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Aspicilia subfarinosa, the correct name for *A. substerilis*

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Abstract— *Lecanora subfarinosa* is lectotypified and transferred to the genus *Aspicilia,* where it is recognized as the correct name for *A. substerilis*. *Lecanora farinosa* f. *subopegraphoides,* which is also lectotypified, is reduced to a synonym of *A. subfarinosa*. *Aspicilia subfarinosa* is newly reported from France, Israel, Iran, Iraq, and Turkey.

Key words— *Ascomycetes*, Croatia, Greece, Italy, Syria

Introduction

We began our study of *Aspicilia* in SW Asia by examining all available types, which gave us an opportunity to look for earlier names for *A. substerilis* (Sipman 2007), a name recently published for a widespread, common species in our study area that has been confused with *A. farinosa* (Flörke) Hue. However, determination of the earliest available name was made difficult because so many new species have been described from the arid lands of SW Asia (Azerbaijan, Iran, Iraq, Lebanon, Syria and Turkey), SE Europe (Greece), and N Africa (Algeria, Egypt, Tunisia).

Aspicilia appears particularly diverse in SW Asia, where Julius Steiner described 44 representatives of *Lecanora* sect. *Aspicilia* (Steiner 1893, 1894, 1895, 1898, 1899, 1902, 1904, 1905, 1909, 1910, 1919a, b, 1921). R.G. Werner next described 18 new taxa in *Aspicilia* (Maire & Monod 1950, Werner 1936, 1938, 1954, 1956, 1957a,b, 1963, 1966, 1979). Ö. Szatala described 10 more species (Szatala 1929, 1931, 1939, 1941, 1943, 1956), and another 10 were proposed by A.N. Oxner (Kopaczevskaja et al. 1971, Oxner 1929, 1933, 1939, 1940). Altogether 55 (of 82) taxa described from SE Europe and SW Asia appeared as potential older names for *A. substerilis*. Of these, 27 taxa had either been originally proposed at or later raised to the species level prior to Sipman's

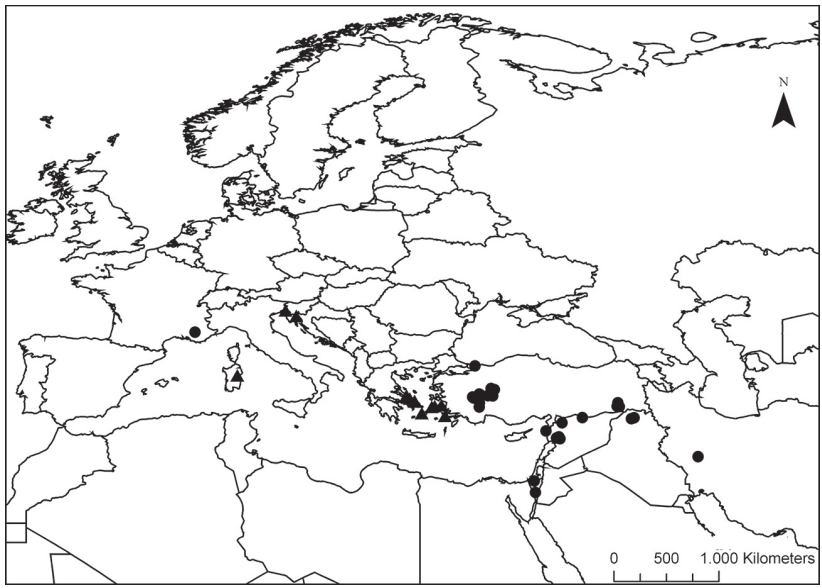

Figure 1. Distribution of *Aspicilia subfarinosa*.
▲ = Localities cited in Sipman (2007), ● = Specimens examined.

2007 description of *A. substerilis*. Examination of the 27 types revealed that one, *Lecanora subfarinosa*, was conspecific with *Aspicilia substerilis*. Among the remaining 28 infraspecific taxa, only the type specimen of *Lecanora farinosa* f. *subopegraphoides* appeared to be also conspecific with *Aspicilia substerilis*.

