhamnaceae

Single *Asteromella* species has been reported on *Rhamnus* in Poland.

### *Asteromella vogelii* (A. Henkel) Petr.

Annals Mycol. 22: 135 (1924).

≡ *Stictochorella vogelii* A. Henkel, Annals Mycol. 21: 144 (1923).

= *Depazea rhamnicola* Lasch, Rabenhorst, Klotzschii Herb. Viv. Mycol. Ed., No. 567.

**Description.** Leaf lesions dirty brown, irregular, without margin, limited with small leaf veins, leaf lamina slightly thickened. Conidiomata apricot-brown to chocolate-brown,

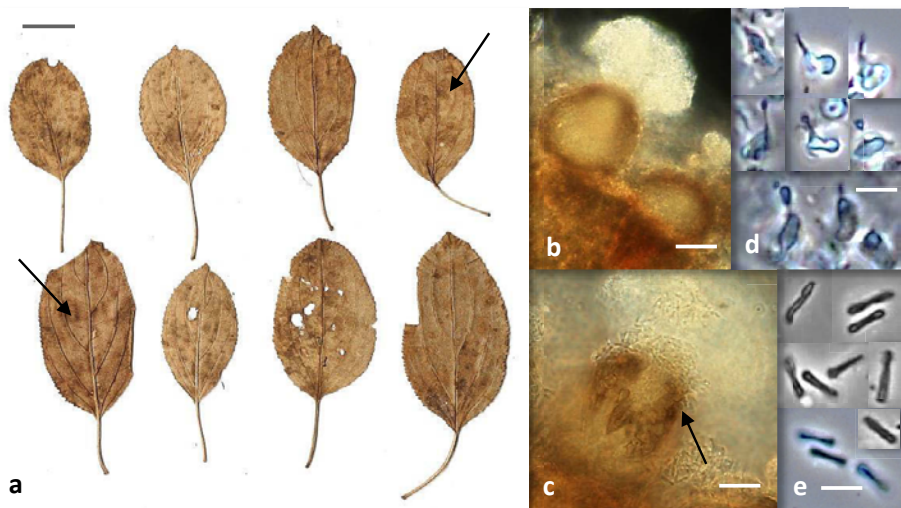
amphigenous, densely and evenly distributed or linearly in loose to dense groups, (53–)74.1–98.8  $\mu\text{m}$  in diam., ostiolum up to 24.7  $\mu\text{m}$  in diam. Conidiophores 1–2-celled, 7–8.6  $\times$  3–3.5  $\mu\text{m}$ . Conidiogenous cells cylindrical to subglobose, 4–5.2  $\times$  2–3.5  $\mu\text{m}$ . Conidia rod-shaped, mostly slightly curved, (4–)5–6  $\times$  1–1.5  $\mu\text{m}$  (Fig. 44).

#### Host plant and distribution in Poland:

- *Rhamnus cathartica* L.: as *Depazea rhamnicola* Lasch on *Rhamus*, Drezdenko, Rabenhorst, Klotzschii Herb. Viv. Mycol. Ed., No. 567, coll. Lasch, WRSL; as *Phyllosticta rhamnicola* Desm., Bydgoszcz, IHAR Botanical Garden, coll. A. Michalski, 15 Aug. 1955, WA 28510; as *Phyllosticta rhamnicola* Desm., Stawska Góra Reserve near Chełm, xerothermic meadow, coll. B. Sałata, 6 Nov. 1989, LBL M-23718; Kampinos National Park, Bieliny, reed of alliance *Phalaridetum arundinaceae* with patches of community with *Calamagrostis canescens* (Weber) Roth, coll. M. Ruszkiewicz-Michalska & D. Michalska-Hejduk, 10 Jul. 2012, LOD PF-3479.

**Notes.** In the material from Częstochowa Upland [136] (Olsztyn near Częstochowa, *Origano-Brachypodietum* xerothermic meadow, 21 Sep. 1999, coll. M. Ruszkiewicz-Michalska, LOD PF-987) no *Asteromella* fungus was confirmed; only single conidiomata of *Coniothyrium olivaceum* Bonord. are present.

**Additional specimens studied.** AUSTRIA. *Asteromella vogelii* (A. Henkel) Petr. on *Rhamnus cathartica* L., Hundsheimerkogel near Hainburg, Niederdonau, coll. F. Petrak, Sep. 1940, Petrak, Mycoth. Gen., No. 708, M-0142472 and B 700015205. GERMANY. *Asteromella vogelii* (A. Henkel) Petr. on *Rhamnus cathartica* L., Brandenburg, Lebus district, between



**Fig. 44** *Asteromella vogelii* on *Rhamnus cathartica*. **a** Symptoms of host infection (KRA F-1940-62). **b–d** Microscopic structures (LOD PF-3479). **b** Conidioma with extruded mass of conidia. **c** Conidiomatal tip (arrow). **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 50  $\mu\text{m}$ ; **c** 20  $\mu\text{m}$ ; **d,e** 5  $\mu\text{m}$ .

Dahmsdorf and Münchehofe, coll. H. Sydow, 20 Sep. 1940, Sydow, Mycoth. Germ., No. 3559, KRA F-1940-62.

**World distribution.** Austria, Czech Republic, Germany, Poland.

**Synanamorphs and teleomorph.** *Passalora rhamni* (Fuckel) U. Braun, recorded in Poland in Pieniny Mts [195]; *Mycosphaerella vogelii* (P. Syd.) Tomilin, unknown in Poland [163].

### Rosaceae

Eight *Asteromella* species has been reported on *Agrimonia*, *Chaenomeles*, *Crataegus*, *Malus*, *Prunus*, *Pyrus*, *Rosa* and *Sorbus* in Poland. No significant differences in dimensions was observed among the species (Tab. 10). Only *A. rosicola* differs from other species with *textura dermoidea* of the conidiomatal wall.

#### ***Asteromella bacilloides* (Dominik) Ruszkiewicz-Michalska, comb. nov.**

Index Fungorum No. IF 552458.

Basionym: *Phyllosticta bacilloides* Dominik, Sprawozdanie Komisji Fizjograficznej 70: 52 (1936).

**Description.** Leaf lesions chocolate brown, circular, 3–8 mm in diam, drying. Conidiomata in small groups, hypophyllous, grey, immersed in host tissue, hardly visible in surrounding tissue, 61.8–98.8 µm in diam. (according to Dominik [165]: 54–95 µm in diam.), ostium invisible. Conidiophores 1–3-celled, branched at the base, 8–12 × 3–3.5 µm. Conidiogenous cells subglobose, 4–4.5 × 3–3.5 µm. Conidia cylindrical, slightly rod-shaped, (3–)3.5–4(–4.5) × 0.7–1 µm (according to Dominik [165]: 2.8–3.9 × 0.56–0.84 µm) (Fig. 45).

#### **Host plant and distribution in Poland:**

- *Chaenomeles japonica* (Thunb.) Lindl. ex Spach.: Poznań, Dendrological Garden, coll. T. Dominik, 30 Oct. 1934 [165]; Łódź, Botanical Garden, Alpinerium (Section III), coll. M. Siennicka, ident. M. Ruszkiewicz-Michalska & M. Siennicka, 24 Sep. 2002, LOD PF-2302; Łódź, Żeńców Str., garden, coll. M. Ruszkiewicz-Michalska, 16 Oct. 2011, LOD PF-3685, **neotype designated here** (IF 552460).

**Notes.** Holotype was not found in any of the Polish herbaria. Most probably it was lost during the World War II as the other specimens of prof. Tadeusz Dominik (prof. T. Majewski, personal communication, 2014).

**World distribution.** Poland.

**Synanamorphs and teleomorph.** Unknown.

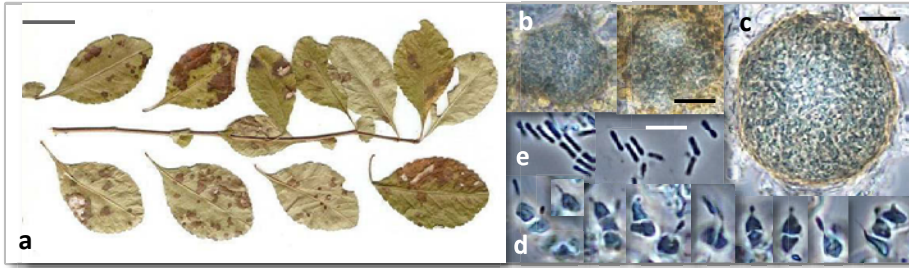
**Notes.** *Asteromella* sp. on *Chaenomeles sinensis* (Thouin) Koehne was observed by Norin and Rumpunen [198] in material from Latvia. On this host a single *Mycosphaerella* species

Tab. 10 *Asteromella* species on Rosaceae (dimensions in  $\mu\text{m}$ ).

Taxon	Conidioma	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. bacilloides</i>	61.8–98.8	1–3-celled; 8–12 $\times$ 3–3.5	4–4.5 $\times$ 3–3.5	(3–)3.5–4(–4.5) $\times$ 0.7–1	<i>Chaenomeles</i>
<i>A. mali</i> *	Up to 98.8	nd	nd	3.5 $\times$ 1	<i>Malus</i>
<i>A. pruni-mahaleb</i>	49.4–74.1	1-celled; 5 $\times$ 3	3 $\times$ 3	3–3.8 $\times$ 0.8–1	<i>Prunus</i> s. l.
<i>A. pyricola</i>	61.8–123.5 or up to 98.8 $\times$ 135.9	1-celled; 5.5–6 $\times$ 4	3.5–5.5 $\times$ 3–3.5	(2.5–)3.5–4 $\times$ 0.8–1(–1.2)	<i>Pyrus</i>
<i>A. rosicola</i>	49.4–98.8(–113)	1–3-celled; 5–15 $\times$ 3–4	4.5–5(–6) $\times$ 3–3.5	3–4.5 $\times$ 1	<i>Rosa</i>
<i>A. rupprechtii</i>	37.1–86.5	–	5–8 $\times$ 2.5–3	2–3(–3.4) $\times$ 0.7–0.8(–1)	<i>Agrimonia</i>
<i>A. trautmänniana</i>	58–72.6	1–2-celled; 5–6 $\times$ (2–)3–4	3–4 $\times$ 1.8–2	(3–)4.5–7.5 $\times$ (0.6–)1–1.5	<i>Sorbus</i>
<i>A. vulgaris</i>	74.1–98.8	–	7–8 $\times$ 3.5–4	(3–)3.5–5 $\times$ 1	<i>Crataegus</i>

\* Species included into insufficiently-studied and doubtful species (Chapter 4.5). nd – no data available.





**Fig. 45** *Asteromella bacilloides* on *Chaenomeles japonica* (neotype, LOD PF-3685). **a** Symptoms of host infection. **b** Conidiomata. **c** Conidioma with ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 20 µm; **c** 10 µm; **d,e** 5 µm.

– *M. chaenomelis* Y. Suto, with *Cercospora* anamorph and without data on spermatial state was described [199]. As the symptoms of host infection are very similar to these caused by *A. bacilloides*, it could constitute a part of that *Mycosphaerella* life cycle.

### ***Asteromella pruni-mahaleb* (Pass.) Bedlan**

J. Kulturpflanzen 66,3: 93 (2014).

≡ *Phyllosticta pruni-mahaleb* Pass., in Passerini, Thümen & Brunaud, J. d'Hist. Nat. 4(4): 54 (1885).

= *Phyllosticta passerinii* Berl. & Voglino, in Saccardo, Syll. Fung., Addit. I–IV (Abellini): 285 (1886).

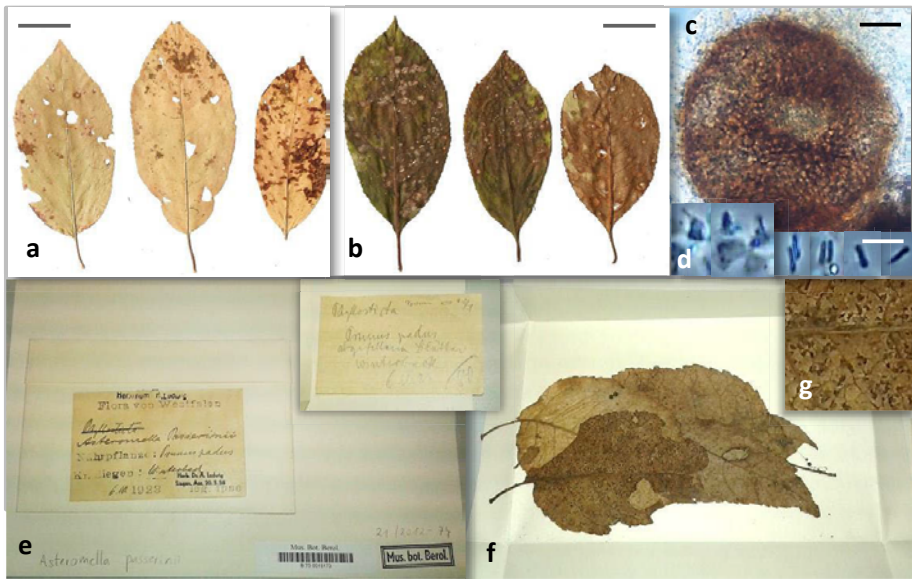
= *Phyllosticta mahaleb* Pass., J. d'Hist. Nat. Bordeaux 4(1): 16 (1885), nom. illegit. Art. 53.1, non *Phyllosticta mahaleb* Thüm. (1880).

= *Phyllosticta minutissima* Kabát & Bubák, Öst. Bot. Z. 54: 2 (1904), nom. illegit. Art. 53.1, non *Phyllosticta minutissima* Ellis & Everh. (1891).

**Description.** Leaf lesions yellow to dark brown, small, polygonal, vein-limited. Conidiomata mainly hypophyllous, globose, black, small, 49.4–74.1 µm in diam., with distinct ostiolum, up to 12.3–24.7 µm in diam. Conidiophores 1-celled, unbranched, 5 × 3 µm. Conidiogenous cells globose to square-shaped, 3 × 3 µm. Conidia rod-shaped, both ends rounded, 3–3.8 × 0.8–1 µm (Fig. 46).

### **Host plants and distribution in Poland:**

- *Cerasus avium* (L.) Moench: Łódź, Łagiewnicki Forest complex, Wycieczkowa Str., near the parking, coll. M. Ruszkiewicz-Michalska, 21 Oct. 2007, LOD PF-3694; Biebrza National Park, Osowiec Protective Unit, Góra Skobła, deciduous forest, 27 Aug. 2013, coll. E. Sucharzewska, ident. M. Dynowska & E. Sucharzewska, rev. M. Ruszkiewicz-Michalska, deposited in the Fungal Collection of Department of Mycology, University of Warmia and Mazury in Olsztyn [141];
- *Padus avium* Mill. (= *Prunus padus* L.): Białowieża National Park, plot V-100, *Carici elongatae-Alnetum*, *Circaeo-Alnetum*, coll. W. Mułenko, Jun.–Nov. 1989, with *Pucciniastrum areolatum* (Fries) Otth, LBL M-23719 [123]; Biebrza National Park, Kapice Protective Unit, *Tilio-Carpinetum*, 28 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3643 [140];



**Fig. 46** *Asteromella pruni-mahaleb* on *Padus* spp. **a,b,f,g** Symptoms of host infection. **a** *Padus avium* (LBL M-23719). **b** *Padus serotina* (LOD PF- 3683). **c,d** Microscopic structures (LOD PF-3683). **c** Conidioma. **d** Conidiogenous cells and conidia. **e-g** *Asteromella passerinii* Rupprecht nom. herb. on *Padus avium* (B 700015173). Scale bars: **a,b** 2 cm; **c** 20  $\mu\text{m}$  **d** 5  $\mu\text{m}$ .

- *Padus serotina* (Ehrh.) Borkh.: Załężce Landscape Park, Stawiska Reserve, deciduous forest, 19 Sep. 1997, coll. M. Ruszkiewicz, LOD PF-3644; Grądy nad Moszczenicą Reserve, *Tilio-Carpinetum*, coll. & ident. M. Ruszkiewicz-Michalska & E. Połec, 10 Aug. 2006, LOD PF-3706; Łódź, Łagiewnicki Forest complex, *Tilio-Carpinetum calamagrostietosum*, forest roadside, coll. A. Kuchnik, 25 Aug. 2007, LOD PF-3683; same locality, *Tilio-Carpinetum typicum*, forest roadside, coll. A. Kuchnik, 28 Jul. 2007, LOD PF-3684;
- *Prunus domestica* L.: Dukla near Krosno [200]; Szczecin-Pogodno [119,160].

**World distribution.** Austria, Canada, Czech Republic, France, Germany, Italy, Poland, Ukraine, USA.

**Synanamorphs and teleomorph.** Teleomorph unknown. Aptroot [63] listed in total nine *Mycosphaerella* species on *Prunus*.

**Notes.** The second *Asteromella* species associated with *Prunus* is *A. cerasicola* (Speg.) H. Ruppr. (cf. [5]) that has a little bigger conidia (according to Vanev and Aa [10]:  $4 \times 1 \mu\text{m}$ ).

The specimen of *Phyllosticta passerinii* from B reference collection (B 700015173) has a new combination *A. passerinii* (Fig. 46e–g) that was most probably proposed by H. Rupprecht but was never published.

***Asteromella pyricola* (Sacc. & Speg.) Moesz ex Bat. & Peres**

Bot. Közl. 39: 192 (1942).

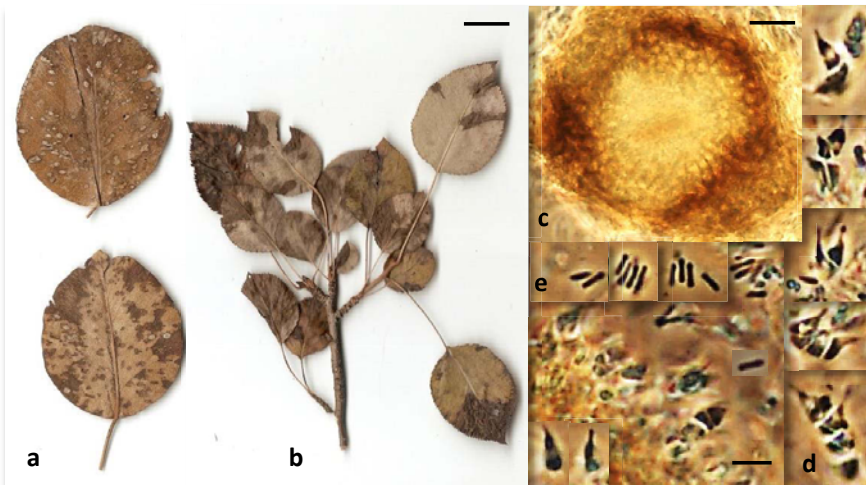
≡ *Phyllosticta pyricola* Sacc. & Speg., *Michelia* 1: 153 (1878).

**Description.** Leaf lesions chocolate brown, limited with minor leaf veins, angled, with indistinct margin or whitened, convex and with dark brown margin. Conidiomata hypophyllous, immersed, black, globose, 61.8–123.5  $\mu\text{m}$  in diam. or elliptic, up to 98.8  $\times$  135.9  $\mu\text{m}$ , ostiolum up to 24.7  $\mu\text{m}$ . Conidiophores 1-celled, 5.5–6  $\times$  4  $\mu\text{m}$ . Conidiogenous cells globose to cylindrical, 3.5–5.5  $\mu\text{m}$  in diam. or 3.5–5.5  $\times$  3–3.5  $\mu\text{m}$ . Conidia rod-shaped, (2.5–)3.5–4  $\times$  0.8–1(–1.2)  $\mu\text{m}$  (Fig. 47).

**Host plant and distribution in Poland:**

- *Pyrus communis* L.: Jakóbkowice (currently Łososina Dolna) and Klęczany near Nowy Sącz, wild growing trees, coll. J. Zabłocki, ident. W. Zabłocka, rev. M. Ruszkiewicz-Michalska, 8 and 10 Sep. 1927, with *Phyllosticta pyrina* Sacc., WA 21969; Mielnik, Góra Rowska, xerothermic thicket, coll. W. Mułenko, 10 Sep. 1981, LBL M-23720 [132]; Bug River Valley, Neple, meadow, coll. M. Danilkiewicz, ident. M. Ruszkiewicz-Michalska, 8 Oct. 1981, LBL M-23721; Łódź, Jaracza Str., urban greenery, coll. M. Ruszkiewicz-Michalska, 18 Oct. 2003, with *Septoria pyricola* Desm., LOD PF- 3688; Częstochowa Upland, Jaskrów, deciduous forest, coll. M. Ruszkiewicz-Michalska, 6 Oct. 2004, LOD PF-3645; Łódź, Las Łagiewnicki Reserve, *Potentillo albae-Quercetum*, coll. M. Ruszkiewicz-Michalska & K. Brózio, 8 Sep. 2007, with *Ochropsora ariae* (Fuckel) Ramsb., LOD PF-3674.

