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Typification and emendation of *Seiophora* Poelt to include species segregated from *Teloschistes* Norman

Patrik FRÖDÉN and Per LASSEN

Abstract: The type material of *Physcia magara* Kremp., which is the type species of *Seiophora* Poelt (*Teloschistaceae*), is shown to be heterogeneous. It is a mixture of *Teloschistes villosus* (Ach.) Norman and *Ramalina maciformis* (Delile) Bory. *Physcia magara* Kremp. is typified on the *T. villosus*-part. *Teloschistes* species with multiseriate hairs, spores with short septa, thick and strongly conglutinated cortex hyphae with thick walls, lacking cilia or rhizines, and which have a mainly northern hemispheric distribution, are transferred to *Seiophora*. The following new combinations are made: *Seiophora aurantiaca* (R. Br.) Frödén, *Seiophora austroarabica* (Sipman) Frödén, *Seiophora californica* (Sipman) Frödén, *Seiophora contortuplicata* (Ach.) Frödén, *Seiophora lacunosa* (Rupr.) Frödén, *Seiophora scorigena* (Mont.) Frödén, *Seiophora stenophylla* (Tav.) Frödén, and *Seiophora villosa* (Ach.) Frödén.

Key words: lichens, *Seiophora*, *Teloschistaceae*, *Teloschistes*, typification

Introduction

During our work with nomenclature and generic delimitation of *Teloschistaceae*, we had the opportunity to study the type material of *Physcia magara* Kremp., which is the type species of the genus *Seiophora* Poelt. The species was originally described by Krempelhuber in 1868. He based his description on material located in the Vienna herbarium (W) which had been collected by Kotschy and issued without description as *Parmelia magara* in his exsiccatum *Iter Syriacum* in 1855. In the protologue, Krempelhuber (1868) cited the two specimens he saw in W: nos 1012 and 1112. Stitzenberger (1890) included *Physcia magara* in his African lichen flora without any special comments, but in the second supplement (1895), he stated that it was very closely related to *Teloschistes villosus* (Ach.) Norman. In his world monograph of *Teloschistes*, Hillmann (1930) concluded that *Physcia magara* was most probably a

member of *Teloschistaceae*, but due to the scarce material, he was uncertain whether it belonged to *Teloschistes* or a new genus. The reasons for assigning it to the *Teloschistaceae* were the polarilocular spores, the K+ red reaction of the apothecia and the interspersed granules in the epithecium. He strongly opposed Stitzenberger's (1895) view on its relation to *T. villosus*, and in fact accused him of not having seen any material at all of *Physcia magara*. Poelt (1983) erected a new genus for this taxon named *Seiophora*, including only the type species. Poelt did not explicitly record what material he studied, but it appears that he studied only the single specimen collected by Kotschy (no. 1112) located in M, which he chose as lectotype (erroneously called holotype), and an additional, sterile specimen collected by Schweinfurth on the Libyan coast in 1883 (also in M). Nevertheless, due to its peculiar strands of prosoplectenchymatic, chondroid tissue embedded in the medulla combined with typical apothecial characters of *Teloschistaceae*, he decided it was distinct enough to form a genus of its own in *Teloschistaceae*. Kärnefelt (1989) followed the views of Poelt,

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but noted the close affinity to *T. lacunosus* (Rupr.) Savicz, thereby incorporating Stitzenberger's view, as *T. lacunosus* is closely related to *T. villosus*.

Material and Methods

Material of *Seiophora* and *Teloschistes* from the following herbaria have been studied: ASU, BM, Bratt priv. hb., C, E, G, GB, H, H-ACH, H-NYL, HBG, LD, Litterski priv. hb., M, MIN, S, UPS, and W. Morphological characters were studied with a dissecting binocular microscope with $\times 40$ magnification. Anatomical structures were studied with a Zeiss Axioscope light microscope with and without interference contrast. Macro photographs were taken with a Canon Eos 300D digital camera with a 50 mm macro lens, and micro photographs were taken with an Olympus DP 11 digital camera. The photographs were subsequently processed in Photoshop 7. Measurements of the spores ($\times 1000$ magnification) were carried out without interference contrast on hand cut sections mounted in distilled water. The cortex hyphae ($\times 1000$ magnification) were first treated with a 10% KOH solution, which then was replaced by distilled water. The type material of *Physcia magara* and material of *Ramalina maciformis* have been investigated with spot tests; using KOH, C, and Pd.