Materials & methods

The study presented here is based mainly on herbarium material kept in BC, BCN, BP, G, GZU, KW, W and WU. Most of type specimens in *Aspicilia* s.lat. described by A.N. Oxner, J. Müller Argoviensis, J. Steiner, Ö. Szatala and R.G. Werner have been revised. Extensive herbarium collections of *Aspicilia calcarea* and *A. farinosa* (incl. synonyms) were examined by the first author. The specimens were studied in the usual way by stereomicroscope and compound microscope, and all measurements (ascospores, conidia, and other apothecial structures) were made in microscopic preparations in tap water. To study ascus structure, Lugol's solution was added to sections and squash preparations after pre-treatment with 10% KOH.

Selected specimens were analysed for secondary metabolites by high performance thin-layer chromatography (HPTLC) in accordance with Arup et al. (1993), using a CAMAG Nanomat 4 sample applicator and a CAMAG Horizontal Development Chamber.

Additional specimen information obtained from collection labels is presented in English. Label data is abbreviated where necessary and reorganized for easy access with site information preceding collection data.

Taxonomy

Aspicilia subfarinosa (J. Steiner) Şenkard. & Sohrabi, **comb. nov.** Fig. 2

MycoBank MB 518413

≡ *Lecanora subfarinosa* J. Steiner, Ann. Naturhist. Mus. Wien 34: 38 (1921).

Typus: [Syria] Mesopotamia, in summo cacumine Tschil Miran montium Dschebel Sindschar, ad rupes substrato calcareo, ca. 1400 m, 9.6.1910, H.F. von Handel-Mazzetti 3297 (W 1920-827!-**lectotypus, hic designatus**, W 1929-2110!-isolectotypus)

= *Aspicilia substerilis* Sipman, Biblioth. Lichenol. 96: 267 (2007), **syn. nov.**

Typus: "Greece, W Aegean, Nomos Evvias, Eparchia & Dimos Karistos: E Evvia, Agios Dimitrios Gorge, c. 350 m., calcareous, N-facing cliffs and boulders along dry stream in ravine, 30.9.2005, H. Sipman & Th. Raus 54305 [B-holotype, Sipman (2007)]

= *Lecanora farinosa* f. *subopegraphoides* Werner, Bull. Soc. Bot. France 103(7–8): 462 (1956), **syn. nov.**

≡ *Aspicilia farinosa* f. *subopegraphoides* (Werner) S.Y. Kondr., in Kondratyuk & Zelenko, Ukr. Bot. Zhurn. 59: 603 (2002).

Typus: "Syrie: monts Ansarieh (Alaouites), région de Slenfé, versant Est dans le Cedretum, 1200–1300 m., sur les rochers calcaires, 27.8.1938, R.G. Werner" (BC!-**lectotypus, hic designatus**, BC!-isolectotypus).

Ecology and distribution— On the upper surface of well-lit, exposed limestone outcrops. Widespread in the Mediterranean (Fig. 1).

Key characters— This species is characterized by a thin, continuous to fissured, chalky-white thallus with farinose surface, apothecia separated from thallus by a fissure when dry, 4-spored asci, medium sized to large ascospores of 20–37 × 20–25 µm in size, rather short to medium sized conidia of 7–18 µm in length, and by the absence of secondary metabolites.

Expanded description [based on Steiner (1921), Sipman (2007), and our own observations]— Thallus crustose, forming large patches usually over 5 cm wide, chalky white, farinose, continuous or more or less fissured around the ascocarps, 0.1–1.5 mm thick; margins without black prothallus, but with a groove between two adjacent thalli; cortex with paraplectenchymatous tissue constructed of less branched, moniliform-like and perpendicular hyphae and occasionally with a necrotic layer up to 60 µm thick; algal layer c. 60 µm thick, filled with small crystals; medulla white or occasionally becoming ochre in lower parts, composed of branched and reticulate hyphae and filled by larger, c. 5–10 µm wide crystals. Apothecia c. 0.2–0.8(–1.0) mm wide, immersed in the thallus and separated from it by a fissure when dry, without thalline margin, rounded or lobulate to elongate, often in groups seemingly originating from disintegrated larger apothecia, with grey, white-pruinose, concave disc and white, raised margins and sterile ridges (columellae); hymenium 100–150 µm tall, hyaline, clear, I+ persistently weak blue or partly turning to yellow; paraphyses in upper parts branched and submoniliform and 4–5 µm wide, in lower part 2.5–4 µm wide, loose, not branched; epithecium dark brown to