**Additional specimens studied.** BELARUS. *Asteromella pyricola* (Sacc. & Speg.) Moesz on *Pyrus communis* L., Polesie, Łuniniec district, Dworzec, coll. H. Jur.(aszkówna?), ident. M. Ruszkiewicz-Michalska, 20 Sep. 1930, with *Phyllosticta pyrina* Sacc. and *Septoria pyricola*



**Fig. 47** *Asteromella pyricola* on *Pyrus communis*. **a, b** Symptoms of host infection. **a** (B 700015180). **b** (LBL M-23720). **c–e** Microscopic structures (B 700015180). **c** Conidioma with ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a, b** 2 cm; **c** 20  $\mu\text{m}$ ; **d, e** 5  $\mu\text{m}$ .

Desm., WA 21961. FRANCE. *Asteromella pyricola* (Sacc. & Speg.) Moesz on *Pyrus communis* L., Auriol near Marseille, coll. Berber, rev. H. Rupprecht, 11 Oct. 1950, with *Septoria pyricola* Desm., B 700015180.

**World distribution.** Belarus, Brazil, France, Greece, Italy, Japan, Korea, Poland, Russia (Siberia) [201], Turkey [182], Ukraine.

**Synanamorphs and teleomorph.** Unknown.

***Asteromella rosicola* (C. Massal.) H. Ruppr.**

Sydowia 13: 14 (1959).

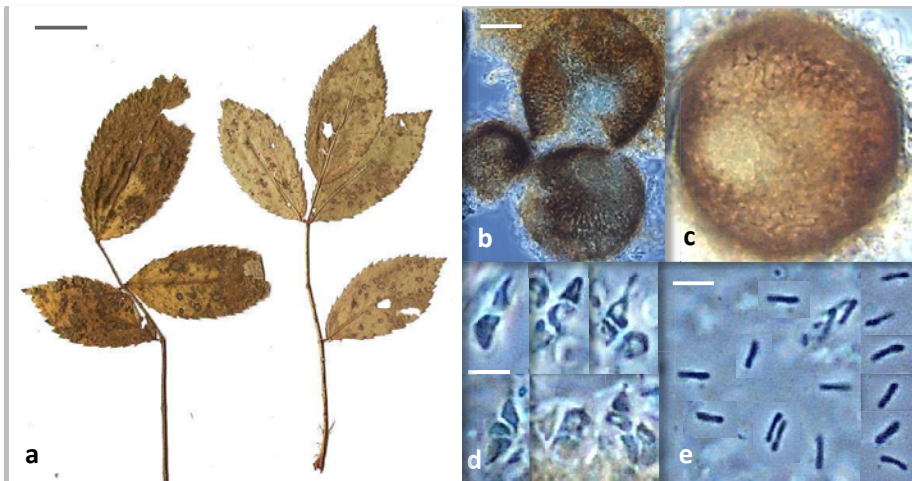
≡ *Phyllosticta rosicola* C. Massal., Atti Ist. Veneto Sci. Lett. Arti 59: 687 (1900).

= *Phyllosticta kurskiana* Bondartsev, Mater. Mikol. Obsléd. Ross 5 (2): 2 (1921).

**Description.** Leaf lesions oblong to circular, pale brown, bordered with violet, indefinite margin. Conidiomata hypophyllous, evenly distributed in lesion tissue, brown, globose to subglobose, 49.4–98.8(–113) µm in diam. Outer layer of conidiomatal wall built of *textura epidermoidea*. Conidiophores 1–3-celled, 5–15 × 3–4 µm. Conidiogenous cells subglobose 4.5–5(–6) × 3–3.5 µm. Conidia rod-shaped to cylindrical, 3–4.5 × 1 µm (Fig. 48).

**Host plant and distribution in Poland:**

- *Rosa* sp.: Bolestraszyce, Arboretum, stand No. 1, coll. B. Wojdyło, 30 Oct. 1998, LBL M-23722 [159]; Łódź, Botanical Garden, Japanese Garden (Section I), coll. M. Siennicka, ident. M. Ruszkiewicz-Michalska & M. Siennicka, 24 Sep. 2002, LOD PF-2304.



**Fig. 48** *Asteromella rosicola* on *Rosa* sp. **a** Symptoms of host infection (LBL M-23722). **b** Group of conidiomata (KRAM F-10274). **c–e** (LOD PF-2304). **c** Conidioma with ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 20 µm; **c** 50 µm; **d,e** 5 µm.

**Additional specimens studied.** GERMANY. *Phyllosticta rosicola* C. Massal. on *Rosa arvensis* L., Upper Bavaria, Schwarteweg near Füssen, coll. H. Sydow, 26 Aug. 1912, Sydow, Mycoth. Germ., No. 1113, KRAM F-10274 and WRSL. ITALY. *Phyllosticta rosicola* C. Massal. on *Rosa gallica* L., Dorfe Marcemigo, province of Verona, coll. C. Massalongo, 10 Oct. 1904, Kabát & Bubák, Fungi Imperf. Exs. No. 204, B 700015123. ROMANIA. *Phyllosticta rosicola* C. Massal. on *Rosa gallica* L., Prahova district, Chițorani, coll. Tr. Săvulescu & C. Sandu, 13 Sep. 1930, Săvulescu, Herb. Mycol. Roman., Fasc. VIII, No. 363, KRA F-1930-107.

**World distribution.** China, Germany, Italy, Poland, Romania, Russia, USA.

**Synanamorphs and teleomorph.** Unknown.

***Asteromella rupprechtii* Ruszkiewicz-Michalska, spec. nov.**

Index Fungorum No. IF 552457.

= *Depazea agrimoniae* Lasch, in Klotzsch Herb. Mycol., No. 1356 (1849); non *Phyllosticta agrimoniae* (Lasch) Allesch. ex Died. (1915).

Etymology: in reference to Heinrich von Rupprecht, in recognition of his outstanding contribution to the study of *Asteromella* species.

**Description.** Leaf lesions pale brown, irregular to oblong, small at first, enlarging and covering large leaf areas, with or without margin. Conidiomata evenly distributed in the lesions, globose, dark brown to blackish, small, 37.1–86.5 µm in diam., immersed in the host tissue, small apical part with ostiolum emerged up to 72 µm above the host epidermis, ostiolum distinct, surrounded with ring of darker cells, 9.88–15 µm in diam. Conidiogenous cells subglobose, 5–8 × 2.5–3 µm. Conidia scarce, cylindrical, 2–3(–3.5) × 0–7.0.8(–1) µm (Fig. 49).

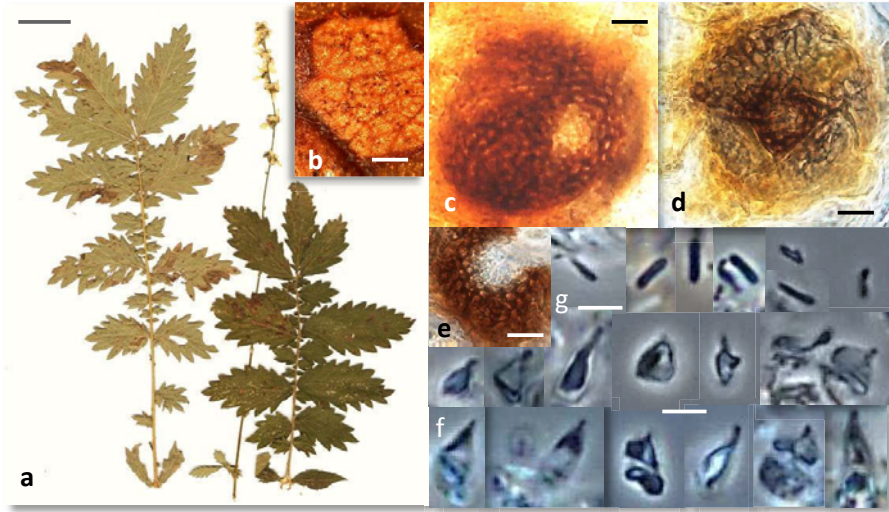
**Host plant and distribution in Poland:**

- *Agrimonia eupatoria* L. s. l.: Drezdenko, coll. W. G. Lasch, no date, Klotzsch Herb. Mycol., No. 1356 (1849), WRSL, **lectotype, designated here**; Drezdenko, Jeże near Gorzów Wielkopolski [96]; Rataje near Kalisz, coll. H. Nelkenówna, 1 Nov. 1931, with *Pucciniastrum agrimoniae* (Dietel) Tranzschel, WAUF; Ojców National Park, near the castle at Grodzisko, sunny, southern slope, coll. J. Kućmierz, 22 Oct. 1965, KRA-AR [124,125]; Murawy Dobromierskie Reserve near Przedbórz, xerothermic grassland, coll. M. Ruszkiewicz-Michalska, 14 Sep. 2005, LOD PF-3642; Western Pomerania, Ińsko Landscape Park, Perłówkowe Buki Reserve, beech forest, coll. M. Ruszkiewicz-Michalska, 7 Sep. 2007, LOD PF-3687.

**Notes.** In the material from KRA-AR, despite systemic infection of the leaves, only empty conidiomata and immature ascomata were found.

**Additional specimens studied.** POLAND. *Depazea agrimoniae* Lasch on *Agrimonia eupatoria* L., near Drezdenko, no locality or date given, coll. Lasch, isotype of *Phyllosticta agrimoniae* (Lasch) Allesch. ex Died., with note of van der Aa [“poorly developed *Septoria*





**Fig. 49** *Asteromella rupprechtii* on *Agrimonia eupatoria*. **a,b** Symptoms of host infection (LOD PF-3642). **a** Host leaves. **b** Leaf lesion with conidiomata. **c–g** Microscopic structures (lectotype, WRSL). **c** Conidioma with ostiolum. **d** Conidiomatal tip emerging through leaf stomata. **e** Details of conidiomatal wall around ostiolum. **f** Conidiogenous cells. **g** Conidia. Scale bars: **a** 2 cm; **b** 2 mm; **c,d** 20  $\mu\text{m}$ ; **e** 10  $\mu\text{m}$ ; **f,g** 5  $\mu\text{m}$ .

*agrimoniae-eupatoriae* Bommer. & Rouss. and *Asteromella* state of some *Mycosphaerella* spec. (may be *Myc. agrimoniae* Sydow – Anns. Mycol. Berol. 40: 200. 1942, which is also described together with an *Asteromella* spermatial state). Notes made by Allescher, and mentioned by Diedicke, 1915: 19 were not present when I studied this specimen.”], B 700015059. GERMANY. *Mycosphaerella agrimoniae* Syd. nov. spec. on *Agrimonia eupatoria* L., Brandenburg, Tiefensee, Kreis Oberbarnim, coll. H. Sydow, 15 Apr. 1941, Sydow, Mycoth. Germ., No. 3501, isotype, KRA F-1941-16 [196].

**World distribution.** Denmark, Poland, Ukraine.

**Synanamorphs and teleomorph.** Unknown.

**Notes.** The species description is based on the isotype of *Depazea agrimoniae* Lasch from WRSL and the isotype of *Mycosphaerella agrimoniae* Syd., housed in KRA (KRA F-1941-16), which contains a number of empty conidiomata (Fig. 49). The characters of the rest of the Polish specimens studied fit the above-given characteristics.

Lasch’s specimen of *Depazea agrimoniae* deposited in B herbarium was a base of *Phyllosticta agrimoniae* (Lasch) Allesch. ex Died. [96]. However, Diedicke [96] did not see any fungus in the above-mentioned specimen when reallocating the species into *Phyllosticta*. Thus, in the characteristics of *Ph. agrimoniae*, Diedicke [96] quoted Allescher’s note describing the spores as very small, ovoidal to oblong (elongated),  $3\text{--}5 \times 1.5\text{--}3 \mu\text{m}$ , hyaline and without guttules (sehr klein, eiförmig oder länglich,  $3\text{--}5 \mu$  lang,  $1.5\text{--}3 \mu$  dick, hyalin, ohne Oltröpfchen). Similar, *Phoma*-like species [conidia colourless, oblong-ellipsoidal,  $3\text{--}5\text{--}(7)$

$\times (1.5\text{--})2\text{--}3\ \mu\text{m}$ ] was observed by Andrianova and Minter [197] as co-occurring with *Septoria agrimoniicola* Bondartsev, *S. agrimoniae-eupatoriae* E. Bommer & M. Rousseau and *Mycosphaerella agrimoniae* Syd.

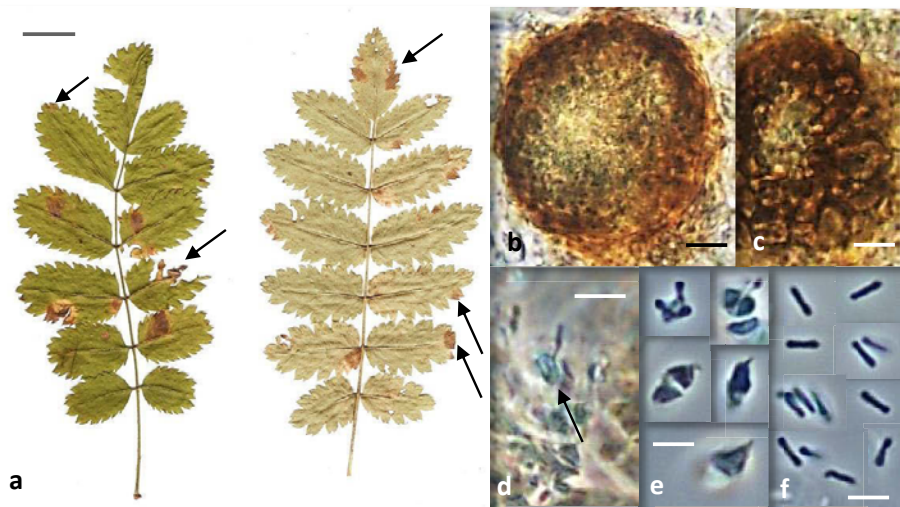
The characteristics given by Allescher [96] and Andrianova and Minter [197] greatly differ from the spore characters observed by myself in the specimen of *D. agrimoniae* from WRSL. My observations instead match the description given by Sydow [196], who characterized the fungus as co-occurring with *Mycosphaerella agrimoniae*. Additionally, Aa and Vanev [5] saw *Asteromella*-like fungus when re-examining the *Depazea agrimonie* in Herbarium Berolinense.

### ***Asteromella trautmanniana* (Moesz) Moesz**

Bot. Közl. 39: 314 (1942).

≡ *Phyllosticta trautmanniana* Moesz, Bot. Közl. 22: 43 (1924).

**Description.** Leaf lesions small, 3–5 mm in diam., yellowish, later brown to dark grey, circular or oblong to irregular, occupying leaf tips, vein-limited, most often at the small, dried tips of the leaves. Conidiomata black, small, 58–72.6  $\mu\text{m}$  in diam., immersed, epiphyllous, usually very few and evenly distributed in a lesions, ostiolum up to 17  $\mu\text{m}$ . Conidiophores cylindrical, 1–2-celled, 5–6  $\times$  (2–)3–4  $\mu\text{m}$ . Conidiogenous cells globose to cylindrical, 3–4  $\times$  1.8–2  $\mu\text{m}$ . Conidia cylindrical to somewhat rod-shaped, (3–)4.5–7.5  $\times$  (0.6–)1–1.5  $\mu\text{m}$  (Fig. 50).



**Fig. 50** *Asteromella trautmanniana* on *Sorbus aucuparia* (LOD PF-3675). **a** Symptoms of host infection: arrows indicate small lesions with conidiomata. **b** Conidioma. **c** Conidiomatal tip. **d,e** Conidiogenous cells. **f** Conidia. Scale bars: **a** 2 cm; **b** 20  $\mu\text{m}$ ; **c** 10  $\mu\text{m}$ ; **d–f** 5  $\mu\text{m}$ .

**Host plant and distribution in Poland:**

- *Sorbus aucuparia* L.: Białowieża National Park, *Carici elongatae-Alnetum*, *Quercus-Pinetum*, *Pino-Quercetum*, *Tilio-Carpinetum*, coll. W. Mułenko, Jul.–Oct. 1988, LBL M-23723 [123]; Częstochowa Upland, Parkowe Reserve, forest roadside, coll. M. Ruszkiewicz, 23 Aug. 1998, LOD PF-1262 [136]; Częstochowa Upland, Jaskrów, deciduous forest, coll. M. Ruszkiewicz-Michalska, 6 Oct. 2004, LOD PF-3646; Gorce National Park, near Jaszczce Małe, roadside, coll. M. Ruszkiewicz-Michalska, 12 Sep. 2005, LOD PF-3647; Łódź, municipal park, coll. D. Papierz, 1 Sep. 2006, LOD PF-3074; Łódź, Łągiewnicki Forest, forest roadside, coll. & ident. E. Połec, 7 Oct. 2006, LOD PF-3698; Grądy nad Moszczenicą Reserve, *Tilio-Carpinetum*, coll. E. Połec, 10 Aug. 2006, LOD PF-3649; Łódź, Łągiewnicki Forest complex, *Tilio-Carpinetum typicum*, coll. M. Ruszkiewicz-Michalska, 28 Jul. 2007, LOD PF-3648; Łódź, Łągiewnicki Forest complex, *Calamagrostio-Quercetum*, coll. K. Brózio, 30 Sep. 2007, LOD PF-3675; Dąbrowa Grotnicka Reserve, *Potentillo albae-Quercetum*, coll. E. Połec, 16 Oct. 2008, LOD PF-3650; Biebrza National Park, Grzędy Protective Unit, mixed forest, 29 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3651 [140]; same locality, deciduous forest, 30 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3652 [140]; same locality, Brzeziny Protective Unit, Grobla Honczarowska causeway, deciduous thicket, 26 Aug. 2013, coll. M. Ruszkiewicz-Michalska, LOD PF-3653 [141]; same locality, Grzędy Protective Unit, deciduous thicket, 27 Aug. 2013, coll. M. Ruszkiewicz-Michalska, LOD PF-3654 [141]; same locality, *Vaccinio uliginosi-Pinetum*, 29 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3655 [141]; same locality, Osowiec Protective Unit, Sośnia, dune, 27 Aug. 2013, coll. M. Ruszkiewicz-Michalska, LOD PF-3656 [141].

**World distribution.** Hungary, Poland.

**Synanamorphs and teleomorph.** Unknown.

***Asteromella vulgaris* Thüm.**

Mycoth. Univ. (1878) No. 1892; Sacc. Syll. Fung. 10: 211 (1892).

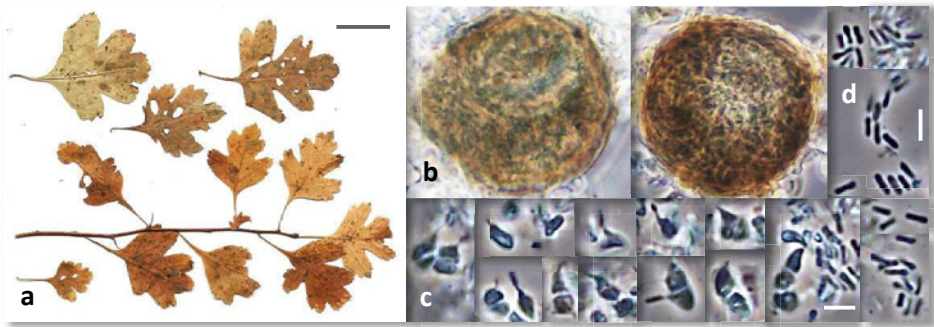
= *Phyllosticta crataegi* Speg., *Michelia* 1: 483 (1879).

= *Phyllosticta crataegicola* Sacc., Syll. Fung. 3: 6 (1884), nom. superfl.

**Description.** Leaf lesions polygonal, pale brown, vein-limited, in some specimens with brown margin, often confluent and covering large area of the leaves. Conidiomata numerous, evenly distributed, hypophyllous, immersed, pale brown, 74.1–98.8 µm in diam., intermixed with globose, dark brown young ascomata. Conidiophores absent. Conidiogenous cells in rows, cylindrical, 7–8 × 3.5–4 µm. Conidia abundant, rod-shaped, (3–)3.5–5 × 1 µm (slightly longer than in description: 3.5–4.5 µm) (Fig. 51).

**Host plants and distribution in Poland:**

- *Crataegus laevigata* (Poir.) DC.: Bolestraszyce, Arboretum, stand No. 10, coll. B. Wojdyło, 29 Sep. 1999, LBL M-23724 [159];



**Fig. 51** *Asteromella vulgaris* on *Crataegus monogyna* (LBL M-23726). **a** Symptoms of host infection. **b** Conidiomata (left conidioma below leaf stoma). **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 2 cm; **b** 20 µm; **c, d** 5 µm.

- *Crataegus lavellei* Heringq.: Bolestraszyce, Arboretum, stand No. 49, coll. B. Wojdyło, 26 Jul. 1999, LBL M-23725 [159];
- *Crataegus monogyna* Jacq.: Bolestraszyce, Arboretum, stand No. 9, coll. B. Wojdyło, 30 Oct. 1998, LBL M-23726; same locality, stand and collector, 29 Sep. 1999, LBL M-23727, both reported in [159]; Słowiński National Park, Gać, *Fraxino-Alnetum*, Sep. 2003, coll. I. Adamska, deposited in Fungal Collection of West Pomeranian University of Technology in Szczecin [142];
- *Crataegus nigra* Wald.: Bolestraszyce, Arboretum [159];
- *Crataegus* sp.: Łódź, municipal park, coll. D. Papierz, 1 Oct. 2006, LOD PF-3063; Łódź, Łagiewnicki Forest complex, Wycieczkowa Str., near the parking, coll. M. Ruszkiewicz-Michalska, 21 Oct. 2007, LOD PF-3693; Dąbrowa Grotnicka Reserve, thermophilous oak forest, coll. & ident. E. Połec & M. Ruszkiewicz-Michalska, 16 Oct. 2008, LOD PF-3705; Kampinos National Park, Bieliny, fresh meadow of alliance *Arrhenatherion*, coll. M. Ruszkiewicz-Michalska & D. Michalska-Hejduk, 10 Jul. 2012, LOD PF-3503.