Taxonomy

The type material

According to a note on the designated lectotype specimen, it had been in Krempelhuber's personal herbarium and was transferred to M in 1883 after his death. Krempelhuber (1868) only mentioned that he studied the two specimens in W and does not refer to any material in his private herbarium. The lectotype also lacks the original, partly printed, exsiccatum label. However, the text on the handwritten label of the lectotype reads the same as in the original label, save for "*Parmelia magara* El Arysch" at the bottom, which is lacking (Fig. 1). Most probably the lectotype is a part taken from the original specimen no. 1112 in W. The fact that specimen no. 1012 is in better condition than no. 1112 also suggests that material has been removed from it. If this assumption is correct, the typification made by Poelt was indeed made on the original material, although it would have been more

appropriate if the lectotype was chosen from one of the syntypes in W. Specimen no. 1112 in W is thus to be regarded as an isolectotype and specimen no. 1012 as a syntype.

The identity of *Physcia magara*

The lectotype consists of two thalli (Fig. 2), clearly separated, but treated as belonging to the same taxon by Poelt (1983) and Kärnefelt (1989). The original material in W is composed of several thalli, but was also treated as one species by Krempelhuber (1868) and Hillmann (1930). The larger, sterile thallus of the lectotype (left in Fig. 2) as well as the other sterile type material, on which the descriptions of the morphology and anatomy are based, has a reddish to yellowish grey colour, but is K $-$, which was noted by Stitzenberger (1895), Hillmann (1930), Poelt (1983), and Kärnefelt (1989). For the most part, it has no colour reactions, but in part the medulla is K $+$ yellow turning orange-red after a while. In addition, it is also Pd $+$ orange-red. These colour reactions indicate either norstictic acid, stictic acid, or salazinic acid. Furthermore, it is corticated all around, without hairs, and has reddish chondroid strands in the medulla. The smaller thallus of the lectotype (right in Fig. 2, Fig. 3) and the other fertile material of the types hold all the apothecia and is thus the base for including *Seiophora* in *Teloschista-ceae*. The upper surface bears short hyaline hairs. The lower side is cracked, exposing the medulla with remaining cortex strands forming a reticulate pattern. These cortex strands are superficially similar to the chondroid strands of the sterile material, but are white, not free from the cortex, and are of different composition. The K $+$ red reaction of the apothecium disc was reported by Hillmann (1930), Poelt (1983), and Kärnefelt (1989). It lacks the K $+$ and Pd $+$ reactions of the medulla completely. The characteristics of the two parts are summarized in Table 1. In our view, the two parts of the lectotype and the rest of the type material clearly represent two different taxa and it is also clear that Krempelhuber's