green, N+ green; hypothecium colourless, without algal layer below; asci of *Aspicilia*-type, subclavate, usually sterile, c. 95–130 × 23–44 µm; ascospores simple, hyaline, 2–4 in asci, c. 20–37 × 16–35 µm, usually absent. Pycnidia immersed, flask-like, with a black and punctiform ostiole; conidia filiform, straight, 6–18 × 0.6–1 µm.

Secondary metabolites— None detected by HPTLC.

Additional specimens examined: **FRANCE**: **Forcalquier,** Les Moures, Provence, 600 m — on calcareous stone, 18 Aug. 1969, *G. Clauzade & X. Llimona* (*BCN-lich. 41* as *A. farinosa*). **ISRAEL**: **C. Negev,** near Avdath — on calcareous stone, 16 Apr. 1974, *J. Garty* 36(7 as *L. farinosa*) (*GZU s.n* as *L. farinosa*); near Beer-Sheba, Nizana road — on hard limestone, 17 Mar. 1947, *Y. Gutter (BCN-lich. 279* as *L. farinosa)*. **IRAN**: **Lorestan Prov.,** Aligudarz district, Oshtran Kouh, 'Schuturun Kuh, Luristan' — no date, *S.D. Strauss* (*W s.n.* as *L. farinosa*); **East Azerbaijan**, Marand district 32 km N of Marand, 38.6763 N, 45.6573 E, 1440 m — 2 Nov. 2007, *M.Sohrabi, H.Sipman, U.Søchting & M.R.Asef.* (*hb. Sohrabi, MS010094*). **IRAQ**: **'Mesopotamia',** Seiramun prope Mossul, ca. 250 m — on calcareous stone, no date, *H.F. von Handel-Mazzetti*, as *L. farinosa* (*WU 40899*); **Kurdistania Turcica**, Mosul, on Mâr Jakub — Jun 1910 *F. Nabelek* (*BP 42430* as *L. farinosa*); ca. 800 m — no date, *Nabelek* (*W s.n.* as *A. farinosa*). **SYRIA**: **Ain Arus,** between Rakka & Urfa, near Dschidle (Dicle), at Belich R. spring, ca. 350 m — on calcareous stone, 3 Jul. 1910, *H.F. von Handel-Mazzetti* 1843 (*W 1929-15582* as *L. farinosa*, with *L. platycarpa* f. *pruinosa* & *L. contorta* var. *glaucopruinosa*); **Dschebel Sindschar,** near Dschaddale between Dschaddale & El Chattunije, ca. 600 m — on tufa-like calcareous stone, 10 Jun. 1910, *H.F. von Handel-Mazzetti 1543* (*WU 40901* as *L. farinosa*); El Magharad Mt on Sindschar, ca. 700–1000 m — on calcareous stone, 8 Jun. 1910, *H.F. von Handel-Mazzetti 1375* (*WU 40903* as *L. farinosa*); ca. 1000 m — on calcareous stone, 9 Jun. 1910, *H.F. von Handel-Mazzetti* 1437 (*WU 40897* as *L. farinosa*); Tschil Mt. summit, ca. 1400 m — on calcareous stone, 9 Jun. 1910, *H.F. von Handel-Mazzetti 3295* (*WU 40894* as *L. farinosa*); **Haleb** (**Aleppo**), near train station, ca. 380 m — on calcareous stone, 15 Mar. 1910, *H.F. von Handel-Mazzetti 162* (*WU 40900* as *L. farinosa*); **Alaouites**, Qastal el Moaf, in Baër 40 km from Lattaquié (Muhāfazah) on the road to Antioche (Hatay) — on calcareous-siliceous stone, 3 Sep. 1938, *R.G. Werner*, (*BC s.n.* as *L. farinosa* f. *subopegraphoides* jointly with type specimens of *L. angulata*). **TURKEY**: **Bithynia**, Osmanköj (Osmanköy), Gökszu (Göksu), in tree grove on limestone cliff, 300 m — 6 Oct. 1918, *I. Györffy de Szigeth* (*BP 42433* as "*L. calcarea* var. *concreta* f. *farinosa*"); Bank of Tigridis (Tigris) River between Sert (Siirt) & Dschesiret-ibm-Omar (Cizre), near Fündük, ca. 1100 m — on calcareous stone, 18 Aug. 1910, *H.F. von Handel-Mazzetti 3036* (*W 1929-15666* & *WU 40893,* both as *L. farinosa*); between Balak & Fündük, ca. 500 m — on calcareous stone, 18 Aug. 1910, *H.F. von Handel-Mazzetti 3018* (*WU 40893* as *L. farinosa*) & *3041* (*WU 40904* as *L. farinosa*). **Afyon**, Söğüt Mts, between Körpeli & Sarıköy, 3rd km, 37°54.96' N, 30°06.16' E, 1160 m — 24 Jun. 2009, *A. Şenkardeşler* (*EGE 39734*); Ahır Mt, between Arızlar & Çepni, 3rd km, 38°34.02' N, 30°03.90' E, 1300 m — 23 Apr. 2010, *A. Şenkardeşler* (*EGE 39735*); between Yağcı & Çalhisar, 4rd km, 38°39.90' N, 30°04.26' E, 1490 m — 23 Apr. 2010, *A. Şenkardeşler* (*EGE 39736*); between Arharım & Karadirek, 2nd km, 38°36.00' N, 30°11.28' E, 1280 m — 23 Apr. 2010, *A. Şenkardeşler* (*EGE 39737*); between Gedikevi & Alibeyce, 1st km, 39°08.82' N, 31°04.56' E, 1130 m — 24 Mai 2010, *A. Şenkardeşler* (*EGE 39738*); between Salihler & Toklucak, 1st km, 39°02.88' N, 31°22.74' E, 980 m — 24 Mai 2010, *A. Şenkardeşler* (*EGE 39739*). Sultan Mts, 0.5 km south of Kırca, 38°30.60'