**Notes.** In one of the above-listed materials from Bolestraszyce Arboretum (LBL M-23725) conidiomata of *Asteromella vulgaris* (= *Ph. crataegicola*) are adhered to conidiomata of *Phoma* sp., that most probably was identified by Wojdyło as *Ph. michailovskoensis* Elenkin & Ohl (as indicated at the label). In the same specimen *Ascochyta crataegicola* Allesch. was revealed, too.

**Additional specimens studied.** ITALY. *Asteromella vulgaris* Thüm. nov. spec. on *Crataegus laevigata* (Poir.) DC. (= *Crataegus oxyacanthoides* Thuill.), Collecchio near Parma, Oct. 1878, coll. Passerini, Thümen, Mycoth. Univ., No. 1892, WRS�; *Asteromella vulgaris* Thüm. nov. spec., *Crataegus oxyacanthoides* Thuill., Collecchio near Parma, Oct. 1878, coll. Passerini, Thümen, Herb. Mycol. Oecon., No. 734, WRS�.

**World distribution.** Armenia, Canada, China, Italy, Netherlands, Poland, Russia (Siberia) [201], Ukraine, USA.

**Tab. 11** *Asteromella* species on Salicaceae (dimensions in  $\mu\text{m}$ ).

Taxon	Conidioma	Conidiophore	Conidiogenous cell	Conidium	Host
<i>A. osteospora</i>	61.8–74.1	-	5 × 3	4.5–5 × 1–1.2	<i>Populus</i>
<i>A. populina</i>	86.5–123.5	1–2-celled; 10–18 × 4	6–6.4 × 4	6–8 × 1	<i>Populus</i>
<i>A. salicina</i>	61.8–84.7	1-celled; 4–8.3 × 3–4	2–3(–3.5) × 2.3–3.4	3–3.5 × 0.8–1	<i>Salix</i>



**Synanamorphs and teleomorph.** *Phloeospora oxyacanthae* (Kunze & J. C. Schmidt) Wallr., recorded in Poland repeatedly [202]; *Mycosphaerella crataegi* (Fuckel) Johanson ex Oudem., not reported from Poland [163].

### Salicaceae

Three *Asteromella* species have been reported on *Populus* and *Salix* in Poland. Species reported from *Populus* hosts differ in the lack of conidiophores in *A. osteospora*, as observed in the Polish collections (Tab. 11). There are no data on conidiophores in type collection as it was not seen by Aa and Vanev [5], who however consider the species to be polyphagous. *Asteromella salicina* has smaller conidia than both species associated with *Populus*.

#### *Asteromella osteospora* (Sacc.) H. Ruppr.

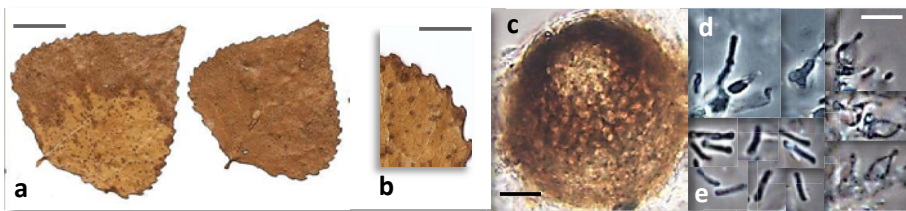
Sydowia 13: 12 (1959).

≡ *Phyllosticta osteospora* Sacc., Michelia 1: 531 (1879).

**Description.** Leaf spots indistinct, whitish to yellowish, vein-limited, small, numerous but not merged. Conidiomata scarce in a spot, brown to dark brown, in small groups, hypophyllous, 61.8–74.1 µm in diam., ostiolum absent. Conidiophores absent. Conidiogenous cells cylindrical, 5 × 3 µm. Conidia rod-shaped, 4.5–5 × 1–1.2 µm (Fig. 52).

#### Host plants and distribution in Poland:

- *Populus alba* L.: no locality [203];
- *Populus deltoides* Marshall (= *P. angulata* Aiton): no locality [203];
- *Populus* × *canescens* (Aiton) Sm. [= *P. euramericana* (Dode) Guinier]: no locality [203];
- *Populus nigra* L.: Bydgoszcz, coll. A. Michalski, 6 Aug. 1950, WA 28512;
- *Populus simonii* Carrière: no locality [203];
- *Populus* sp.: Tuszowskie Forests, vicinity of Babule near Tarnobrzeg, Aug. 1924, coll. W. Siemaszko, ident. K. Jankowska, with *Septoria populi* Desm. and *Melampsora populnea* (Pers.) P. Karst., WAUF;
- *Populus* × *tomentosa* Carrière: no locality [203].



**Fig. 52** *Asteromella osteospora* on *Populus nigra* (KRAM F-10304). **a,b** Symptoms of host infection. **c** Conidioma with ostiolum. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 3 cm; **c** 20 µm; **d,e** 5 µm.

**Additional specimens studied.** FRANCE. *Phyllosticta osteospora* Sacc. on *Populus nigra* L., Kreuzberg near Forbach, Lothringen, coll. A. Ludwig, 24 Oct. 1912, Sydow, Mycoth. Germ., No. 1180, KRAM F-10304. GERMANY. *Asteromella osteospora* (Sacc.) Ruppr. on *Populus nigra* L., Niederhomburg, district of Forbach, coll. A. Ludwig, rev. H. Rupprecht, 1 Nov. 1913, B 700015172.

**World distribution.** Bosnia and Herzegovina, China, Czech Republic, France, Germany, Italy, Poland, Spain, Turkey [182], Ukraine, USA (Alaska).

**Synanamorphs and teleomorph.** Unknown. On *Populus* species three *Asteromella* and nine *Mycosphaerella* species were recorded worldwide [10,63].

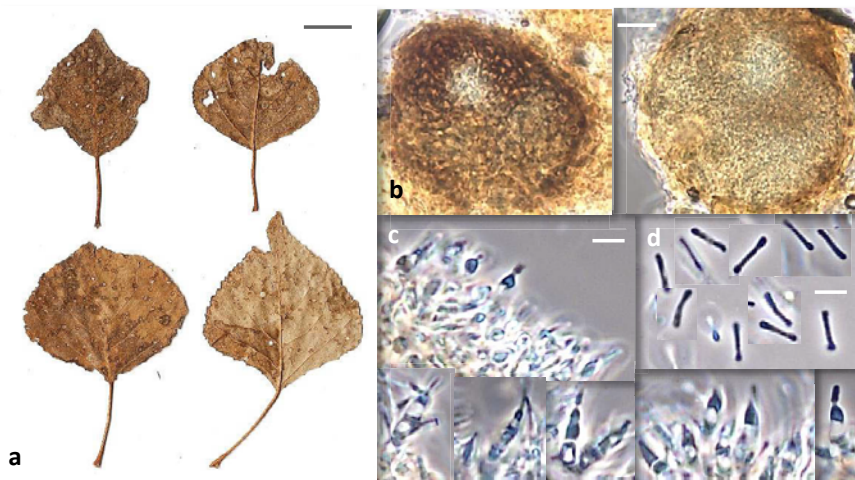
***Asteromella populina* (Fuckel) Ruszkiewicz-Michalska, comb. nov.**

Index Fungorum No. IF 552461.

Basionym: *Depazea populina* Fuckel, Jahrb. Ver. Naturk. Herzogth. Nassau 15: 46 (1860).

non *Phyllosticta populina* (Fuckel) Sacc. (1878), non *Phyllosticta populina* Pers. (1818), nec *Phyllosticta intermixta* Seaver (1922).

**Description.** Leaves densely covered with small, pale brown vein limited lesions, the rest of the leaf lamina yellowish. Conidiomata hypophyllous, evenly distributed on whole leaves, including single, minute, circular, silver spots probably caused by other fungus. Conidiomata greyish brown to black, papillate, 86.5–123.5 µm in diam., ostiolum up to 37.1 µm in diam. Conidiophores 1–2-celled, 10–18 × 4 µm. Conidiogenous cells globose to cylindrical, 6–6.4 × 4 µm. Conidia cylindrical, small percent slightly rod-shaped and curved, 6–8 × 1 µm (Fig. 53).



**Fig. 53** *Asteromella populina* on *Populus nigra* (KRAM F-13266). **a** Symptoms of host infection. **b** Conidiomata. **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 2 cm; **b** 2.5 cm; **c,d** 5 µm.

**Host plants and distribution in Poland:**

- *Populus alba* L.: no locality [203];
- *Populus × berolinensis* K. Koch: no locality [203];
- *Populus deltoides* Marshall (= *P. angulata* Aiton): no locality [203];
- *Populus nigra* L.: Obrębiec, Przasnysz district [99], re-reported by Trzebiński et al. [109] as hosted by *Populus* sp.; Zagórzany near Gorlice, coll. B. Namysłowski, Sep. 1907, KRAM F-13266 [102,103]; Szczecin-Pomorzany [119,160];
- *Populus simonii* Carrière: no locality [203];
- *Populus × tomentosa* Carrière: no locality [203];
- *Populus tremula* L.: no locality [203];
- *Populus tremuloides* Michx.: no locality [203];
- *Populus wilsonii* C. K. Schneid.: no locality [203].

**Notes.** The species was also reported on *Populus tremula* L. from *Tilio-Carpinetum* in Białowieża National Park [123]. In the corresponding specimen (*Carici elongatae-Alnetum*, *Tilio-Carpinetum*, *Pino-Quercetum*, *Quercu-Piceetum*, *Peucedano-Pinetum*, coll. W. Mułenko, Jul. 1989, LBL M-23728) no anamorphic fungus was found. Corresponding notes at the envelope made by W. Mułenko suggest a *Phoma* species (conidiomata 120–150 µm in diam., conidia 6–10 × 3–4.5 µm).

**World distribution.** Austria, Bosnia and Herzegovina, Canada, Chile, China, Czech Republic, Denmark, Germany, Great Britain, Italy, Latvia, Norway, Poland, Russia [177], Ukraine, USA.

**Synanamorphs and teleomorph.** *Septoria populi* Desm., repeatedly recorded in Poland [194], and *Mycosphaerella populi* (Auersw.) J. Schroet. known only from Silesia [163].

**Notes.** *Phyllosticta populina* (Fuckel) Sacc. (later homonym of *Ph. populina* Pers.) and its noven novum – *Phyllosticta intermixta* Seaver are not included into synonyms of *Asteromella populina*. In the opinion of Aa and Vanev [5], Saccardo [204] based a new combination on the study of a secondary collection (originating from Selva) and not on Fuckel's specimen. Furthermore, Saccardo [204] focused on another fungus, describing most likely a *Coniothyrium* species. Aa and Vanev [5] examined a holotype (in L) and accepted *Ph. populina* (Fuckel) Sacc. as the spermatial state of *Mycosphaerella populi*. A genetic connection between *Phyllosticta populina* and *Mycosphaerella populi* was not verified and was not mentioned by Klebahn [20], who experimentally proved the connection of *M. populi* and *Septoria populi*. As there are no unequivocal experimental data to support inclusion of *Phyllosticta populina* into life cycle of any of the 19 *Mycosphaerella* species described on *Populus* [63], the new combination is proposed here.

***Asteromella salicina* (Kabát & Bubák) Ruszkiewicz-Michalska, comb. nov.**

Index Fungorum No. IF 552459.

Basionym: *Phyllosticta salicina* Kabát & Bubák, Hedwigia 44: 351 (1905).

**Description.** Leaf lesions olive brown, irregular, with indistinct margins. Conidiomata regularly distributed in leaf spots, pale brown, darkening with age, 61.8–84.7  $\mu\text{m}$  in diam., epiphyllous, about 1/3 of conidiomata emerged above the leaf epidermis. Conidiophores 1-celled, 4–8.3  $\times$  3–4  $\mu\text{m}$ . Conidiogenous cells cylindrical to conical, 2–3(–3.5)  $\times$  2.3–3.4  $\mu\text{m}$ . Conidia cylindrical, 3–3.5  $\times$  0.8–1  $\mu\text{m}$  (Fig. 54).

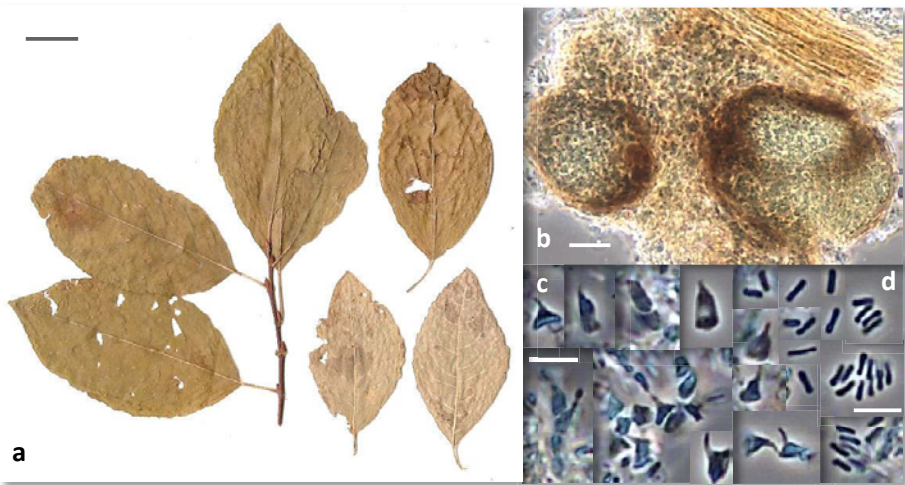
**Host plants and distribution in Poland:**

- *Salix caprea* L.: Białowieża National Park, plot V-100, *Circaeo-Alnetum*, coll. W. Mułenko, Oct. 1990, LBL M-23729 [123];
- *Salix fragilis* L.: as *Phyllosticta salicicola* Thüm., Łęczna-Włodawa Lake District, Długie Lake, alder forest, coll. W. Mułenko, 14 Sep. 1983, LBL M-23730 [128]; Łódź, Botanical Garden, coll. M. Ruszkiewicz-Michalska & M. Siennicka, 27 Oct. 2004, LOD PF-3657.

**Notes.** *Asteromella salicina* was also reported on *Salix fragilis* L. from Arboretum Bolestraszyce [159]. In corresponding specimen (stand No. 34, 30 Oct. 1998, coll. B. Wojdyło, LBL M-23731), no *Asteromella* conidiomata were found, and only *Asteroma vleugelium* (Bubák) B. Sutton was revealed.

**Additional specimen studied.** CZECH REPUBLIC. *Phyllosticta salicina* Kabát & Bubák n. sp. on *Salix alba* L., Pelešany, Turnov (orig. Pelešany nächst Turnau, Böhmen), coll. Jos. Em. Kabát, 30 Oct. 1904, Kabát & Bubák, Fungi Imperf. Exs., No. 253, isotype, B 700015126; *Phyllosticta salicina* Kabát & Bubák on *Salix amygdalina* L., Böhmen, near Tábor, coll. F. Bubák, Oct. 1903, Kabát & Bubák, Fungi Imperf. Exs., No. 453, B 700015127.

**World distribution.** Austria, Czech Republic, Poland.



**Fig. 54** *Asteromella salicina* on *Salix* spp. **a** Symptoms of host infection (*Salix caprea*, LBL M-23729). **b–d** Microscopic structures (*Salix fragilis*, LOD PF-3657). **b** Conidiomata. **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 2 cm; **b** 20  $\mu\text{m}$ ; **c, d** 5  $\mu\text{m}$ .

**Synanamorphs and teleomorph.** Unknown.

### Tiliaceae

Single *Asteromella* species has been reported on *Tilia* in Poland. On the hosts from that genus also *Asteromella tiliae* (F. Rudolphi) Verkley & Gruyter was reported from Poland. The species has been recently reallocated to *Paraconiothyrium* [16].

#### *Asteromella tiliicola* (Oudem.) Arx

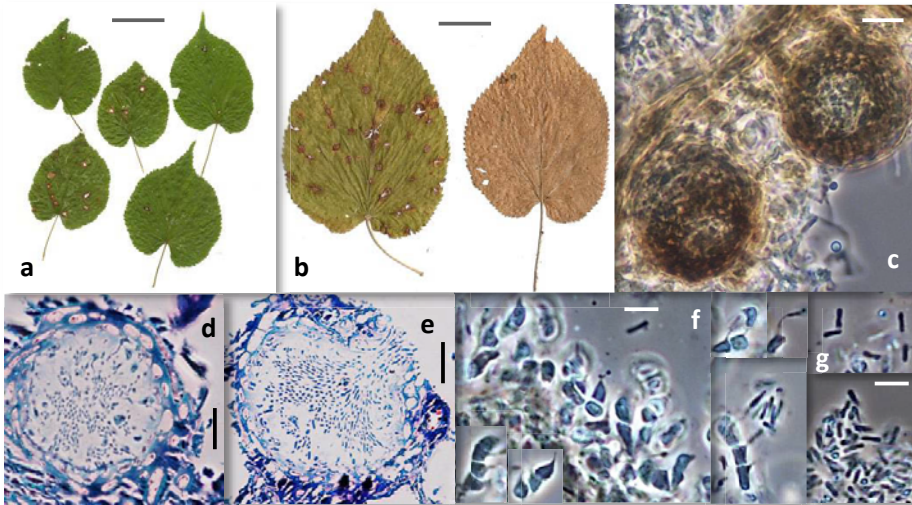
Verh. K. Ned. Akad. Wet. Afd. Natuurk. 51(3): 149 (1957).

≡ *Phyllosticta tiliicola* Oudem., Ned. Kruidk. Archf, Sér. 3 (2): 747 (1902).

= *Phyllosticta vogelii* (Syd.) Died., Annals Mycol. 11: 537 (1913).

≡ *Gloeosporium vogelii* Syd., Annals Mycol. 3: 233 (1905).

**Description.** Leaf lesions mostly circular or oblong, brownish, drying and greying, fast hollowed, with distinct dark brown to red-brown margin. Conidiomata in lines along leaf veins, amphigenous, pale brown to brown, 74.1–86.5  $\mu\text{m}$  in diam., up to 12.3  $\mu\text{m}$  in diam. Conidiophores 1–2-celed, 3–7.5  $\times$  3  $\mu\text{m}$ . Conidiogenous cells globose, 3.5–4  $\mu\text{m}$  in diam or cylindrical-conical, 3.5–4.5  $\times$  3.5–4  $\mu\text{m}$ . Conidia rod-shaped, 4–5  $\times$  1  $\mu\text{m}$  (Fig. 55).



**Fig. 55** *Asteromella tiliicola* on *Tilia* spp. **a, b** Symptoms of host infection. **a** *Tilia cordata* (LOD PF-2910). **b** *Tilia platyphyllos* (LOD PF-1373). **c–g** Microscopic structures (LOD PF-1373). **c** Conidiomata. **d** Young conidioma cross section. **e** Mature conidioma cross section. **f** Conidiogenous cells. **g** Conidia. Scale bars: **a, b** 2 cm; **c** 50  $\mu\text{m}$ ; **d, e** 20  $\mu\text{m}$ ; **f, g** 5  $\mu\text{m}$ .