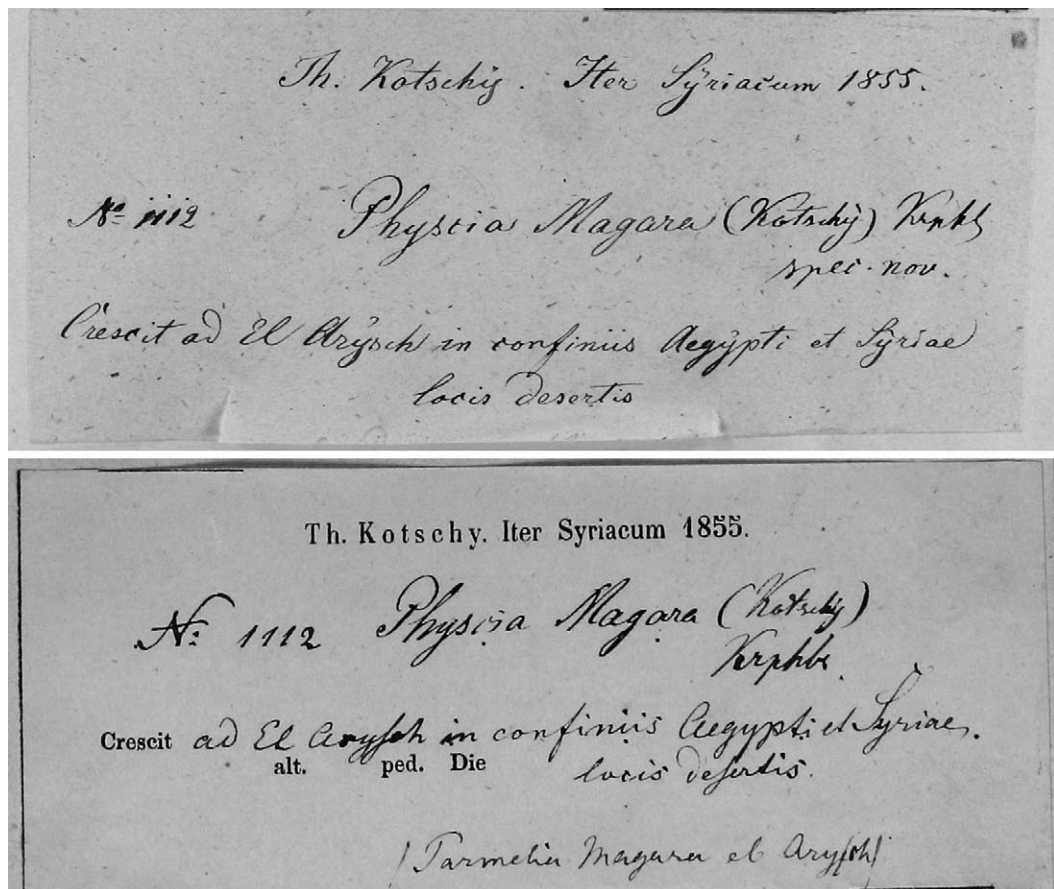


FIG. 1. *Physcia magara*, labels of the lectotype (Kotschy 1112, M) and the isolectotype (Kotschy 1112, W).

(1868) protologue is based on two taxa. The original drawings of the protologue, most of which are referable to thalli in the syntype, also confirm this (Fig. 4).

The morphology, anatomy, and chemical reactions indicate that the larger thallus of the lectotype as well as the other sterile material of the types belong to *Ramalina maciformis* (Delile) Bory. This species was described from Egypt (Delile 1813), not far from where *Physcia magara* was collected. The sterile material of the types agree well with the available material of *R. maciformis* in LD. *Ramalina maciformis* usually contains norstictic acid + bourgeanic acid or salazinic acid + bourgeanic acid, but acid deficient strains occur (Krog & Østhaugen 1980).

Follmann (1976) has also reported partly acid deficient specimens from Israel. The Libyan material cited by Poelt (1983) shows strong colour reactions in the medulla with K and Pd. The smaller thallus of the lectotype as well as the other fertile material of the isotype and syntype, belong to *Teloschistes villosus* (Ach.) Norman. As the type consists of two different taxa which is also reflected in the protologue, an additional typification needs to be made. Thus, *Physcia magara* is here typified on the smaller, fertile *T. villosus* part (Fig. 3 and on the right in Fig. 2) of the lectotype (M). *Physcia magara* is antedated by *Parmelia villosa* Ach. (Acharius 1803), and is reduced to synonymy with the latter.