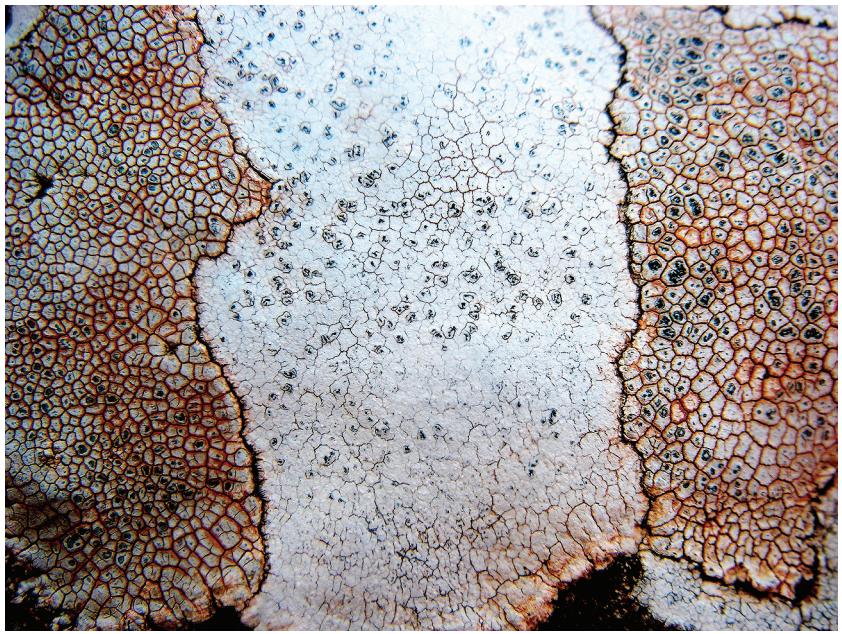

Figure 2. Comparison of the farinose, smooth surface with occasional very fine cracks of *Aspicilia subfarinosa* (EGE 39735, central), with the deeply cracked-areolate surface of *A. calcarea* (EGE 39735, left; EGE 39735, right).