**Host plants and distribution in Poland:**

- *Tilia cordata* Mill.: Tuszowskie Forests, vicinity of Babule near Tarnobrzeg, coll. W. Siemaszko, ident. K. Jankowska, Aug. 1924, WAUF; Skierniewice, park, coll. W. Siemaszko, ident. Z. Zweigbaumówna, 3 Oct. 1924, with *Phyllosticta tiliae* Sacc. & Speg. and *Gloeosporium tiliae* Oudem., WAUF; Białowieża National Park, plot V-100, *Tilio-Carpinetum*, *Circaeo-Alnetum*, *Quercu-Pinetum*, *Carici elongatae-Alnetum*, coll. W. Mułenko, Sep.–Oct. 1989, LBL M-23732 [123]; Białowieża National Park, plot V-100, *Carici elongatae-Alnetum*, *Circaeo-Alnetum*, *Tilio-Carpinetum*, *Quercu-Piceetum*, Sep.–Oct. 1990, with *Septoria tiliae* Westend., LBL M-23733 [123]; Częstochowa Upland, Olsztyn near Częstochowa, ruderal habitat, coll. M. Ruszkiewicz, 26 Sep. 1998, LOD PF-1108 [136]; Wola near Pszczyna, *Molinio-Pinetum*, coll. A. Myszka, 11 Oct. 2006, LOD PF-2910; Łódź, Łagiewnicki Forest complex, *Tilio-Carpinetum typicum*, coll. K. Brózio, 8 Jul. 2007, with *Phyllosticta tiliae* Sacc. & Speg. and *Gloeosporium tiliae* Oudem., LOD PF-3676; Łódź, Łagiewnicki Forest complex, *Tilio-Carpinetum typicum*, roadside, coll. A. Kuchnik, 8 Sep. 2007, LOD PF-3677; Łódź, Łagiewnicki Forest complex, *Calamagrostio-Quercetum typicum*, roadside, coll. A. Kuchnik, 30 Sep. 2007, LOD PF-3678; Łódź, Łagiewnicki Forest complex, forest parking, coll. M. Ruszkiewicz-Michalska, 21 Oct. 2007, LOD PF-3658; Dąbrowa Grotnicka Reserve, thermophilous oak forest, coll. & ident. E. Połec & M. Ruszkiewicz-Michalska, 29 Jun 2008, LOD PF-3702; same locality and collectors, 22 Sep. 2008, LOD PF-3702; same locality and collectors, 16 Oct. 2008, LOD PF-2703; Grądy nad Moszczenicą Reserve, *Tilio-Carpinetum*, coll. & ident. E. Połec, 18 Oct. 2008, LOD PF-3659; same locality and collector, 29 Jun. 2008, LOD PF-2704; Biebrza National Park, Kapice Protective Unit, *Tilio-Carpinetum*, 28 Aug. 2012, coll. M. Ruszkiewicz-Michalska, LOD PF-3660 [140]; Kampinos National Park, Bieliny, fresh meadow of alliance *Arrhenatherion*, coll. M. Ruszkiewicz-Michalska & D. Michalska-Hejduk, 10 Jul. 2012, co-occurring with *Paraconiothyrium tiliae* (F. Rudolphi) Verkley & Gruyter, LOD PF-3519; Biebrza National Park, Osowiec Protective Unit, Biały Grąd, deciduous forest, 27 Aug. 2013, coll. E. Sucharzewska, ident. M. Ruszkiewicz-Michalska, with *Passalora microsora* (Sacc.) U. Braun, deposited in the Fungal Collection of Department of Mycology, University of Warmia and Mazury in Olsztyn [141]; Łódź, Łagiewnicki Forest complex, near a bus terminus, deciduous forest, 10 Oct. 2013, coll. M. Ruszkiewicz-Michalska, LOD PF-3661;
- *Tilia americana* var. *heterophylla* (Vent.) Loudon (= *Tilia heterophylla* Vent.): Bolestraszyce, Arboretum [159];
- *Tilia platyphyllos* Scop.: Lubartów [98]; Częstochowa Upland, Parkowe Reserve, forest section 273d, forest roadside, coll. M. Ruszkiewicz, 30 Sep. 1998 LOD PF-1373 [136];
- *Tilia ulmifolia* Scop.: Dąbroszyn near Kostrzyn nad Odrą (orig. Tamsel, Brandenburg), tree nursery [96]; Kazimierz nad Wisłą, 28 Sep. 1923, coll. W. Konopacka, WA [171].

**Notes.** *Asteroma tiliae* F. Rudolphi [= *Paraconiothyrium tiliae* (F. Rudolphi) Verkley & Gruyter] was erroneously listed among the synonyms of *Asteromella tiliicola* by Ruszkiewicz-Michalska [139].

**Additional specimens studied.** GERMANY. As “*Asteromella vogelii* (Syd.) Petr.” on *Tilia platyphyllos* Scop., Westphalia, Reckhammer near Siegen, coll. A. Ludwig, Nov. 1926, Petrak, Mycoth. Gen., No. 1972, B 700015204; as “*Asteromella tiliicola* (Oudem.) H. Ruppr.”

on *Tilia platyphyllos* Scop., Siegkreis, beim Bahnhof Herchen, coll. A. Ludwig, 13 Oct. 1953, Herbarium D. Ludwig. Flora der Rheinprovinz, B 700015199.

**World distribution.** China, Germany, Netherlands, Poland, Ukraine.

**Synanamorphs and teleomorph.** According to Aa and Vanev [5], *Passalora microsora* (Sacc.) U. Braun and *Mycosphaerella millegrana* (Cooke) J. Schroet.; both species known in Poland [174,195]. Other authors connect these morphs to *Asteromella bacterioides* (Vuill.) Moesz [63].

## Ulmaceae

Single *Asteromella* species has been reported on *Ulmus* in Poland.

### *Asteromella ulmi* Boerema

Persoonia 18(2): 159 (2003).

≡ *Phyllosticta bellunensis* Martelli, Nuovo G. Bot. Ital. 20: 395 (1888).

≡ *Asteromella bellunensis* (Martelli) Boerema & Dorenb., Stud. Mycol. 3: 5 (1973), nom. illegit. Art. 53.1, non *Asteromella bellunensis* Syd. (1932).

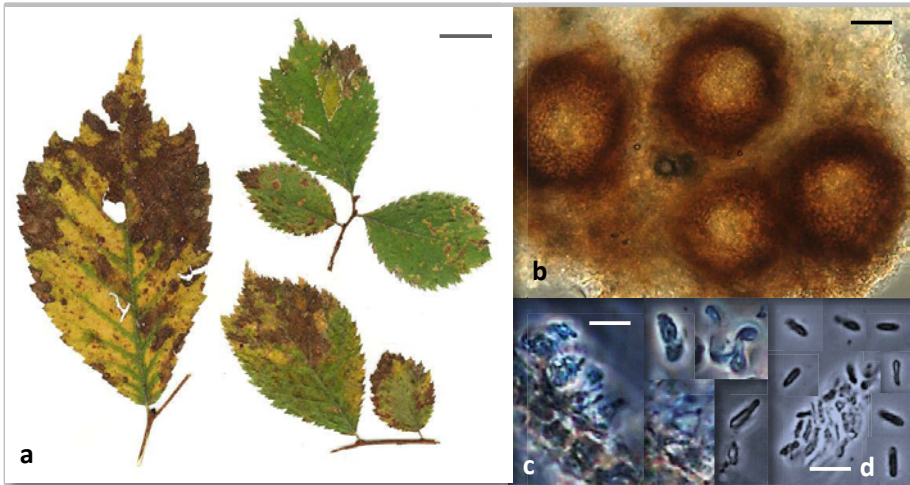
**Description.** Leaf lesions brown, irregular, covering often large area of the leaves, limited with minor leaf veins. Conidiomata amphigenous, more abundantly hypophyllous, evenly distributed, 79.8–123.5 µm in diam., ostiolum up to 17.3 µm in diam. Conidiophores 1–2(–4)-celled, cylindrical, 5–10(–12) × (2–)4–5.5(–6) µm. Conidiogenous cells conical, 5 × 4 µm. Conidia cylindrical, part of them curved, (3.5–)4.5–5 × (1–)1.2–1.5 µm (Fig. 56).

### Host plants and distribution in Poland:

- *Ulmus glabra* Huds.: Lubartów [98]; Omelno Reserve near Radzyń Podlaski, *Tilio-Carpinetum* [193];
- *Ulmus minor* Mill.: Poznań, Botanical Garden, coll. A. Michalski (?), 5 Sep. 1952, WA 28507;
- *Ulmus* sp.: Częstochowa Upland, Parkowe Reserve, *Dentario enneaphyllidis-Fagetum*, 10 Oct. 2005, coll. M. Ruszkiewicz-Michalska, LOD PF-3692.

**Notes.** Most probably to that species belongs Kowalski's [205] record of endophytic *Asteromella* sp. on *U. glabra* Huds., reported without spore dimensions but with microphotographs.

**Additional specimens studied.** GERMANY. *Phyllosticta bellunensis* Martelli on *Ulmus glabra* Huds. (= *U. campestris* L.), Brandenburg, Oberbarnim district, Gebüsh at Ihland-See near Strausberg, coll. H. Sydow, Oct. 1941, Sydow, Mycoth. Germ., No. 3556, KRA F-1941-191; *Asteromella bellunensis* (Martelli) Boerema & Dorenb. on *Ulmus glabra* Huds., Bayern, München City, walking path at the Isar River, coll. G. Rambold, ident. U. Braun, 14 Sep. 2003,



**Fig. 56** *Asteromella ulmi* on *Ulmus* spp. **a** Symptoms of host infection (*Ulmus glabra*, M-0040561). **b–d** Microscopic structures (*Ulmus* sp., LOD PF-3692). **b** Group of conidiomata. **c** Conidiogenous cells. **d** Conidia. Scale bars: **a** 2 cm; **b** 50 µm; **c, d** 5 µm.

together with *Phloeospora ulmi* (Fr.) Wallr., Triebel, Microf. Exs., No. 630, M-0040561. LATVIA. *Asteromella ulmi* Boerema on *Ulmus* sp., Gauja National Park, vicinity of Krimulda, mixed forest, coll. M. Ruszkiewicz-Michalska, 24 Sep. 2005, LOD PF-3680.

**World distribution.** China, Costa Rica, Finland, Germany, Great Britain (England), Italy, Latvia, Netherlands, Poland, Ukraine, USA, former USSR.

**Synanamorphs and teleomorph.** *Septoria ulmi* Fr. [= *Phloeospora ulmi* (Fr.) Wallr.], known from Poland [194]; *Mycosphaerella ulmi* Kleb. not reported from Poland [163].

#### 4.5. Insufficiently studied and doubtful species

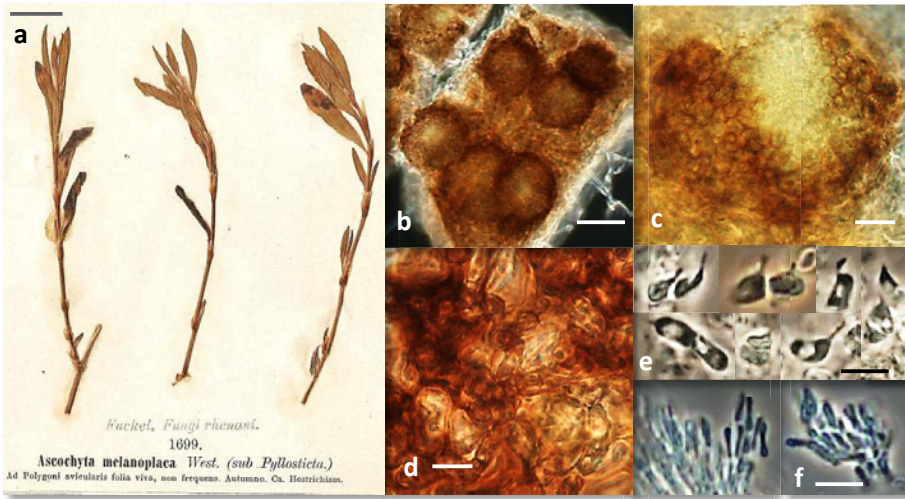
Nine *Asteromella* species reported in Poland are characterized below and arranged in alphabetical order. The corresponding specimens, as well as exsiccata were insufficient for confirming their occurrence in Poland (eight species) or to draw final conclusions about their affinity (*A. confusa*).

##### ***Asteromella aviculariae* (Westend.) Petr.**

Sydowia 10: 302 (1956).

≡ *Melasmia aviculariae* Westend., Bull. Acad. R. Sci. Belg., Sér. 2, 2: 570 (1857).

= *Phyllosticta melanoplaca* Westend.



**Fig. 57** *Asteromella aviculariae* on *Polygonum aviculare* (M-0142463). **a** Symptoms of host infection. **b** Group of conidiomata. **c** Details of ostiolum. **d** Stroma on leaf tissue. **e** Conidiogenous cells. **f** Conidia. Scale bars: **a** 2 cm; **b** 50  $\mu$ m; **c,d** 20  $\mu$ m; **e,f** 5  $\mu$ m.

**Description.** Infected leaves black, thick, rigid, overgrown with stromata, that gives them the appearance of burnt and dried. Conidiomata immersed in stromata, in dense groups, polygonal, multiform, papillate, black, (67.7–)148–173  $\mu$ m in diam., with irregular ostiolum. Conidiogenous cells conical, 4–4.6(–5)  $\times$  3.5–4.5  $\mu$ m. Conidia rod-shaped, 3–5  $\times$  (0.9–)1–1.5  $\mu$ m (Fig. 57).

#### Host plants and distribution in Poland:

- *Polygonum hydropiper* L. (Polygonaceae): Białowieża National Park [123].

**Notes.** In the corresponding specimen (in *Circaeo-Alnetum*, Jul. 1989, coll. W. Mułenko, LBL M-23734) no *Asteromella* fungus was found, but only small-spored *Phoma* species [conidiomata very pale brown, evenly distributed in lesions, immersed, elliptic, 112–160  $\times$  148–197  $\mu$ m, with distinct cell-ring around the ostiolum, 19.7  $\mu$ m in diam., conidiogenous cells globose, conidia curved, of diverse shape and size, with two polar guttules, 4.5–6(–8)  $\times$  1.8–2(2.2)  $\mu$ m].

**Additional specimens studied.** GERMANY. as “*Ascochyta melanoplaca* West. (sub *Phyllosticta*)” on *Polygonum aviculare* L., near Hostrichiam, autumn, Fuckel, Fungi Rhen. Exs., No. 1699, M-0142476. LATVIA. *Asteromella aviculariae* (Westend.) Petr. on *Polygonum aviculare* L., Riga, Dreilini, coll. J. Smarods, Sep. 1940, Petrak, Mycoth. Gen., No. 1708, M-0142463.

**World distribution.** Belgium, Finland, Germany, Latvia, Poland.

**Synanamorphs and teleomorph.** Unknown.

***Asteromella confusa* (Bubák) Petr.**

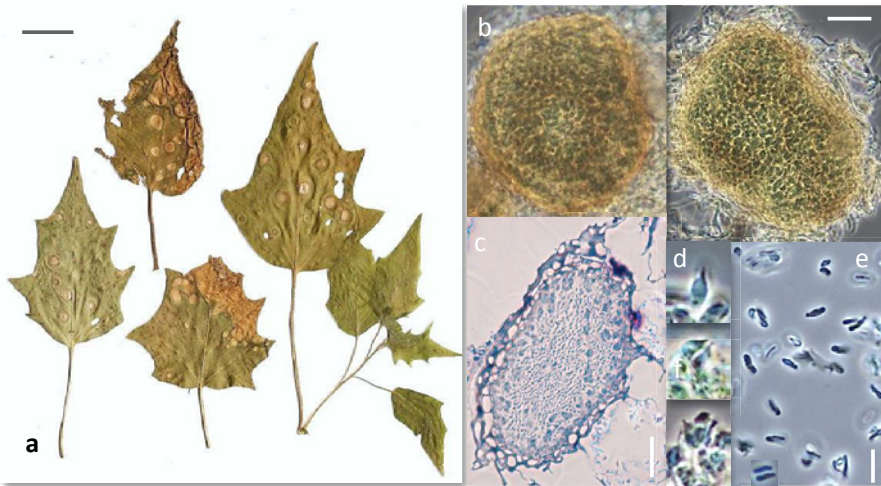
Hedwigia 65: 253 (1925).

≡ *Phyllosticta confusa* Bubák, in Tranzschel & Serebrian., Mycoth. Ross. No. 330 (1912), Hedwigia 57: 339 (1916).

**Description.** Leaf lesions elliptical, gold-brown, slightly zonated. Conidiomata evenly distributed in centre of leaf spots, in periphery they form concentric rings, amphigenous, greyish brown, ± cylindrical to irregular in shape, papillate, 86.5–98.8 µm (up to 111.2–185.3 µm in M-0142466 specimen) or up to 130.7 × 208.1 µm, ostiolum regularly rimmed with cells of the same colour, up to 24.7 µm in diam. Conidiomatal wall composed of two layers of polygonal cells, in some specimens outer layer is covered with hyphal net. Conidiogenous cells pear-shaped, 5(–7) × 4 µm, hardly discernible from the cells of internal layer of conidiomatal wall. Conidia in huge, loose mass, diverse in shape, rod-shaped, to ovoid-cylindrical, or cylindrical, a portion of conidia curved, 3.5–4(–4.9) × 1.3–1.5(–1.8) µm (Fig. 58).

**Host plants and distribution in Poland:**

- *Atriplex patula* L. (Chenopodiaceae): Częstochowa Upland, Olsztyn near Częstochowa, Botaniczna Str., close to the hedge, coll. M. Ruszkiewicz-Michalska, 26 Sep. 1998, LOD PF-2725 [136];
- *Chenopodium album* L. (Chenopodiaceae): Gorce National Park, Forendówki, pathway, coll. M. Ruszkiewicz-Michalska, 10 Sep. 2005, LOD PF-3662;
- *Chenopodium hybridum* L. (Chenopodiaceae): Częstochowa Upland, Olsztyn near Częstochowa, Karlińskiego Str., close to the wall, coll. M. Ruszkiewicz, 26 Sep. 1998, LOD PF-1310 [136]; Nadnidziański Landscape Park, Chotel Czerwony, roadside, coll. M. Ruszkiewicz-Michalska, 2 Aug. 2011, LOD PF-3663.



**Fig. 58** *Asteromella confusa* on *Chenopodium hybridum* (LOD PF-3663). **a** Symptoms of host infection. **b** Conidiomata with ostiolum. **c** Conidioma cross section. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b,c** 50 µm; **d,e** 5 µm.



**Additional specimens studied.** LATVIA. *Asteromella confusa* (Bubák) Petr. on *Chenopodium album* L., Kr. Riga, Mazupe, coll. J. Smarods, Jul. 1942, F. Petrak Pilzherbarium, M-0142466. ROMANIA. *Phyllosticta confusa* Bubák, in Tranzschel & Serebrian. on *Atriplex tatarica* L., Bassarabia, distr. Lăpușna, Lozova, 19 Jun. 1931, coll. & ident. Tr. Săvulescu & C. Sandu, Săvulescu, Herb. Mycol. Roman., Fasc. VIII, No. 362, KRA F-1931-78.

**World distribution.** Australia, Latvia, Poland, Romania, Russia, Turkey [182], Ukraine.

**Synanamorphs and teleomorph.** Unknown.

**Notes.** Most likely, the fungi revealed in the above-listed Polish collections, as well as in the additional specimens studied, belong to *Phoma heteromorphospora* Aa & Kesteren, which is known to form two types of conidia. Its microconidia are one-celled, similar to those typical for *Asteromella*,  $3\text{--}6 \times 1\text{--}1.5 \mu\text{m}$  [143] and correspond to those given in the description of *Phyllosticta confusa* Bubák. Macroconidia of *Phoma heteromorphospora* (larger, ovoid or irregularly cylindrical,  $15\text{--}20 \times 3.5\text{--}4.5 \mu\text{m}$ ) are present alongside microconidia in the collections from Poland (LOD PF-1310, LOD PF-3663) and Romania (KRA F-1931-78). Examination of the type collection is necessary to elucidate the species status.

### ***Asteromella garrettii* (Syd.) Aa**

in Aa & Vanev, A revision of the species described in *Phyllosticta*: 228 (2002).

≡ *Phyllosticta garrettii* Syd., Annals Mycol. 6: 484 (1908).

**Description.** Leaf lesions roundish, pale brown, 5–15 mm in diam. Conidiomata amphigenous, intermixed with immature, mycosphaerella-like ascomata, shiny, black, up to 160  $\mu\text{m}$  in diam., slightly erected above the host epidermis, with flat papilla and irregular ostiolum. Conidiophores absent. Conidiogenous cells lining the conidiomatal cavity, globose to subglobose, 4–7  $\mu\text{m}$  in diam. Conidia rod-shaped,  $3\text{--}4 \times 1.5\text{--}2 \mu\text{m}$  (according to [5]).

#### **Host plant and distribution in Poland:**

- *Senecio ovatus* Willd. (Asteraceae): Dukla near Krosno [200].

**World distribution.** Poland, USA.

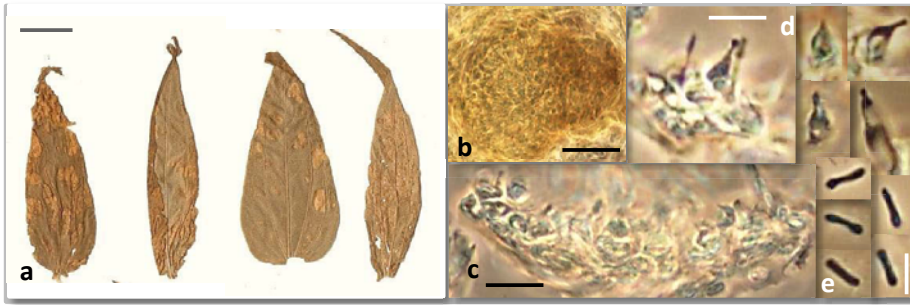
**Synanamorphs and teleomorph.** Unknown.

### ***Asteromella gentianellae* (C. Massal.) Petr.**

Hedwigia 65: 253 (1925).

≡ *Phyllosticta gentianellae* C. Massal., Malpighia 8: 196 (1894).