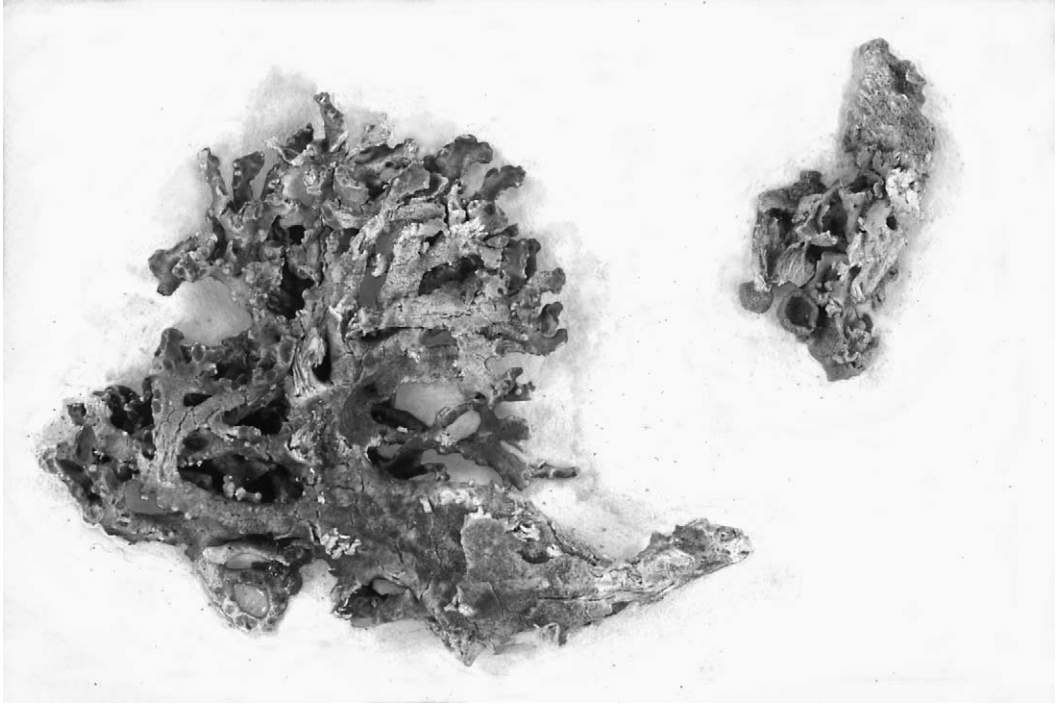


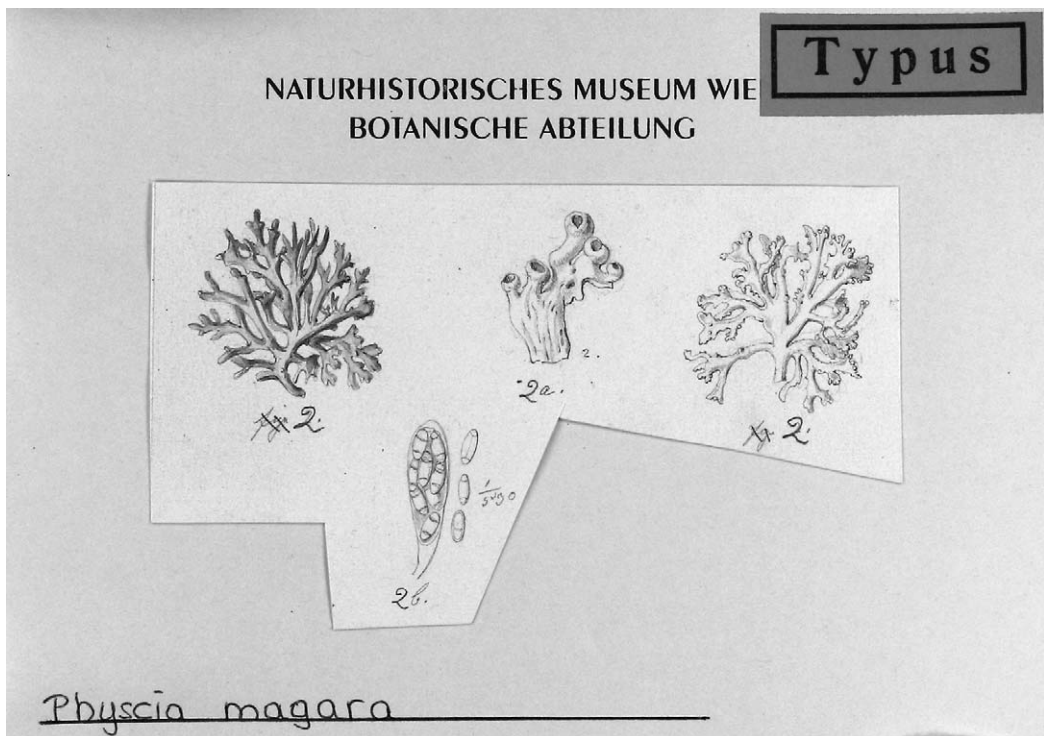
FIG. 2. *Physcia magara* (Kotschy 1112, M), the two thalli of the lectotype.



FIG. 3. *Physcia magara* (Kotschy 1112, M), the fertile part on the right (in Fig. 2) chosen here as lectotype.

TABLE 1. Comparison between the two parts of the type material of *Physcia magara*

Character	Sterile part (<i>R. maciformis</i>)	Fertile part (<i>T. villosus</i>)
Colour	Yellowish grey to reddish all around	Grey on upper side, white on lower
Surface	Naked	Villose on upper side, naked on lower
Cortex	Corticated all around	Upper side corticated, lower cracked exposing the medulla with remaining cortex strands forming a reticulate pattern
Chondroid strands	Present, reddish, separated from cortex	Not present, lower cortex forming a reticulate pattern
Spot test	Partly PD+ orange red, K+ yellow turning red	No colour reactions on thallus, apothecia K+ red

FIG. 4. *Physcia magara*, Krempelhuber's original drawings. The two Figs. 2 represent *Ramalina maciformis*, Fig. 2a and 2b represent *Teloschistes villosus*.