N, 31°13.86' E, 1120 m — 25 Mai 2010, *A. Şenkardeşler* (*EGE 39740*); between Pazarağaç & İnli, 5th km, 38°31.80' N, 30°49.38' E, 1060 m — 25 Mai 2010, *A. Şenkardeşler* (*EGE 39741*). **Uşak**, between Delihidirli & Çokakli, 0.5 km, 38°20.58' N, 29°34.56' E, 910 m — 14 Mai 2010, *A. Şenkardeşler* (*EGE 39742*). Ulubey Canyon, between Alfaklar & Paşalar, 4th km, 38°24.90' N, 29°30.42' E, 860 m — 14 Mai 2010, *A. Şenkardeşler* (*EGE 39743*).

Comments— Steiner (1915) provides a description with 4 ascospores per ascus for this species under the name *Lecanora farinosa* but admittedly never studied original material. Therefore he was unable to decide which of the two was correct, "*Lecanora farinosa* sensu J. Steiner" or "*A. farinosa* (Flörke) Hue", which has asci with up to 8 ascospores (Sipman 2007, Nordin & Roux 2009). All specimens of *Lecanora farinosa* sensu J. Steiner listed in Steiner (1910, 1915, 1921), Szatala (1927, 1941) and Şenkardeşler & Lõkös (2010) that we examined appear to belong to the species described by Sipman (2007) and not to "*A. farinosa* (Flörke) Hue".

The species *A. subfarinosa* was based on its longer conidia compared with *A. farinosa* sensu J. Steiner (11–18 µm vs. 7–12 µm). However, the cited specimen from Iran has conidia 11–14 µm long and a specimen from Israel, covered only with pycnidia, has longer (9–16 µm) conidia. Together with the similar external

thallus morphology for both species, the intermediate conidial lengths suggest that there are no informative morphological differences between *A. subfarinosa* and *A. farinosa* sensu J. Steiner.

The short description of *Lecanora farinosa* f. *subopegraphoides* is based only on the farinose surface and absence of areoles, which our study confirms. We also observed fissures around the ascocarps and 4-spored asci and detected no secondary metabolites. For these reasons, we synonymize here *A. farinosa* var. *subopegraphoides* and *A. substerilis* with *A. subfarinosa.*

The type specimen for a second form described by Szatala (1943), *A. farinosa* f. *ochracea*, has not been found even after diligent searches in BP, W, and WU. Probably it was lost during World War II. Verseghy (1964, 1968, 1974, 1981) did not report this type specimen from BP, either.

Aspicilia subfarinosa is very similar to and could be confused with *A. calcarea* (L.) Körb., but their surface structure is evidently different: *A. subfarinosa* has a farinose smooth surface with occasional very fine cracks, while *A. calcarea* has a deeply cracked-areolate surface (Fig. 2). Another difference between both species is the fissures around the apothecia in dry condition: *A. subfarinosa* has immersed apothecia, which are separated from the thallus by a fissure, while this is not a trait of *A. calcarea*.

Conclusion

Although *A. subfarinosa* and *A. farinosa* seem to be well defined species, the names have a complicated application history in some publications and checklists, chiefly in those dealing with southwest Asian and Mediterranean lichen flora. During this study it became clear that in the herbaria indicated above, a large number of examined specimens should be referred to *A. farinosa*. There are also some specimens in the *A. calcarea* complex, tentatively filed under *A. farinosa* or vice versa, deposited in different herbaria, that may need to be referred to *A. subfarinosa* after the number of ascospores per ascus and occurrence of fissures around the apothecia have been noted.

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