**Description.** Leaf lesions pale, roundish, with distinct, darker margin. Conidiomata straw-coloured to pale brownish, hardly visible at leaf surface, epiphyllous, in dense groups, elliptic,



**Fig. 59** *Asteromella gentianellae* on *Gentiana asclepiadea* (WRSL). **a** Symptoms of host infection. **b** Conidioma. **c** Layer of conidiogenous cells. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2 cm; **b** 40 µm; **c** 10 µm; **d,e** 5 µm.

flattened,  $49.4\text{--}61.8 \times 74.1\text{--}86.5$  µm or globose, up to 86.5 µm in diam. Ostiolum invisible, probably due to light colour of conidiomatal wall. Conidiophores 1–2-celled,  $7\text{--}10 \times 3\text{--}3.5$  µm. Conidiogenous cells conical,  $4\text{--}4.5(-5) \times 2.5\text{--}3$  µm. Conidia rod-shaped,  $4\text{--}5(-5.5) \times (0.8\text{--})1\text{--}1.3$  µm (Fig. 59).

#### Host plant and distribution in Poland:

- *Gentiana pneumonanthe* L. (Gentianaceae): Czaślów, Czaślawiec, Tuszyňa [102,106].

**Additional specimens examined.** GERMANY. *Phyllosticta gentianellae* C. Massal. on *Gentiana asclepiadea* L., Ober Bayern, Galmeikopf near Füssen, coll. H. Sydow, 15 Aug. 1912, together with *Ramularia evanida* (J. G. Kühn) Sacc., Sydow, Mycoth. Germ., No. 1178, KRAM F-10309 and WRSL. ROMANIA. *Phyllosticta gentianellae* C. Massal. on *Gentiana asclepiadea* L., Transilvania, distr. Năsăud, Valea Vinului, 6 Aug. 1925, with *Ramularia evanida* (J. G. Kühn) Sacc., coll. & ident. Tr. Săvulescu et C. Sandu, Săvulescu, Herb. Mycol. Roman., Fasc. VIII, No. 365, KRA F-1925-130. SLOVAKIA. *Phyllosticta gentianellae* C. Massal. on *Gentiana asclepiadea* L., Tatra Mts, valley of Niewcyrka, coll. K. Rouppert, Aug. 1909, together with *Ramularia evanida* (J. G. Kühn) Sacc., KRAM F-8970 [102,106,117].

**World distribution.** Bulgaria [206], Germany, Italy, Poland, Romania, Slovakia, Ukraine.

**Synanamorphs and teleomorph.** *Mycosphaerella gentianae* (Niessl) Lindau, not recorded in Poland [163].

#### *Asteromella helleboricola* (C. Massal.) Moesz

Bot. Közl. 35: 64 (1938).

≡ *Phyllosticta helleboricola* C. Massal., Memorie Accad. Agric. Sci. Verona, Sér. 3, 65: 81 (1889).

**Description.** Leaf lesions amphigenous, dried, polygonal, whitening, dried. Conidiomata hypophyllous, globose, 70–100 µm in diam., ostiolum often invisible. Conidiophores



**Fig. 60** *Asteromella helleboricola* on *Helleborus viridis* (B 700015088). **a** Symptoms of host infection. **b** Conidiomata. **c** Details of conidiomatal tip. **d** Conidiogenous cells. **e** Conidia. Scale bars: **a** 2.5 cm; **b** 35  $\mu$ m; **c** 20  $\mu$ m; **d,e** 5  $\mu$ m.

0-2-celled, 4–12  $\times$  2.5–3  $\mu$ m. Conidiogenous cells cylindrical to conical, 2.5–4  $\times$  2.5–3  $\mu$ m. Conidia rod-shaped, 3–5  $\times$  1–1.5  $\mu$ m (according to Saccardo [145]). According to Moesz [147] ostiolum 7–14  $\mu$ m in diam., conidia longer, 3–7  $\times$  1–1.5  $\mu$ m (Fig. 60).

#### Host plant and distribution in Poland:

- *Helleborus viridis* L. (Ranunculaceae): Kraków, Botanical Garden [100,102].

**Additional specimens studied.** FRANCE. *Phyllosticta helleboricola* C. Massal. on *Helleborus viridis* L., Pyrenees, Gavarnie, coll. R. Maire, 29 Jul. 1906, Kabát & Bubák, Fungi Imperf. Exs., No. 655, B 700015088. GERMANY. *Asteromella helleboricola* (C. Massal.) Moesz on *Helleborus viridis* L., Kr. Meschede, Deutmecke, coll./ident. A. Ludwig, rev. H. Rupprecht, 29 Sep. 1935, Herbarium A. Ludwig, Flora von Westfalen, B 700015161.

**World distribution.** Brazil, France, Germany, Great Britain (Scotland), Italy, Poland, Spain, Turkey [182]

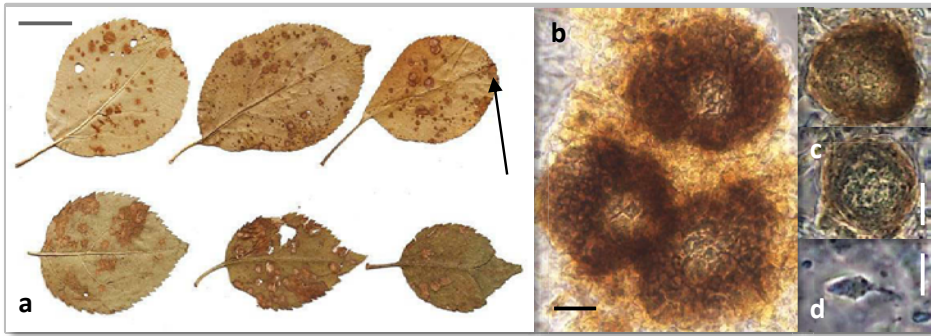
**Synanamorphs and teleomorph.** Unknown.

#### *Asteromella mali* (Briard) Boerema & Dorenb.

Versl. Pl. Ziektenk. Diens 142 (Jaarb. 1964): 149 (1965).

$\equiv$  *Phyllosticta mali* Briard, Florule cryptogamique de l'Aube et Supplement au Catalogue des plantes de Ce département. Troyes 8: 79 (1888).

= *Phyllosticta briardii* Sacc., Syll. Fung. 10: 109 (1892), nom. superfl.



**Fig. 61** *Asteromella mali* on *Malus domestica* (B 700015070). **a** Symptoms of host infection (arrow). **b** Conidiomata. **c** Details of conidiomatal tip. **d** Conidiogenous cell with young conidium. Scale bars: **a** 2 cm; **b** 30 µm; **c** 20 µm; **d** 5 µm.

**Description.** Leaf lesions pale to dark brown, small, enlarging and forming greater, irregular groups, confluent, marginate, margin zoned. Conidiomata evenly distributed in lesions or arranged in linear groups along the veins limiting the lesion, up to 98.8 µm in diam. Most conidiomata empty, intermixed with immature ascomata. Conidiophores and conidiogenous cells not preserved. Conidia scarce, rod-shape to cylindrical,  $3.5 \times 1$  µm (Fig. 61).

**Host plant and distribution in Poland:**

- *Malus domestica* Borkh. (Rosaceae): Puławy [207]; Mory pod Warszawą, coll. H. Jur. (asz-kówna?), 1930, WA 21898 [114].

**Notes.** The specimen is included into *A. mali* provisionally because of paucity of spores and lack of conidia-forming structures. Presence of the species in Poland needs to be confirmed with new collections.

**Additional specimen studied.** RUSSIA. *Phyllosticta briardii* Sacc. on *Malus domestica* Borkh. (= *Pyrus malus* L.), Berdicino, province Jaroslavl, coll. Serebrianikow, 10 Aug. 1909, Tranzschel & Serebrianikow, Mycoth. Ross., No. 34, B 700015070.

**Notes.** In the specimen B 700015070, only very few conidiomata of *Asteromella mali*, located in a single leaf lesion were found, while *Phyllosticta mali* Prill. & Delacr. dominated in the remaining lesions.

**World distribution.** Armenia, Austria, Bulgaria, China, former Czechoslovakia, Dominican Republic, France, Great Britain, India, Japan, Myanmar, Poland, Romania, Russia, Southern Africa, Turkey, Ukraine, USA.

**Synanamorphs and teleomorph.** Unknown.

### ***Asteromella saponariae* (Fuckel) Petr.**

Sydowia 9: 492 (1955).

≡ *Phyllosticta saponariae* (Fuckel) Sacc., Michelia 1: 154 (1878).

≡ *Ascochyta saponariae* Fuckel, Symb. Mycol. 388 (1869).

**Description.** Leaf lesions limited with main leaf veins, first circular, becoming oblong to oblong-elliptical or irregular, without margin, of darker, almost black appearance due to great number and density of conidiomata. Conidiomata pale grey to black, up to 1/2 of conidiomata elevated above leaf epidermis, amphigenous, but mostly hypophyllous, 74.1–98.8 µm in diam., ostiolum up to 24.7 µm in diam. Conidiophores 1–2-celled, branched at the base, 12–14 × 3 µm. Conidiogenous cells 4.5–5.2 × 3 µm. Conidia cylindrical, part of them (up to 30%) slightly curved, 4–5 × 1–1.2 µm.

#### **Host plant and distribution in Poland:**

- *Saponaria officinalis* L. (Caryophyllaceae): Terespol Pomorski near Świecie [94,160,165].

**Additional specimen studied.** CZECH REPUBLIC. *Asteromella saponariae* (Fuckel) Petr. on *Saponaria officinalis* L., Hranice, Becwa-Ufer near Jesionik, coll. F. Petrak, Oct. 1935, Poelt & Scheuer, Reliqu. Petrak., No. 545, M-0142471. GERMANY. *Ascochyta saponariae* on *Saponaria officinalis*, Eberbach, Fuckel, Fungi Rhen. Exs. No. 2230, B 700015146.

**World distribution.** Czech Republic, Germany, Italy, Poland, Ukraine.

**Synanamorphs and teleomorph.** *Septoria* sp., teleomorph unknown.

### ***Asteromella scabiosae* (Kalymb.) Vanev & Aa**

in Aa & Vanev, A revision of the species described in *Phyllosticta*: 415 (2002).

≡ *Phyllosticta scabiosae* Kalymb., Trudy Inst. Bot. Akad. Nauk Kazakh. S.S.R. 13: 282 (1962).

**Description.** Leaf lesions yellowish-pale brown, barely visible, without a clear border, mostly at the ends of the leaves. Conidiomata greyish, glassy, hypophyllous, globose, papillate, 74.1–98.8 µm in diam. Conidiogenous cells subglobose to conical, badly preserved. Conidia rod-shaped or slightly curved, 3–5.5 × 0.8–1 µm.

#### **Host plant and distribution in Poland:**

- *Scabiosa ochroleuca* L. (Dipsacaceae): Częstochowa Upland, Olsztyn near Częstochowa, *Origano-Brachypodietum* xerothermic grassland, coll. M. Ruszkiewicz, 13 Jul. 1998, LOD PF-1333 [136].

**World distribution.** Kazakhstan, Poland, Ukraine.

**Synanamorphs and teleomorph.** *Mycosphaerella* sp. Hitherto three *Mycosphaerella* species are known on *Scabiosa* but no spermatial states were indicated [63].



### ***Asteromella scorzonerae* (Petr.) Petr.**

Hedwigia 65: 254 (1925)

≡ *Phyllosticta scorzonerae* Petr., Annals Mycol. 19: 86 (1921); Sacc. Syll. Fung. 10: 126 (1892), nom. illegit. Art. 53.1, non *Phyllosticta scorzonerae* Pass. (1887).

= *Asteromella polonica* Aa, in Aa & Vanev, A revision of the species described in *Phyllosticta*: 418 (2002), nom. superfl.

**Description.** Leaf lesions elliptical, whitish grey, up to 1-1.5 mm in diam., limited with dark brown or violet margin. Conidiomata beige grey to dark grey, immersed in plant tissue, hypophyllous, one per lesion, 60-100 µm in diam., ostiolum distinct, surrounded with darker thin-walled cells, up to 30 µm in diam. Conidiophores lacking. Conidia rod-shaped, 3.5 × 1 µm. The description is given according to Petrak [29,146], who however did not provide the characters of conidiogenous cells.

#### **Host plant and distribution in Poland:**

- *Scorzonera humilis* L. (Asteraceae): Białowieża National Park, *Peucedano-Pinetum*, coll. W. Mullenko, Jul. 1988, with *Valdensia heterodoxa* Peyronel, LBL M-23735 [123].

**Notes.** In the material studied (LBL M-23735 given above) only species of small-spored *Phoma* section *Phoma* was found. It causes white-beige leaf lesions, up to 3 mm in diam., concave, roundish, with violet margin; conidiomata beige-grey to dark grey, epiphyllous, immersed in host tissue, one per lesion, 61.8–98.8 µm in diam., ostiolum distinct, surrounded with darker cells, up to 9.88 µm in diam., conidiogenous cells easily distinguishable from the inner layer cells of conidiomatal wall, conidia ovoid to cylindrical, 3.5–4 × 1.5 µm.

**World distribution.** Austria, Latvia, Lithuania, Ukraine.

**Synanamorphs and teleomorph.** *Cercospora scorzonerae* Höhn., not recorded in Poland, [195], *Septoria* sp., *Mycosphaerella* sp.

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## 6. Appendix 1. Index of Latin names

<i>Acer</i>	<i>acetosae</i>
<i>campestre</i>	<i>acorella</i>
<i>negundo</i>	<i>adeana</i>
<i>platanoides</i>	<i>adoxicola</i>
<i>pseudoplatanus</i>	<i>aegopodii</i>
<i>tataricum</i>	<i>aesculicola</i>
Aceraceae	<i>agrimoniae</i>
<i>Acorus calamus</i>	<i>alnicola</i>
<i>Adoxa moschatellina</i>	<i>angelicae</i>
Adoxaceae	<i>artemisiae</i>
<i>Aegopodium podagraria</i>	<i>asteris</i>
<i>Aesculus</i>	<i>astragalicola</i>
<i>hippocastanum</i>	<i>austriaca</i>
<i>pavia</i>	<i>aviculariae</i>
<i>Agrimonia eupatoria</i>	<i>bacilloides</i>
<i>Alnus</i>	<i>bacterioides</i>
<i>glutinosa</i>	<i>baldensis</i>
<i>incana</i>	<i>bellunensis</i>
<i>viridis</i>	<i>borszczowii</i>
<i>Alternaria tenuissima</i>	<i>brassicae</i>
<i>Angelica sylvestris</i>	<i>brassicicola</i>
Apiaceae	<i>brunellae</i>
<i>Apiosporella</i>	<i>bupthalmi</i>
<i>Aplosporidium</i>	<i>carlinae</i>
Araceae	<i>castaneicola</i>
Araliaceae	<i>cerasicola</i>
<i>Aronicum clusii</i>	<i>chaerophylli</i>
<i>Ascochyta</i>	<i>cicutae</i>
<i>crataegicola</i>	<i>confusa</i>
<i>ebuli</i>	<i>convallariae</i>
<i>melanoplaca</i>	<i>corcontica</i>
<i>ranunculi</i>	<i>doronicigena</i>
<i>saponariae</i>	<i>drymariae</i>
Ascomycota	<i>ebuli</i>
Asteraceae	<i>epitrema</i>
Asterinales	<i>euonymella</i>
<i>Asterinella</i>	<i>eupatoriicola</i>
<i>Asteroma</i>	<i>fraxini</i>
<i>leptothyrioides</i>	<i>galii-schultesii</i>
<i>tiliae</i>	<i>garbowskii</i>
<i>vleugelianum</i>	<i>garrettii</i>
<i>Asteromella</i>	<i>gentianellae</i>

<i>gorholti</i>	<i>stemmatea</i>
<i>hederacea</i>	<i>tiliae</i>
<i>hederae</i>	<i>tiliicola</i>
<i>helleboricola</i>	<i>tobira</i>
<i>hranicensis</i>	<i>trautmanniana</i>
<i>huubii</i>	<i>trollii</i>
<i>intricata</i>	<i>ulmi</i>
<i>ixiolirii</i>	<i>ungerniae</i>
<i>leptidea</i>	<i>velata</i>
<i>livida</i>	<i>vogelii</i>
<i>longissima</i>	<i>vulgaris</i>
<i>ludwigii</i>	f. <i>geditschiae triacantis</i>
<i>lupini</i>	<i>wandae</i>
<i>lysimachiae</i>	Asteromellaceae
<i>maculiformis</i>	<i>Asterostomella</i>
<i>mali</i>	<i>Astragalus glycyphyllos</i>
<i>melampyrina</i>	<i>Atriplex</i>
<i>moeszii</i>	<i>patula</i>
<i>osteospora</i>	<i>tatarica</i>
var. <i>samaricola</i>	Berberidaceae
<i>ovata</i>	<i>Berberis</i>
<i>petasitidis</i>	<i>laurina</i>
<i>phalaridis</i>	<i>vulgaris</i>
<i>pistaciarum</i>	<i>Betula</i>
<i>platanoidis</i>	<i>alba</i>
<i>pleurospermi</i>	<i>humilis</i>
<i>podocarpi</i>	<i>pendula</i>
<i>polonica</i>	<i>pubescens</i>
<i>populina</i>	Betulaceae
<i>pruni-mahaleb</i>	<i>Boeremia hedericola</i>
<i>pulmonariae</i>	Boraginaceae
<i>pyricola</i>	<i>Brassica oleracea</i>
<i>quercicola</i>	Brassicaceae
<i>quercifolii</i>	<i>Calamagrostis canescens</i>
<i>ranunculi</i>	Capnodiales
<i>rhoina</i>	Caprifoliaceae
<i>rosicola</i>	<i>Caragana arborescens</i>
<i>rumicis</i>	<i>Carlina vulgaris</i>
<i>rupprechtii</i>	Caryophyllaceae
<i>salicina</i>	<i>Castanea</i>
<i>saponariae</i>	<i>sativa</i>
<i>scabiosae</i>	<i>vesca</i>
<i>scorzonerae</i>	Celastraceae
<i>senecionis-nemorensis</i>	<i>Cerasus avium</i>
<i>sphaerospora</i>	<i>Cercospora</i>
state of <i>Mycosphaerella</i>	<i>bloxamii</i>

<i>brassicicola</i>	Dothideomycetes
<i>microsora</i>	Dothideomycetidae
<i>scorzonerae</i>	<i>Epilobium</i>
<i>Cercospora prolifans</i>	<i>collinum</i>
<i>Chaenomeles</i>	<i>hirsutum</i>
<i>japonica</i>	<i>roseum</i>
<i>sinensis</i>	<i>Erysiphe aquilegiae</i>
<i>Chaerophyllum aromaticum</i>	<i>Eucaliptus</i>
<i>Chamaenerion angustifolium</i>	<i>Euonymus</i>
Chenopodiaceae	<i>europaea</i>
<i>Chenopodium</i>	<i>vulgaris</i>
<i>album</i>	<i>Eupatorium cannabinum</i>
<i>hybridum</i>	Fabaceae
<i>Cicuta virosa</i>	Fagaceae
<i>Clypeispora</i>	<i>Fagus sylvatica</i>
Coelomycetes	<i>Fraxinus</i>
<i>Coleosporium tussilaginis</i>	<i>americana</i>
<i>Coniella</i>	<i>excelsior</i>
<i>Coniothyrium olivaceum</i>	Fungi
<i>Convallaria majalis</i>	<i>Fusicladium aronici</i>
<i>Corylus colurna</i>	<i>Fusidium adoxae</i>
<i>Crataegus</i>	<i>Gentiana</i>
<i>laevigata</i>	<i>asclepiadea</i>
<i>lavellei</i>	<i>pneumonanthe</i>
<i>monogyna</i>	Gentianaceae
<i>nigra</i>	<i>Gillotia</i>
<i>oxyacanthoides</i>	<i>Gloeosporium</i>
<i>Cronartium flaccidum</i>	<i>tiliae</i>
<i>Dasystictella</i>	<i>vogelii</i>
<i>Dendrophoma convallariae</i>	<i>Graphiopsis chlorocephala</i>
<i>Depazea</i>	<i>Guignardia aesculi</i>
<i>adoxaecola</i>	<i>Haplosporidium</i>
<i>agrimoniae</i>	<i>Hedera helix</i>
<i>populina</i>	<i>Helleborus viridis</i>
<i>rhamnocola</i>	<i>Heracleum</i>
<i>sambucicola</i>	<i>sibiricum</i>
<i>Didymella winteriana</i>	<i>sphondylium</i>
Didymosphaeriaceae	<i>Hieracium</i>
Dipsacaceae	<i>alpinum</i>
<i>Dipsacus sylvestris</i>	<i>lachenalii</i> subsp. <i>cruentifolium</i>
<i>Doronicum</i>	<i>murorum</i>
<i>austriacum</i>	<i>pilosella</i>
<i>caucasicum</i>	<i>umbellatum</i>
<i>clusii</i>	<i>vulgatum</i>
<i>columnae</i>	Hippocastanaceae
<i>Dothidella</i>	Lamiaceae



<i>Leptodothiorella aesculicola</i>	<i>vogelii</i>
<i>Leptosphaeria artemisiae</i>	<i>winteriana</i>
<i>Leptotrochila ranunculi</i>	Mycosphaerellaceae
Liliaceae	Myrsinaceae
<i>Lotus</i>	<i>Ochropsora ariae</i>
<i>Lysimachia vulgaris</i>	Oleaceae
<i>Malus domestica</i>	Onagraceae
<i>Melampsora populnea</i>	Orobanchaceae
<i>Melampsorium betulinum</i>	<i>Padus</i>
<i>Melampyrum nemorosum</i>	<i>avium</i>
<i>Melasmia aviculariae</i>	<i>serotina</i>
<i>Menispermum canadense</i>	<i>Paeonia</i>
<i>Microsphaera</i>	<i>officinalis</i>
<i>astragali</i>	<i>romanica</i>
<i>euonymi</i>	Paeoniaceae
Microthyriaceae	<i>Paraconiothyrium tiliae</i>
<i>Morus</i>	<i>Paraphoma</i>
<i>Mycosphaerella</i>	<i>Passalora</i>
<i>acilegna</i>	<i>aronici</i>
<i>aegopodii</i>	<i>bacilligera</i>
<i>agrimoniae</i>	<i>depressa</i>
<i>angelicae</i>	<i>microsora</i>
<i>aronici</i>	<i>rhamni</i>
<i>berberidis</i>	<i>Petasites</i>
<i>brassicicola</i>	<i>hybridus</i>
<i>brunneola</i>	<i>kablikianus</i>
<i>carlinae</i>	<i>officinalis</i>
<i>chaenomelis</i>	<i>spurius</i>
<i>crataegi</i>	Pezizomycotina
<i>ebuli</i>	<i>Phaeoramularia punctiformis</i>
<i>gentianae</i>	<i>Phaseolus</i>
<i>hieracii</i>	<i>Phloeospora</i>
<i>hippocastani</i>	<i>apatela</i>
cf. <i>insulana</i>	<i>oxyacanthae</i>
<i>jaczewskii</i>	<i>ulmi</i>
<i>lysimachiae</i>	<i>Phoma</i>
<i>millegrana</i>	<i>betae</i>
<i>morthieri</i>	<i>heteromorphospora</i>
<i>podagrariae</i>	<i>longissima</i>
<i>populi</i>	sect. <i>Paraphoma</i>
<i>pulmonariae</i>	sect. <i>Pilosa</i>
<i>punctiformis</i>	<i>typhina</i>
f. <i>tiliae</i>	<i>Phomopsis</i>
sect. <i>Caterva</i>	<i>Phyllachora angelicae</i>
<i>tulipiferae</i>	<i>Phyllonochaeta solani</i>
<i>ulmi</i>	<i>Phyllosticta</i>

<i>acericola</i>	<i>faginea</i>
<i>acetosae</i>	<i>garbowskii</i>
<i>acorella</i>	<i>garrettii</i>
<i>adoxae</i>	<i>gentianellae</i>
<i>advena</i>	<i>hederae</i>
<i>aegopodii</i>	<i>hedericola</i>
<i>aesculicola</i>	<i>helleboricola</i>
<i>agrimoniae</i>	<i>hieracii</i>
<i>alnicola</i>	<i>humeriformis</i>
<i>alni-glutinosae</i>	<i>intermixta</i>
<i>angelicae</i>	<i>kurskiana</i>
<i>aronici</i>	<i>letendrei</i>
<i>astragalicola</i>	<i>lysimachiae</i>
<i>austriaca</i>	<i>maculiformis</i>
<i>bacilloides</i>	<i>f. quercus</i>
<i>bacterioides</i>	<i>mahaleb</i>
<i>baldensis</i>	<i>mali</i>
<i>bellunensis</i>	<i>melampyrina</i>
<i>berberidicola</i>	<i>melanoplaca</i>
<i>berberidis</i>	<i>michailovskoensis</i>
<i>betulae</i>	<i>minutissima</i>
<i>betulicola</i>	<i>napi</i>
<i>betulina</i>	<i>osteospora</i>
<i>borszczowii</i>	<i>paeoniae</i>
<i>brassicae f. brassicae olearceae</i>	<i>passerinii</i>
<i>brassicicola</i>	<i>paviaecola</i>
<i>bresadolae</i>	<i>petasitidis</i>
<i>briardii</i>	<i>f. petasitidis-officinalis</i>
<i>brunellae</i>	<i>petasitis</i>
<i>buphthalmi</i>	<i>platanoidis</i>
<i>caraganae</i>	<i>pleurospermi</i>
<i>carlinae</i>	<i>populina</i>
<i>castanae</i>	<i>pruni-mahaleb</i>
<i>chaerophylli</i>	<i>pulmonariae</i>
<i>chamaenerii</i>	<i>pyricola</i>
<i>cicutae</i>	<i>pyrina</i>
<i>confusa</i>	<i>quernea</i>
<i>corcontica</i>	<i>ranunculi</i>
<i>crataegi</i>	<i>ranuncolorum</i>
<i>crataegicola</i>	<i>rhamnicola</i>
<i>doronicigena</i>	<i>rosicola</i>
<i>ebuli</i>	<i>salicicola</i>
<i>euonymella</i>	<i>salicina</i>
<i>euonymi</i>	<i>saponariae</i>
<i>euonymicola</i>	<i>scabiosae</i>
<i>eupatoriicola</i>	<i>scorzoneriae</i>

<i>senecionis-nemorensis</i>	<i>Pulmonaria</i>
<i>stevenii</i>	<i>obscura</i>
<i>tambowiensis</i>	<i>officinalis</i>
<i>tiliae</i>	<i>Pyrus</i>
<i>tiliicola</i>	<i>communis</i>
<i>tinea</i>	<i>malus</i>
<i>trautmanniana</i>	<i>Quercus</i>
<i>trollii</i>	<i>cerris</i>
<i>typhina</i>	<i>ilex</i>
<i>vandae</i>	<i>pedunculata</i>
<i>vogelii</i>	<i>petraea</i>
<i>wandae</i>	<i>petraea</i> × <i>Q. robur</i>
<i>Pimpinella saxifraga</i>	<i>robur</i>
<i>Plectophoma</i>	<i>Ramularia</i>
<i>Plenodomus lupini</i>	<i>adoxae</i>
Pleosporales	<i>buphthalmi</i>
<i>Pleurospermum austriacum</i>	<i>celastri</i>
Polygonaceae	<i>cicutae</i>
<i>Polygonatum odoratum</i>	<i>cylindroides</i>
<i>Polygonum</i>	<i>endophylla</i>
<i>aviculare</i>	<i>evanida</i>
<i>hydropiper</i>	<i>inaequalis</i>
Polystomellaceae	<i>lysimachiae</i>
<i>Populus</i>	<i>rubella</i>
<i>alba</i>	<i>sambucina</i>
<i>angulata</i>	<i>unterseheri</i>
× <i>berolinensis</i>	<i>vizellae</i>
× <i>canescens</i>	Ranunculaceae
<i>deltoides</i>	<i>Ranunculus</i>
× <i>euramericana</i>	<i>aconitifolius</i>
<i>nigra</i>	<i>acris</i>
<i>simonii</i>	<i>lanuginosus</i>
× <i>tomentosa</i>	<i>lingua</i>
<i>tremula</i>	<i>repens</i>
<i>tremuloides</i>	Rhamnaceae
<i>wilsonii</i>	<i>Rhamnus cathartica</i>
<i>Porterula</i>	<i>Rhus typhina</i>
<i>Prunella vulgaris</i>	<i>Rosa</i>
<i>Prunus</i>	<i>arvensis</i>
<i>domestica</i>	<i>gallica</i>
<i>padus</i>	Rosaceae
<i>Pseudocercospora</i>	<i>Rumex</i>
<i>Pseudocercosporella</i>	<i>acetosa</i>
<i>Pucciniastrum</i>	<i>acetosella</i>
<i>agrioniae</i>	<i>sanguineus</i>
<i>areolatum</i>	Salicaceae

<i>Salix</i>	<i>ulmi</i>
<i>amygdalina</i>	<i>Sorbus aucuparia</i>
<i>caprea</i>	<i>Sphaerella adoxae</i>
<i>fragilis</i>	<i>Sphaeria</i>
<i>Sambucus</i>	<i>aegopodii</i>
<i>ebulus</i>	<i>longissima</i>
<i>nigra</i>	<i>Sphaerulina rehmanniana</i>
<i>racemosa</i>	<i>Sporonema</i>
<i>Saponaria officinalis</i>	<i>Stagonospora</i>
<i>Sawadaea bicornis</i>	<i>Stenella</i>
<i>Scabiosa ochroleuca</i>	<i>Stictochorella vogelii</i>
<i>Scorzonera humilis</i>	<i>Stictochorellina</i>
<i>Seimatosporium kriegermanum</i>	<i>Taphrina betulae</i>
<i>Senecio</i>	<i>Teratosphaeria</i>
<i>ovatus</i>	<i>Tilia</i>
<i>paludosus</i>	<i>americana</i> var. <i>heterophylla</i>
<i>Septogloeum carthusianum</i>	<i>cordata</i>
<i>Septoria</i>	<i>heterophylla</i>
<i>acetosae</i>	<i>platyphyllos</i>
<i>aegopodii</i>	<i>ulmifolia</i>
<i>agrimoniicola</i>	Tiliaceae
<i>alni</i>	<i>Trollius europaeus</i>
<i>astragali</i>	Ulmaceae
<i>buphthalmi</i>	<i>Ulmus</i>
<i>caraganae</i>	<i>campestris</i>
<i>carisolensis</i>	<i>glabra</i>
<i>lysimachiae</i>	<i>minor</i>
<i>paeoniae</i>	<i>Uromyces punctatus</i>
<i>podagrariae</i>	<i>Valdensia heterodoxa</i>
<i>populi</i>	<i>Viburnum</i>
<i>pulmonariae</i>	<i>lantana</i>
<i>pyricola</i>	<i>opulus</i>
<i>tiliae</i>	<i>tinus</i>
<i>trollii</i>	<i>Zasmidium</i>

## 7. Appendix 2. Worldwide list of *Asteromella* names

Worldwide list of *Asteromella* names, including species reallocated by the author. Species are arranged according to type-host species affinity and within the family according to the date of description/reallocation. Species confirmed to occur in Poland set in bold font.

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Diverse families	<i>Asteromella artemisiae</i> E. Müll.	-	? <i>Leptosphaeria artemisiae</i> (Fuckel) Auersw.	<i>Alyssum</i> sp. (Brassicaceae), <i>Artemisia campestris</i> (Asteraceae), <i>Clematis</i> sp. (Ranunculaceae), <i>Epilobium</i> sp. (Onagraceae)	Europe: Switzerland
	<i>Asteromella longissima</i> (Pers.) Petr.*	-	-	<i>Chaerophyllum bulbosum</i> (Apiaceae), <i>Chenopodium album</i> (Chenopodiaceae)	Europe: France
	<b><i>Asteromella vulgaris</i></b> Thüm.	-	-	<i>Crataegus oxyacanthoides</i> (Rosaceae), <i>Gleditsia triacanthos</i> (Fabaceae)	Europe: Italy
	<b><i>Asteromella maculiformis</i></b> (Sacc.) Petr.	-	<i>Mycosphaerella punctiformis</i> (Pers.) Starbäck	<i>Castanea sativa</i> , <i>Fagus</i> sp. (Fagaceae), <i>Fraxinus</i> sp. (Oleaceae)	Europe: Italy



Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella osteospora</i> (Sacc.) H. Rupp.	-	-	<i>Populus nigra</i> (Salicaceae), <i>Fraxinus</i> sp. (Oleaceae), <i>Morus</i> sp. (Mora- ceae), <i>Rhamnus</i> sp. (Rhamnaceae)	Europe: Italy; France
<b>Host-specific species</b>					
Aceraceae	<i>Asteromella velata</i> Petr.	-	-	<i>Acer platanoides</i> with <i>Rhytisma acerinum</i> (Pers.) Fr. (anamorph <i>Melasmia acerina</i> Lev.)	Europe: Austria
	<b><i>Asteromella platanoidis</i></b> (Sacc.) Petr.	-	-	<i>Acer platanoides</i> , <i>A.</i> <i>pseudoplatanus</i> , <i>A. negundo</i> , <i>A.</i> <i>truncatum</i>	Europe: Italy; France
	<i>Asteromella vestita</i> Petr. nomen nudum, the spe- cies should have been described in <i>Annals</i> <i>Mycol.</i> 42 (1944): 112 but was never published	-	-	<i>Acer pseudoplatanus</i>	Europe: Austria
Adoxaceae	<b><i>Asteromella adoxicola</i></b> (Lasch) Ruszkiewicz-Michalska	-	-	<i>Adoxa moschatellina</i>	Europe: Poland

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Agavaceae	<i>Asteromella dracaenae</i> (Henn.) Aa	-	-	<i>Dracena</i> sp.	South America: Brazil
Amaryllidaceae	<i>Asteromella amaryllidis</i> (Bres.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Amaryllis</i> sp.	South America: Brazil
	<i>Asteromella curculliginis</i> (Bond.-Mont.) Vanev & Aa	-	-	<i>Curculigo recurvata</i>	Asia: Russia
	<i>Asteromella ixiolirii</i> (Kalymb.) Aa & Vanev	-	<i>Mycosphaerella</i> sp.	<i>Ixiolirion tataricum</i>	Asia: Kazakhstan
	<i>Asteromella ungerinae</i> (Vasyag.) Vanev & Aa	Septoria ungerinae N.P. Golovina	<i>Mycosphaerella</i> sp.	<i>Ungernia severzovii</i>	Asia: Kazakhstan
Anacardiaceae	<i>Asteromella odinae</i> (Henn. & Pole-Evans) Aa	-	<i>Mycosphaerella</i> sp.	<i>Lansea (= Odina) discolor</i>	Africa: South African Republic
	<i>Asteromella metopii</i> Petr. & Cif.	-	-	<i>Metopium brownei</i>	North America: Dominican Republic
	<i>Asteromella pistaciarum</i> Bremer & Petr.	Septoria pistaciarum Carac.	<i>Mycosphaerella</i> sp.	<i>Pistacia vera</i>	Asia: Turkey
	<i>Asteromella rhoina</i> (Kalchbr. & Cooke) Aa	-	<i>Mycosphaerella</i> sp.	<i>Rhus laevigata</i>	Africa: Central Africa
Apiaceae	<b><i>Asteromella chaerophylli</i></b> (C. Massal.) Petr.	-	? <i>Mycosphaerella morphotieri</i> (Fuckel) Petr.	<i>Angelica</i> sp., <i>Heracleum</i> sp., <i>Chaerophyllum hirsutum</i>	Europe: Italy

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella angelicae</i> Sawada	-	-	<i>Angelica miqueliana</i>	Asia: Japan
	<b><i>Asteromella huubii</i></b> (Sacc.) Ruszkiewicz-Michalska [= <i>A. angelicae</i> (Sacc.) Moesz ex Bat. & Peres]	-	-	<i>Angelica silvestris</i>	Europe: France, Italy
	<i>Asteromella bupleuri</i> (Fuckel) Aa	<i>Septoria bupleuri</i> Desm.	-	<i>Bupleurum falcatum</i>	Europe: Germany
	<b><i>Asteromella cicutae</i></b> (Lind.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Cicuta virosa</i>	Europe: Denmark
	<i>Asteromella ferulina</i> Petr.	-	<i>Mycosphaerella</i> sp.	<i>Ferula foetida</i>	Asia: Iran
	<i>Asteromella malabailae</i> (C. Massal. ex Sacc.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Malabala hacqueti</i>	Europe: Italy
	<i>Asteromella tragii</i> (Bubák) Petr.	-	<i>Mycosphaerella</i> sp.	<i>Pimpinella tragii</i>	Asia: Turkey
	<b><i>Asteromella pleurospirmi</i></b> (Died.) Petr.	-	-	<i>Pleurosporum austriacum</i>	Europe: Germany
	<i>Asteromella ambiens</i> (Syd. & P. Syd.) Petr.	-	-	<i>Prangos uloptera</i>	Asia: Iran
	<i>Asteromella schultziae</i> Murashk.	<i>Septoria schultziae</i> Murashk.	-	<i>Schultzia crinata</i>	Asia: Russia

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<b><i>Asteromella aegopodii</i></b> (Curr.) Petr.	<i>Septoria podagrariae</i> Lasch	<i>Mycosphaerella aegopodii</i> (Roth) Petr.	<i>Aegopodium podagraria</i>	Europe: UK
Apocynaceae	<i>Asteromella carissae</i> (Kalchbr. & Cooke) Aa	-	<i>Mycosphaerella</i> sp.	<i>Carissa arduina</i>	Africa: South Africa
Araceae	<b><i>Asteromella acorella</i></b> (Sacc. & Penz.) H. Rupp.	-	-	<i>Acorus calamus</i>	Europe: France
	<i>Asteromella porteana</i> (Sacc.) Aa	-	-	<i>Alocasia portei</i>	Asia: Philippines
	<i>Asteromella spermatiale</i> (= <i>Phyllosticta colocasiae</i> Höhn.)	<i>Passalora colocasiae</i> (Höhn.) U. Braun (= <i>Cercospora caladii</i> var. <i>colocasiae</i> Höhn.)	<i>Mycosphaerella alocasiae</i> H. & P. Sydow	<i>Colocasia</i> sp.	Asia: Philippines
Araliaceae	<i>Asteromella acanthopanax</i> (Syd. & P. Syd.) Aa	-	-	<i>Acanthopanax ricinifolium</i>	Asia: Japan
	<i>Asteromella hederacea</i> Petr.	-	<i>Mycosphaerella hedericola</i> (Desm.) Lindau	<i>Hedera helix</i>	Europe: France
	<i>Asteromella hederiae</i> (Sacc. & Roum.) Petr. nom. illegit., Art. 53.1	-	-	<i>Hedera helix</i>	Europe: France, Belgium
	<i>Asteromella hederiae</i> Petr. in Bremer et al. nom. inv., Art 39.1	<i>Phyllosticta hedericola</i> Durrieu & Mont, <i>Vermicularia trichella</i> Fr.	-	<i>Hedera helix</i>	Asia: Turkey

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella hederæ</i> C. Massal.	-	-	<i>Hedera helix</i>	Europe: Italy
Asclepiadaceae	<i>Asteromella cynanchicola</i> Petr.	-	? <i>Mycosphaerella albescens</i> (Rabenh.) Lindau	<i>Cynanchum vincetoxicum</i>	Europe: Czech Republic
Asteraceae	<i>Asteromella astericola</i> Davis	? <i>Stagonospora astericola</i> (Davis) H. C. Greene	? <i>Phaeosphaeria</i>	<i>Aster lateriflora</i>	North America
	<i>Asteromella anthemididis</i> (H. Rupp.) H. Rupp.	-	<i>Mycosphaerella anthemidina</i> Petr.	<i>Anthemis arvensis</i>	Europe: Germany
	<i>Asteromella asteris</i> Peck	-	-	<i>Aster paniculatus</i>	North America: USA
	<i>Asteromella compositarum</i> Bat, J. L. Bezerra & Poroca	-	? <i>Mycosphaerella ixodiae</i> Hansf.	Asteraceae	South America: Brazil
	<i>Asteromella barnadesiae</i> (Gutner) Aa & Vanev	-	-	<i>Barnadesia macrocephala</i>	Europe: Russia
	<i>Asteromella bupthalmi</i> (Allesch.) Aa	<i>Ramularia bupthalmi</i> Allesch., <i>Septoria bupthalmi</i> Allesch.	<i>Mycosphaerella</i> sp.	<i>Bupthalmum salicifolium</i>	Europe: Germany
	<i>Asteromella personatae</i> (Allesch.) H. Rupp.	<i>Ramularia</i> sp.	<i>Mycosphaerella</i> sp.	<i>Carduus personata</i>	Europe: Czech Republic
	<i>Asteromella carlinae</i> Petr.	-	<i>Mycosphaerella carlinae</i> (Wint.) Lindau	<i>Carlina vulgaris</i>	Europe: Czech Republic
	<i>Asteromella bellunensis</i> Syd.	<i>Ramularia bellunensis</i> Speg.	-	<i>Chrysanthemum corymbosum</i>	Europe: Germany

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella cirsiorum</i> (Bondartsev) Vanev & Aa	<i>Ramularia cirsii</i> Allesch.	<i>Mycosphaerella</i> sp.	<i>Cirsium eriophorum</i>	Europe: Russia
	<i>Asteromella cousiniae</i> (Vasyag.) Aa & Vanev	-	<i>Mycosphaerella</i> sp.	<i>Cousinia severtzovii</i>	Asia: Kazakhstan
	<i>Asteromella eximia</i> (Bubák) Aa & Vanev	<i>Ramularia eximia</i> Bubak	<i>Mycosphaerella</i> sp.	<i>Crepis viscidula</i>	Europe: Montenegro
	<i>Asteromella austriaca</i> (Sacc.) H. Rupp.	-	-	<i>Doronicum austriacum</i>	Europe: Italy
	<i>Asteromella doronicigena</i> (Bubák) Petr.	-	? <i>Mycosphaerella aronici</i> Volkart	<i>Doronicum cordatum</i>	Europe: Hungary
	<i>Asteromella eupatoriicola</i> (Kabát & Bubák) H. Rupp.	-	<i>Mycosphaerella</i> sp.	<i>Eupatorium cannabinum</i>	Europe: Austria
	<i>Asteromella corcontica</i> (Kabát & Bubák) Moesz ex Bat. & Peres	<i>Ramularia corcontica</i> Bubak & Kabat	-	<i>Hieracium alpinum</i>	Europe: Czech Republic
	<i>Asteromella poeverleinii</i> Petr.	-	<i>Mycosphaerella</i> sp.	<i>Hypochaeris uniflora</i>	Europe: Switzerland
	<i>Asteromella inulae</i> Petr.	-	-	<i>Inula hirta</i>	Europe: Austria
	<i>Asteromella cretica</i> Petr.	-	-	<i>Lactuca</i> sp.	Europe: Greece
	<i>Asteromella ligulariicola</i> (Melnik) Vanev & Aa	-	-	<i>Ligularia macrophylla</i>	Asia: Kazakhstan



Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella exigua</i> (Naumov) Vanev & Aa	-	-	<i>Mulgedium cacaliaefolium</i>	Europe: Russia
	<i>Asteromella petasitidis</i> Petr.	<i>Ramularia</i> sp.	<i>Mycosphaerella</i> sp.	<i>Petasites officinalis</i>	Europe: Czech Republic
	<i>Asteromella proustiae</i> (Speg.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Proustia ilicifolia</i>	South America: Argentina
	<i>Asteromella scorzonerae</i> Petr. (= <i>Asteromella polonica</i> Aa)	<i>Cercospora scorzonerae</i> Hohn.	-	<i>Scorzonera humilis</i>	Europe: Ukraine
	<i>Asteromella garrettii</i> (Syd. & P. Syd.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Senecio dispar</i>	North America: USA
	<i>Asteromella senecionis- nemorensis</i> (Sävul. & Sandu) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Senecio nemorensis</i>	Europe: Romania
	<i>Asteromella gregariella</i> Petr.	-	-	<i>Serratula coronata</i>	Asia: Russia
	<i>Asteromella tanacetii</i> (Vasyag.) Vanev & Aa	<i>Ramularia</i> sp.	<i>Mycosphaerella</i> sp.	<i>Tanacetum achilleifolium</i>	Asia: Kazakhstan
	<i>Asteromella spermatial</i> state [= <i>Phyllostictia fer- ruginea</i> (Sacc.) Kalymb.]	<i>Passalora ferruginea</i> (Fuckel) U. Braun & Crous (= <i>Cercospora fer- ruginea</i> Fuckel)	<i>Mycosphaerella ferru- ginea</i> (Fuckel) Cruchet	<i>Artemisia vulgaris</i>	Europe: Italy
Betulaceae	<i>Asteromella gorholtii</i> H. Ruppr.	-	-	<i>Corylus avellana</i>	Europe: Germany

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Berberida- ceae	<b><i>Asteromella gar- bowskii</i></b> (Gucevič) Ruszkiewicz-Michalska	-	-	<i>Berberis vulgaris</i>	Europe: Ukraine
Bignoniaceae	<i>Asteromella bacillispora</i> (Kabát & Bubák) Aa	-	<i>Mycosphaerella</i> sp.	<i>Catalpa syringaeifolia</i>	Europe: Austria
	<i>Asteromella dombeyae</i> Petr.	<i>Septoria dombeyae</i> Petr.	<i>Mycosphaerella</i> sp.	<i>Dombeya</i> sp.	Africa: Tanzania
Boraginaceae	<b><i>Asteromella moeszii</i></b> Ruszkiewicz-Michalska & Mufenko (= <i>A. pul- monariae</i> Moesz ex Bat. & Peres)	-	-	<i>Pulmonaria obscura</i>	Europe: Poland
Brassicaceae	<b><i>Asteromella brassicae</i></b> (Chevall.) Boerema & Kesteren	-	<i>Mycosphaerella brassici- cola</i> (Duby) Lindau	<i>Brassica oleracea</i>	Europe: France
	<i>Asteromella brassicina</i> (Sacc.) H. Ruppr.	-	-	<i>Brassica oleracea</i>	Europe: Malta
	<i>Asteromella cheiranthicola</i> (Bubák & H. Zimm.) Aa	-	-	<i>Cheiranthus cheiri</i>	Europe: Czech Republic
	<i>Asteromella dentariae</i> (Kabát & Bubák) H. Ruppr.	-	-	<i>Dentaria enneaphyllos</i>	Europe: Austria

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella thlaspeos</i> Murashk.	-	-	<i>Thlaspi cochleariforme</i>	Asia: Russia
	<i>Asteromella thlaspeos</i> Moesz & Smarods	-	-	<i>Thlaspi arvense</i>	Europe: Latvia
Burseraceae	<i>Asteromella burserae</i> (Gonz. Frag. & Cif.) Syd.	-	-	<i>Bursera gumifera</i>	North America: Dominican Republic
Cactaceae	<i>Asteromella rhipsalidicola</i> (Speg.) Cif.	-	-	<i>Rhipsalis lorentziana</i>	South America: Argentina
	<i>Asteromella spermatiale</i> (= <i>Phyllosticta con-cava</i> Seaver)	-	<i>Mycosphaerella opuntiae</i> (Ellis & Everh.) Dearn.	<i>Opuntia</i> sp.	North America: Bermuda
Campanulaceae	<i>Asteromella campanulae-latifoliae</i> (Dobrozz.) Aa & Yanev	-	-	<i>Campanula latifolia</i>	Europe: Russia
	<i>Asteromella phyteumatis</i> Petr.	<i>Ramularia phyteumatis</i> Sacc. & Wint.	<i>Mycosphaerella</i> sp.	<i>Phyteuma spicatum</i>	Europe: Slovak Republic
Caprifoliaceae	<i>Asteromella adeana</i> Petr.	-	-	<i>Viburnum tinus</i>	Europe: Spain
	<i>Asteromella alpigena</i> (Sacc.) H. Ruppert.	-	-	<i>Lonicera alpigena</i>	Europe: Germany
	<i>Asteromella ebuli</i> (Fuckel) Moesz ex Bat. & Peres	-	-	<i>Sambucus ebulus</i>	Europe: Germany

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Caryophyllaceae	<i>Asteromella drymariae</i> Syd.	-	? <i>Mycosphaerella drymariae</i> H. & P. Syd.	<i>Drymaria cordata</i>	South America: Ecuador
	<i>Asteromella saginae</i> Urries	-	<i>Mycosphaerella saginae</i> Urries	<i>Sagina procumbens</i> var. <i>apetala</i>	Europe: Spain (Canary Islands)
	<i>Asteromella saponariae</i> (Fuckel) Petr.	<i>Septoria</i> sp.	-	<i>Saponaria officinalis</i>	Europe: Italy, Germany
Celastraceae	<b><i>Asteromella euonymella</i></b> (Sacc.) Aa & Vanev	? <i>Septoria euonymella</i> Pass. (in sec. coll. studied by [5])	-	<i>Euonymus europaeus</i>	Europe: Italy
	<i>Asteromella gymnosporiae</i> Syd.	-	-	<i>Gymnosporia spinosa</i>	Asia: Philippines
Chenopodiaceae	<b><i>Asteromella confusa</i></b> (Bubák) Petr.	-	-	<i>Chenopodium</i> sp.	Europe: Ukraine
Clethraceae	<i>Asteromella clethrae</i> (P. Syd.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Clethra scabra</i>	Europe: Germany
Combretaceae	<i>Asteromella terminaliae</i> (Henn.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Terminalia baumiana</i> , <i>T. catappa</i>	Africa: Zambia, Asia: Myanmar (Burma)
Coriariaceae	<i>Asteromella coriariae</i> Petr.	-	-	<i>Coriaria intermedia</i>	Asia: Philippines
Crassulaceae	<i>Asteromella rhodiolae</i> Petr.	-	-	<i>Sedum rhodiola</i>	Europe: Sweden
Cyperaceae	<i>Asteromella silvarum</i> Petr.	-	<i>Mycosphaerella hraniensis</i> Petr.	<i>Carex sylvatica</i>	Europe: Czech Republic

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Dioscoreaceae	<i>Asteromella dioscoreina</i> (Woron.) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Dioscorea caucasica</i>	Europe: Georgia
	<i>Asteromella tamicola</i> (Woron.) Aa & Vanev	-	<i>Mycosphaerella</i> sp.	<i>Tamus communis</i>	Europe: Georgia
Dipsacaceae	<i>Asteromella cephalariae</i> (G. Winter) Aa	-	-	<i>Cephalaria attenuata</i>	Africa: South Africa
	<i>Asteromella scabiosae</i> (Kalymb.) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Scabiosa alpestris</i>	Asia: Kazakhstan
	<i>Asteromella wandae</i> (Namysł.) H. Ruppr.	-	-	<i>Dipsacus sylvestris</i>	Europe: Ukraine,
Equisetaceae	<i>Asteromella equiseti</i> (Dobrozn.) Aa & Vanev	-	<i>Mycosphaerella</i> sp.	<i>Equisetum sylvaticum</i>	Europe: Russia
Ericaceae	<i>Asteromella arbuticola</i> (Gucević) Aa & Vanev	<i>Septoria arbutina</i> Gucević	<i>Mycosphaerella</i> sp.	<i>Arbutus andrachne</i>	Europe: Ukraine
	<i>Asteromella kalmicola</i> (Schwein.) Petr.	-	-	<i>Kalmia latifolia</i>	North America: USA
	<i>Asteromella saccardoi</i> (Thüm.) Petr.	-	<i>Mycosphaerella</i> sp.	<i>Rhododendron ponticum</i>	Europe: France, Portugal
	<i>Asteromella stemmatea</i> (Fr.) Petr.	-	<i>Mycosphaerella stemmatea</i> (Fr.) Romell	<i>Vaccinium vitis-idaea</i>	Europe: Sweden, Germany, Italy, Russia
Euphorbiaceae	<i>Asteromella homalanthi</i> Cooke & Masee	-	-	<i>Homalanthus populifolius</i>	Oceania: Australia

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Fabaceae	<i>Asteromella picbaueri</i> Petr.	<i>Septoria astragali</i> (Desm.) Sacc.	<i>Mycosphaerella</i> sp.	<i>Astragalus cicer</i>	Europe: Czech Republic
	<b><i>Asteromella astragalicola</i></b> (C. Massal.) Petr.	-	-	<i>Astragalus glycyphylloides</i>	Europe: Italy
	<i>Asteromella baphinae</i> (Novoss.) Aa & Vanev	-	-	<i>Baphia racemosa</i>	Europe: Russia
	<i>Asteromella bakeri</i> (Syd. & P. Syd.) Aa	-	-	<i>Bauhinia malabarica</i>	Asia: Philippines
	<i>Asteromella buteae</i> S.M. Singh	-	-	<i>Butea monosperma</i>	Asia: India
	<b><i>Asteromella borszczowii</i></b> (Thüm.) Aa	-	<i>Mycosphaerella jaczewskii</i> Potebnia	<i>Caragana arborescens</i>	Asia: Russia
	<i>Asteromella cercidis</i> (D. Sacc.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Cercis siliquastrum</i>	Europe: Italy
	<i>Asteromella nogalesii</i> Urries	-	-	<i>Cytisus prolifer</i>	Europe: Spain (Canary Islands)
	<i>Asteromella sissoo</i> (Died.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Dalbergia sissoo</i>	Asia: India
	<i>Asteromella derridis</i> (Henn.) Aa	-	-	<i>Derris</i> sp.	Africa: Congo
	<i>Asteromella microsticta</i> Petr. & Cif.	-	-	<i>Desmodium tortuosum</i>	North America: Dominican Republic



Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella lathyri-silvestris</i> H. Ruppr.	-	-	<i>Lathyrus silvestris</i>	Europe: Germany
	<i>Asteromella heringeri</i> Bat. & J. L. Bezerra	-	-	<i>Leguminosae leaves</i>	South America: Brazil
	<i>Asteromella ononidis</i> (Unamuno) Vanev & Aa	<i>Ramularia winteri</i> Thüm.	<i>Mycosphaerella</i> sp.	<i>Ononis procurrens</i>	Europe: Spain
	<i>Asteromella oxytropis</i> Murashk.	-	-	<i>Oxytropis alpina</i>	Asia: Russia
	<i>Asteromella acaciae</i> Cooke	-	-	<i>Acacia</i>	Oceania: Australia
	<i>Asteromella pongamiae</i> (Syd. & P. Syd.) Aa	-	-	<i>Pongamia glabra</i>	Asia: India
	<i>Asteromella neomexicana</i> (Kabát & Bubák) Aa	-	-	<i>Robinia neomexicana</i>	Europe: Austria
	<i>Asteromella thermopsisidis</i> (Thüm.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Thermopsis lanceolata</i>	Asia: Russia
	<i>Asteromella spermatiale</i> (= <i>Phyllosticta dalbergiae</i> Syd.)	-	<i>Mycosphaerella devia</i> Petr. & Cif.	<i>Dalbergia</i> sp.	South America: Brazil
Fagaceae	<i>Asteromella livida</i> (Ellis & Everh.) Petr. (nomen nudum?)	-	-	<i>Quercus douglasii</i>	North America: USA

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella quercicola</i> Petr. (nomen nudum?)*	-	-	<i>Quercus cerris</i>	Europe: Germany
	<i>Asteromella hrancicensis</i> Petr.	<i>Septoria</i> sp.	<i>Mycosphaerella</i> sp.	<i>Quercus lanuginosa</i>	Europe: Austria
	<b><i>Asteromella quercifolia</i></b> C. Massal.	-	-	<i>Quercus robur</i>	Europe: Italy
Gentianaceae	<i>Asteromella andrewsii</i> Petr. ex Davis	-	? <i>Mycosphaerella andrewsii</i> Sacc.	<i>Gentiana andrewsii</i>	North America: USA
	<i>Asteromella gentianellae</i> (C. Massal.) Petr.	-	<i>Mycosphaerella gentianae</i> (Niess) Lindau	<i>Gentiana asclepiadea</i>	Europe: Italy
Geraniaceae	<i>Asteromella geranii</i> Chevassut	-	-	<i>Geranium sylvaticum</i>	Europe: France
	<i>Asteromella pivensis</i> (Bubák) Moesz ex Bat. & Peres	<i>Ramularia geranii</i> (Westend.) Fuckel [= <i>Ramularia geranii-phaei</i> (C. Massal.) Magn.]	-	<i>Geranium phaeum</i> , G. <i>reflexum</i>	Europe: Montenegro
Goodeniaceae	<i>Asteromella scaevolae</i> Petr.	-	<i>Mycosphaerella scaevolae</i> Shear & Stevens	<i>Scaevola</i> sp.	North America: USA (Hawaii)
Hippocastanaceae	<i>Asteromella aesculicarpa</i> Cooke & Massee	-	-	<i>Aesculus hippocastanum</i>	Europe: UK
	<b><i>Asteromella aesculicola</i></b> (Sacc.) Petr.	<i>Septoria</i> sp.	-	<i>Aesculus hippocastanum</i>	Europe: Italy

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella</i> spermatial state (= <i>Phyllosticta socialis</i> Bubák & Kabát)	<i>Septoria aesculicola</i> (Fr.) Fuckel	<i>Mycosphaerella aesculi</i> (Cocconi & Morini) Tomilin	<i>Aesculus hippocastanum</i>	Europe: Austria
Juglandaceae	<i>Asteromella</i> spermatial state (= <i>Phyllosticta con-vexula</i> Bubák)		<i>Mycosphaerella convexula</i> (Schwein.) F.V. Rand	<i>Carya tomentosa</i>	North America: USA
Juncaceae	<i>Asteromella luzulina</i> Syd.	-	-	<i>Luzula maxima</i>	Europe: Germany
	<i>Asteromella luzulae-nemorosae</i> Petr.	-	-	<i>Luzula nemorosa</i>	Europe: Czech Republic
Lamiaceae	<i>Asteromella fibrillosa</i> (Desm.) Sacc. var. <i>pro-dicta</i> Roberge	-	-	Diverse Lamiaceae ( <i>Stachys</i> , <i>Ballota</i> , <i>Menitha</i> )	Europe: France
	<i>Asteromella melittidis</i> Chevassut	-	-	<i>Melittis melissophyllum</i>	Europe: France
	<i>Asteromella monardellae</i> (W. B. Cooke) Petr.	-	-	<i>Monardella</i> sp.	North America: USA
	<i>Asteromella perowskiae</i> (Zaprom.) Vanev & Aa	<i>Ramularia</i> -like	<i>Mycosphaerella</i> sp.	<i>Perowskia scrophulariaefolia</i>	Asia: Uzbekistan
	<i>Asteromella stachydis</i> (Brunaud) Petr.	<i>Septoria stachydis</i> Roberge & Desm.	-	<i>Stachys sylvatica</i>	Europe: France
	<b><i>Asteromella prunellae</i></b> (Ellis. & Everh.) Ruszkiewicz-Michalska	-	-	<i>Prunella vulgaris</i>	North America: USA

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Lauraceae	<i>Asteromella camphorae</i> (Gucević) Aa & Vanev	-	-	<i>Cinnamomum glanduliferum</i>	Europe: Ukraine
	<i>Asteromella gratissima</i> Petr. & Cif.	-	-	<i>Persea gratissima</i>	North America: Dominican Republic
	<i>Asteromella linderae</i> (Ellis & Everh.) Aa & Vanev	-	<i>Mycosphaerella</i> sp.	<i>Lindera benzoin</i>	North America: USA
	<i>Asteromella allii-rotundi</i> (Lobik) Aa & Vanev	cf. <i>Septoria viridifingens</i> Curtis	-	<i>Allium rotundum</i>	Europe: Russia
Liliaceae	<i>Asteromella kuenmerlei</i> Moesz	-	-	<i>Asphodelus microcarpa</i>	Europe: Croatia
	<i>Asteromella aspidistrae</i> (Oudem.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Aspidistra elatior</i>	Europe: Netherlands
	<i>Asteromella latemarensis</i> (Kabát & Bubák) H. Rupp.	<i>Septoria gallica</i> Sacc. & Syd.	-	<i>Colchicum autumnale</i>	Europe: Italy
	<i>Asteromella aterrima</i> Petr.	-	-	<i>Colchicum</i> sp.	Europe: Greece
	<b><i>Asteromella conval-lariae</i></b> (Cavara) Petr.	-	? <i>Mycosphaerella brun-neola</i> (Fr.) Johanson ex Oudem.	<i>Convallaria majalis</i>	Europe: Italy
	<i>Asteromella fritillariae</i> (Bonar & W. B. Cooke) Vanev & Aa	-	-	<i>Fritillaria atropurpurea</i>	North America: USA

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella woronowii</i> (Woron.) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Polygonatum vulgare</i>	Europe: Georgia
	<i>Asteromella semelicola</i> Urries	-	<i>Mycosphaerella</i> sp.	<i>Senele androgyna</i> var. <i>gayae</i>	Europe: Spain (Canary Islands)
	<i>Asteromella urgineae</i> Bremer	-	-	<i>Urginea maritima</i>	Asia: Turkey
	<i>Asteromella melanoplaca</i> Petr.	-	-	<i>Veratrum album</i>	Asia: Russia
Loganiaceae	<i>Asteromella strychni</i> (Allesch.) Aa & Vanev	-	<i>Mycosphaerella</i> sp.	<i>Strychnos stuhlmannii</i>	Africa: Mozambique
Lythraceae	<i>Asteromella lafoensiae</i> (Allesch.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Lafoensia</i> sp.	South America: Brazil
Malpighiaceae	<i>Asteromella pterandrae</i> (Allesch.) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Pterandra</i> sp.	South America: Brazil
Meliaceae	<i>Asteromella cedrelae</i> Petr.	-	-	<i>Cedrela tonduzii</i>	Central America: Costa Rica
Menispermaceae	<i>Asteromella ovata</i> Thüm.	-	-	<i>Menispermum canadense</i>	Europe: Italy
	<i>Asteromella abortiva</i> (Ellis & Kellerm.) Vanev & Aa	-	-	<i>Menispermum canadense</i>	North America: USA
	<i>Asteromella caricae</i> (C. Massal.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Ficus carica</i>	Europe: Italy

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Moraceae	<i>Asteromella fici</i> Peres & J. L. Bezerra	<i>Phyllosticta tayuvuae</i> Viégas	<i>Mycosphaerella fici-ovatae</i> Hansford	<i>Ficus elastica</i>	South America: Brazil
	<i>Asteromella bacillarlis</i> Pass. & Beltrani	<i>Phloeospora mori</i> (Lex.) Sacc.	<i>Mycosphaerella mori</i> (Fuckel) Wolf	<i>Morus nigra</i>	Europe: Italy (Sicily)
Musaceae	<i>Asteromella paradisiaca</i> Petr.	-	<i>Mycosphaerella musae</i> (Speg.) Syd.	<i>Musa textilis</i> , <i>M. paradisiaca</i>	Asia: Philippines
Myrsinaceae	<b><i>Asteromella lysimachiae</i></b> (Allesch.) Ruszkiewicz-Michalska (= <i>Asteromella</i> spermatial state; <i>Phyllosticta lysimachiae</i> Allesch.)	<i>Ramularia lysimachiae</i> Thümen	<i>Mycosphaerella lysimachiae</i> (Höhn.) Höhn.	<i>Lysimachia vulgaris</i>	Europe: Germany
Nyctaginaceae	<i>Asteromella tricyclae</i> (Speg.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Tricycla spinosa</i>	South America: Argentina
Nyssaceae	<i>Asteromella nyssae</i> (Cooke) Aa	-	<i>Mycosphaerella nyssae-cola</i> (Cooke) F. A. Wolf	<i>Nyssa capitata</i>	North America: USA
Ochnaceae	<i>Asteromella ourateae</i> Bat., J. L. Bezerra & Poroca	<i>Cercospora</i> sp.	-	<i>Ouratea</i> sp.	South America: Brazil
Oleaceae	<i>Asteromella fraxini</i> (Berk. & M. A. Curtis) Petr.	-	<i>Mycosphaerella effigurrata</i> (Schwein.) House	<i>Fraxinus</i> sp.	North America: USA
	<i>Asteromella jasminicola</i> Petr.	-	<i>Mycosphaerella</i> sp.	<i>Jasminum officinale</i>	Europe: France



Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella americana</i> - <i>cola</i> (Gucević) Vanev & Aa	-	-	<i>Osmanthus americana</i>	Europe: Ukraine
	<i>Asteromella</i> spermatial state (= <i>Phyllosticta</i> <i>oleina</i> Cooke)	-	<i>Mycosphaerella oleina</i> (Cooke) J. H. Miller	<i>Osmanthus americana</i>	North America: USA
Onagraceae	<b><i>Asteromella ludwigii</i></b> Petr.	-	-	<i>Epilobium hirsutum</i>	Europe: Germany, among <i>Coleosporium</i> sp. (Uredinales)
Ortho- richaceae, Splachnaceae	<i>Asteromella muscorum</i> (Rostr.) Moesz	-	-	<i>Orthotrichum almatum</i> , <i>Tetraplodon bryoides</i>	Europe: Denmark, Hungary
Orobancha- ceae	<b><i>Asteromella melampy-</i></b> <b><i>rina</i></b> (Aksel) Aa & Vanev	-	<i>Mycosphaerella</i> sp.	<i>Melampyrum</i> <i>nemorosum</i>	Europe: Russia
	<i>Asteromella pedicularis</i> (Solheim) Petr.	-	<i>Mycosphaerella</i> sp.	<i>Pedicularis paysoniana</i>	Europe: Germany
Paeoniaceae	<b><i>Asteromella baldensis</i></b> (C. Massal.) H. Ruppert.	-	-	<i>Paeonia peregrina</i>	Europe: Italy
Palmae	<i>Asteromella coccothrinina</i> - <i>cis</i> Petr. & Cif.	-	<i>Mycosphaerella</i> sp.	<i>Coccothrinax argentea</i>	North America: Do- minican Republic
	<i>Asteromella cocoës</i> Bat. & J. L. Bezerra	-	-	<i>Cocos nucifera</i>	South America: Brazil

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella cocogena</i> Boerema, Loer. & Hamers	-	<i>Mycosphaerella</i> sp.	<i>Cocos nucifera</i>	Asia: Taiwan
	<i>Asteromella coryphae</i> Petr. & Syd.	-	-	<i>Corypha umbraculifera</i>	Asia: Philippines
Pittosporaceae	<i>Asteromella tobira</i> (Gucević) Aa & Vanev	<i>Septoria pittospori</i> Brunaud	<i>Mycosphaerella</i> sp.	<i>Pittosporum tobira</i>	Europe: Ukraine, <i>textura prismatica</i>
Plantaginaceae	<i>Asteromella digitalis-ambiguae</i> Arx	-	<i>Mycosphaerella</i> sp.	<i>Digitalis ambigua</i>	Europe: Switzerland
	<i>Asteromella lagotidis</i> Murashk.	-	-	<i>Lagotis glauca</i>	Asia: Russia
Poaceae	<i>Asteromella agropyri</i> Petr.	-	-	<i>Agropyron orientale</i>	Asia: Russia
	<i>Asteromella striolata</i> (Sacc.) H. Rupp.	-	-	<i>Brachypodium distachyon</i>	Europe: Italy
	<i>Asteromella molinae</i> Syd.	-	-	<i>Molinia coerulea</i>	Europe: Germany
	<i>Asteromella phalaridis</i> Syd.	-	-	<i>Phalaris arundinacea</i>	Europe: Germany
Podocarpaceae	<i>Asteromella podocarpi</i> Syd.	-	-	<i>Podocarpus coriaceus</i>	South America: Venezuela
Polygalaceae	<i>Asteromella chamaebuxi</i> Petr.	-	-	<i>Polygala chamaebuxus</i>	Europe: Austria

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Polygonaceae	<i>Asteromella aviculariae</i> (Westend.) Petr.	-	-	<i>Polygonum aviculare</i>	Europe: Belgium
	<i>Asteromella curvata</i> (Golovin) Aa & Vanev	<i>Septoria macrospora</i> Golovin	-	<i>Rheum</i> sp.	Asia: Tajikistan
	<i>Asteromella rumicis</i> (Bondartsev) Aa & Vanev	<i>Ramularia obovata</i> Sacc, [= <i>Ovularia obovata</i> (Fuckel) Sacc.]	<i>Mycosphaerella lapathi</i> (Laibach) Petr.	<i>Rumex confertus</i>	Europe: Russia
	<b><i>Asteromella acetosae</i></b> (Sacc.) Ruszkiewicz-Michalska	<i>Septoria acetosae</i> Oudem.	-	<i>Rumex acetosa</i>	Europe: Italy
Portulacaceae	<i>Asteromella claytoniae</i> Murashk.	-	-	<i>Claytonia joaneana</i>	Asia: Russia
Ranunculaceae	<i>Asteromella anemionicola</i> (Sacc. & P. Syd.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Anemone pennsylvanica</i>	North America: USA
	<i>Asteromella calthae</i> (Tranzschel) Vanev & Aa	<i>Ramularia didyma</i> Unger (= <i>Ramularia calthae</i> Linder)	-	<i>Caltha palustris</i>	Asia: Russia
	<i>Asteromella delphinii</i> Petr.	-	-	<i>Delphinium</i> sp.	Asia: Iran
	<i>Asteromella hamadryadis</i> (Speg.) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Hamadryas magellanica</i>	South America: Argentina
	<i>Asteromella helleboricola</i> (C. Massal.) Moesz	-	-	<i>Helleborus viridis</i>	Europe: Italy

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella hydrastridis</i> (Bond.-Mont.) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Hydrastis canadensis</i>	Europe: Russia
	<i>Asteromella isopyri</i> (Thüm.) Petr. & Syd.	-	<i>Mycosphaerella</i> sp.	<i>Isopyrum fumaritoides</i>	Asia: Russia
	<i>Asteromella ranunculi</i> (Fuckel) Vanev & Aa	<i>Ramularia</i> (? <i>Ramularia didyma</i> Unger)	? <i>Mycosphaerella ranunculi</i> (Karst.) Lind	<i>Ranunculus acris</i>	Europe: Germany
	<i>Asteromella thalictрина</i> Petr.	-	-	<i>Thalicttrum minus</i>	Asia: Russia
	<i>Asteromella trollii</i> (Trail) H. Ruppr.	-	-	<i>Trollius europaeus</i>	Europe: Great Britain (Scotland)
Resedaceae	<i>Asteromella resedae</i> (Oudem.) Petr.	-	-	<i>Reseda odorata</i>	Europe: Netherlands
Rhamnaceae	<i>Asteromella paliuri</i> (Lév.) Arx	-	-	<i>Paliurus spina-cristi</i>	Europe: Ukraine
	<i>Asteromella vogelii</i> (A. Henkel) Petr.	<i>Cercospora rhamni</i> Fuckel	<i>Mycosphaerella vogelii</i> (Syd.) Tomilin	<i>Rhamnus cathartica</i>	Europe: Germany
Rosaceae	<i>Asteromella pomi</i> Boerema, Loer. & Hamers	<i>Pseudocercospora pomi</i> (Brooks) Noordel. & Boerema	<i>Mycosphaerella</i> sp.	<i>Malus sylvestris</i> (= <i>M. pumila</i> )	Europe: Austria
	<i>Asteromella mali</i> (Briard) Boerema	-	-	<i>Malus sylvestris</i>	Europe: France

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella mespili</i> (Roberge ex Desm.) Petr.	-	<i>Mycosphaerella</i> sp.	<i>Mespilus germanica</i>	Europe: France
	<i>Asteromella cerasicola</i> (Speg.) H. Ruppr.	-	<i>Mycosphaerella</i> sp.	<i>Prunus cerasus</i>	South America: Chile
	<i>Asteromella pyricola</i> (Sacc. & Speg.) Moesz ex Bat. & Peres	-	-	<i>Pyrus communis</i> (= <i>P. pyrastrer</i> )	Europe: Italy
	<i>Asteromella rosicola</i> (C. Massal.) H. Ruppr.	-	-	<i>Rosa gallica</i>	Europe: Italy
	<i>Asteromella hybridae</i> (Mig.) H. Ruppr.	-	-	<i>Sorbus hybrida</i>	Europe: Germany
	<i>Asteromella trautmanniana</i> (Moesz) Moesz	-	-	<i>Sorbus torminalis</i>	Europe: Hungary
	<i>Asteromella spermatiale</i> (= <i>Phyllosticta arunci</i> Sacc.)	-	<i>Mycosphaerella dejanina</i> (Sacc.) Tomilin	<i>Spiraea aruncus</i> (= <i>Aruncus sylvestris</i> )	Europe: Italy
	<i>Asteromella spermatiale</i> (= <i>Phyllosticta tormentillae</i> Sacc.)	-	<i>Mycosphaerella tormentillae</i> (Sacc.) Tomilin	<i>Tormentilla</i> (= <i>Potentilla erecta</i> )	Europe: Italy
	<i>Asteromella prunimahaleb</i> (Pass.) Bedlan	-	-	<i>Prunus mahaleb</i>	Europe: France
	<i>Asteromella bacilloides</i> (Dominik) Ruszkiewicz-Michalska	-	-	<i>Chaenomeles japonica</i>	Europe: Poland

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<b><i>Asteromella rupprechtii</i></b> Ruszkiewicz-Michalska	-	-	<i>Agrimonia eupatoria</i>	Europe: Poland
Rubiaceae	<i>Asteromella gali</i> Moesz & Lindtner	<i>Phyllosticta asperulae</i> Sacc. & Fautr.	-	<i>Galium schultesii</i>	Europe: Serbia
	<i>Asteromella gali-schultesii</i> Moesz ex Bat. & Peres (nom. inval., Art. 39.1)	-	-	<i>Galium schultesii</i>	Europe: Hungary
	<i>Asteromella atronitens</i> Petr. & Cif.	-	-	<i>Guettarda</i> sp.	North America: Dominican Republic
	<i>Asteromella psychotriae</i> (Henn.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Psychotria</i> sp.	South America: Brazil
Rutaceae	<i>Asteromella morgan-jonesii</i> N. D. Sharma	-	-	<i>Citrus maxima</i>	Asia: India
	<i>Asteromella fuliginosa</i> (C. Massal.) Aa	Pycnidia of several different fungi in holotype [5]	<i>Mycosphaerella</i> sp.	<i>Citrus</i> sp.	Europe: Italy
	<i>Asteromella dictamni</i> Petr.	<i>Septoria dictamni</i> Fuckel	<i>Mycosphaerella dictamni</i> Petr.	<i>Dictamnus fraxinella</i>	Europe: Germany
Salicaceae	<i>Asteromella angustifoliorum</i> A. W. Ramaley	-	<i>Mycosphaerella angustifolium</i> Ramaley	<i>Populus angustifolia</i>	North America: USA
	<i>Asteromella bacteriiformis</i> (Pass.) Petr.	-	-	<i>Populus nigra</i>	Europe: Italy



Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<b><i>Asteromella populina</i></b> (Fuckel) Ruszkiewicz-Michalska (= <i>Plyl- losticta populina</i> Fuckel, <i>Ph. intermixta</i> Seaver, <i>Asteromella</i> spermatial state)		<i>Mycosphaerella populi</i> (Auersw.) J. Schröt.	<i>Populus nigra</i>	Europe: Germany
	<b><i>Asteromella salicina</i></b> (Kabát & Bubák) Ruszkiewicz-Michalska	-	-	<i>Salix alba</i>	Europe: Czech Republic
Santalaceae	<i>Asteromella visci</i> DoIDGE	-	? <i>Asterostomella visci</i> DoIDGE	? <i>Viscum obscurum</i>	Africa: South Africa
Saxifragaceae	<i>Asteromella cylindrica</i> (Sacc. & P. Syd.) Vanev [= <i>Asteromella heuch- erae</i> (Sacc. & P. Syd.) Petr.]	-	<i>Mycosphaerella heu- cherae</i> (Ellis & Everh.) Petr.	<i>Heuchera cylindrica</i>	North America: USA
Scrophulariaceae	<i>Asteromella fibrillosa</i> (Desm.) Sacc.	-	-	<i>Scrophularia aquatica</i>	Europe: France
	<i>Asteromella scrophu- larina</i> (P. Karst.) H. Ruppr.	-	-	<i>Scrophularia nodosa</i>	Europe: Finland, Germany
Solanaceae	<i>Asteromella atropina</i> (Vassiljevsky) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Atropa belladonna</i>	Europe: Russia

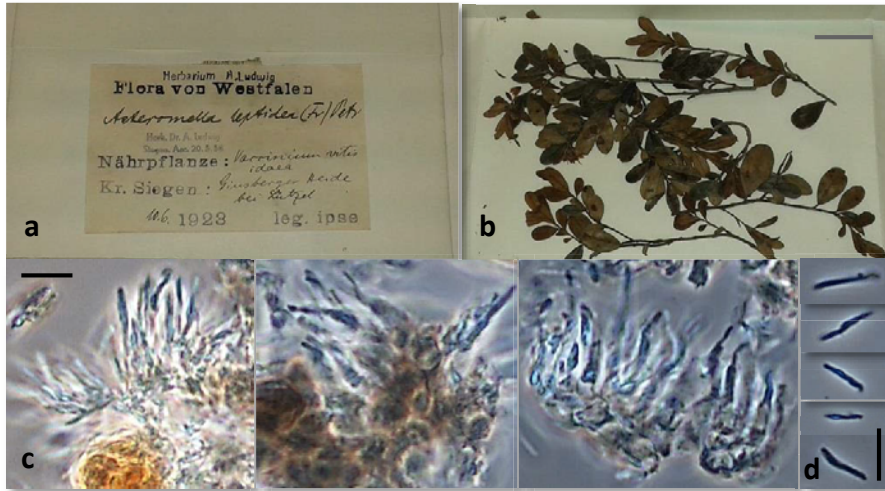
Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
	<i>Asteromella carpatica</i> Petr.	-	-	<i>Scopolia carniolica</i>	Europe: Ukraine
	<i>Asteromella solani</i> (Gonz. Frag. & Cif.) Cif.	-	-	<i>Solanum torvum</i>	North America: Dominican Republic
Staphyleaceae	<i>Asteromella staphyleicola</i> (Oudem.) Petr.	-	-	<i>Staphylea pinnata</i>	Europe: Netherlands
Sterculiaceae	<i>Asteromella clemensae</i> Syd.	-	-	<i>Sterculia cuneata</i>	Asia: Philippines
Taxodiaceae	<i>Asteromella sequoiicola</i> (Melnik) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Sequoia sempervirens</i>	Europe: Ukraine
Thymelaeaceae	<i>Asteromella carniolica</i> (W. Voss) Aa	-	<i>Mycosphaerella</i> sp.	<i>Daphne blagayana</i>	Europe: Croatia
Tiliaceae	<i>Asteromella ovata</i> var. <i>tiliophila</i> Ferraris	-	-	<i>Tilia × europaea</i>	Europe: Italy
	<i>Asteromella praetervisana</i> (Bubák) H. Ruppr.	-	-	<i>Tilia cordata</i> (= <i>T. parviflora</i> )	Europe: Czech Republic, Germany
	<i>Asteromella bacterioides</i> (Vuill.) Moesz	<i>Passalora microsora</i> (Sacc.) U. Braun	<i>Mycosphaerella</i> sp., <i>Mycosphaerella microsora</i> Syd. [59]	<i>Tilia sylvestris</i>	Europe: France
	<b><i>Asteromella tiliicola</i></b> (Oudem.) Arx	<i>Passalora microsora</i> (Sacc.) U. Braun (= <i>Cercospora microsora</i> Sacc.), but only acc. to [5]	<i>Mycosphaerella milligrana</i> (Cooke) Schrot.	<i>Tilia ulmifolia</i>	Europe: Netherlands

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Ulmaceae	<i>Asteromella celtidis</i> (Ellis & Kellerm.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Celtis occidentalis</i>	North America: USA
	<b><i>Asteromella ulmi</i></b> Boerema [= <i>Asteromella bellunensis</i> (Martelli) Boerema & Dorenb., = <i>Asteromella spermatial</i> state of <i>Mycosphaeella ulmi</i> ]	-	<i>Mycosphaerella ulmi</i> Kleb.	<i>Ulmus</i> sp.	Europe: Italy
Verbenaceae	<i>Asteromella lantanae</i> Petr.	-	<i>Mycosphaerella</i> sp.	<i>Lantana camara</i>	North America: USA
	<i>Asteromella tectonae</i> (Syd., P. Syd. & E. J. Butler) Aa	-	<i>Mycosphaerella</i> sp.	<i>Tectona grandis</i>	Asia: India
Violaceae	<i>Asteromella nigrescens</i> (Bonar & W. B. Cooke) Aa & Vanev	-	<i>Mycosphaerella</i> sp.	<i>Viola purpurea</i>	North America: USA
Vitaceae	<i>Asteromella allescheri</i> (P. Syd.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Partenocissus quinquefoliae</i>	Europe: Germany
	<i>Asteromella bizzozeriana</i> (C. Massal.) Aa	-	<i>Mycosphaerella</i> sp.	<i>Vitis vinifera</i>	Europe: Italy
Vochysiaceae	<i>Asteromella qualleana</i> (Allesch.) Vanev & Aa	-	<i>Mycosphaerella</i> sp.	<i>Qualea</i> sp.	South America: Brazil
<b>Unidentified host</b>					

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
No data	<i>Asteromella myriadea</i> Cooke	-	-	Coriaceous leaves (?)	Oceania: New Zealand
	<i>Asteromella perpusilla</i> Speg.	-	-	Non-identified plants	South America: Brazil
	<i>Asteromella innumera</i> (Cooke & Harkn.) Petr.	-	-	Unknown plant	North America: USA
	<i>Asteromella gabonensis</i> Cooke & Masseur	-	-	Withering herbaceous plants	Africa: Gabon
<b>Excluded species</b>					
Ericaceae	<i>Myxothyrium leptideum</i> (Fr.) Bubák & Kabát [= <i>Asteromella leptidea</i> (Fr.) Petr.]***	-	-	<i>Vaccinium vitis-idaea</i>	Europe: Sweden
Fabaceae	<i>Plenodomus lupini</i> (Ellis & Everh.) Gruyter, Aveskamp & Verkley [= <i>Asteromella lupini</i> (Ellis & Everh.) Petr.]	-	-	<i>Lupinus</i> sp.	North America: USA
Fagaceae	<i>Coniella castaneicola</i> (Ellis & Everh.) B. Sutton [= <i>Asteromella castaneicola</i> (Ellis & Everh.) Petr.]	-	-	<i>Mycosphaerella janus</i> (Berk. & M. A. Curtis) <i>Quercus lanuginosa</i> Petr.	North America: USA

Host family	Taxon	Synanamorph	Teleomorph	Type host	Type locality
Poaceae	<i>Dasytictella sphaerospora</i> (Sacc. & Traverso) Höhn. (= <i>Asteromella sphaerospora</i> Sacc. & Traverso_	-	-	<i>Triticum vulgare</i>	Europe: Italy (Sardinia)
Tiliaceae	<i>Paraconiothyrium tiliae</i> (F. Rudolphi) Verkley & Gruyter [= <i>Asteromella tiliae</i> (F. Rudolphi) Butin & Kehr]	-	? <i>Didymosphaeria petra-kiama</i> Sacc.	<i>Tilia platyphyllos</i>	Europe: Austria
Ulmaceae	<i>Dasytictella epitrema</i> (Cooke) Höhn. (= <i>Asteromella epitrema</i> Cooke)	-	-	<i>Trema aspera</i>	Oceania: Australia

nd – no data available. \* The species attributed to F. Petrak but the combination *Asteromella longissima* (Westend.) Petrak (in Mycotheca Generalis, No. 1801, on *Chenopodium album*) was never validly published (Christian Scheuer, in letter, Sep. 2016). \*\* See the entry at *Asteromella quercifolia* in the Chapter 4.4. \*\*\* The combination *Asteromella leptidea* (Fr.) Petr. probably was never published (Christian Scheuer, in letter, Sep. 2016). Fungus in the specimen from B reference collection (B 700015165) with name of *A. leptidea* most probably written by F. Petrak (Fig. 62), belongs to *Myxothyrium leptideum* (Fr.) Bubák & Kabát.



**Fig. 62** *Asteromella leptidea* on *Vaccinium vitis-idaea* (B 700015165). **a** Envelope with hand written name. **b** Symptoms of host infection. **c** Layers of conidiogenous cell with conidia. **d** Conidia. Scale bars: **b** 2 cm; **c,d** 10  $\mu$ m.