Emendation of *Seiophora*

As was suggested in Frödén *et al.* (2004), some species should be separated from *Teloschistes*. With the new typification of *Seiophora*, the name becomes available for this group. *Seiophora* differs from *Teloschistes* s. str. in a number of characters, the

principal ones being summarized in Table 2. The species of *Seiophora* have no cilia or rhizines. All species of *Teloschistes* produce these, although in some cases only sparingly so, as for example in *T. cymbalifer* (Eschw.) Müll. Arg. All species of *Seiophora* produce multiseriate, complex hairs, consisting of strongly conglutinated hyphae (Fig. 5A).

TABLE 2. Comparison between *Seiophora* and *Teloschistes* s. str.

Character	<i>Seiophora</i>	<i>Teloschistes</i> s. str.
Cilia/rhizines	Absent	Present in all species
Spores	Short septa (2–4 µm in water)	Long septa (4–10 µm in water)
Hairs	Simple and complex (multiseriate) sometimes branched	Mostly simple, consisting of a single row of cells, rarely complex and then more loosely conglutinated
Cortex hyphae	Strongly conglutinated after treatment with KOH, thick (3–7 µm) with thick walls (c. 1–2 µm)	More lax and separating after treatment with KOH, thin (1.5–3 µm) with thin walls (c. 0.5 µm)
Conidia	Bacilliform to narrowly ellipsoid	Bacilliform, bacilliform to narrowly ellipsoid, or bifusiform
Chemistry*	Chemosyndrome A	Chemosyndrome A, A+1, A+2, A+3, A+4, A+5, A3, A3+2, or A3+3
Distribution	Mainly northern hemispheric	Mainly southern hemispheric

*Chemosyndromes are referable to Søchting & Frödén (2002).

Simple hairs made up of single rows of cells are also produced. The species of *Teloschistes* either lack hairs or mainly produce simple hairs, single or loosely conglutinated, but in some species such as *T. puber* (Ach.) Almb. the complex type is also formed, although shorter and less conglutinated than in *Seiophora* (Fig. 5B and 5C). *Seiophora* species have spores with short septa (2–4 µm in water); in *Teloschistes* they are 4–10 µm (Fig. 6). In *T. hypoglacus* (Nyl.) Zahlbr., which has quadrilocular spores, the septa are only c. 1.5–2 µm, but the total length between the end locules is 9–10 µm. Although both genera have a prosoplectenchymatic cortex, the cortical hyphae in *Seiophora*, measured after treatment with KOH, are thicker (3–7 µm) with thicker walls (c. 1–2 µm) than in *Teloschistes* (1.5–3 µm, and walls c. 0.5 µm) (Fig. 7). The cortical hyphae in *Seiophora* remain virtually unchanged after the treatment while they become somewhat lax and separated in *Teloschistes*. All species of *Seiophora* investigated have narrowly ellipsoid to bacilliform conidia and chemosyndrome A (Søchting & Frödén 2002). The variation in *Teloschistes* is much greater; bacilliform, bacilliform to narrowly ellipsoid, and bifusiform conidia occur and several chemosyndromes have been found (Søchting & Frödén 2002).

Seiophora species occur only in the northern hemisphere, except for the outlying populations of *S. villosa* (Ach.) Frödén in Peru and Chile. They occur over large parts of Asia, southern parts of Europe, northern Africa, and western North America up to the Canadian Arctic and Greenland. The centre of diversity for *Teloschistes*, on the other hand, is in southern Africa, southern Australia and New Zealand, and South America. While *Seiophora* has a Laurasian distribution, *Teloschistes* s. str. has a distribution pattern typical of groups of organisms originating in Gondwanaland (see Galloway 1991 and references therein). This is probably due to the area of origin of the two genera as well as their preference for rather dry areas, but with elevated local air humidity. Apparently, most species of *Seiophora* and *Teloschistes* do not cross the tropical and subtropical regions and establish themselves in the suitable areas on the other side of these regions. Only three widespread species of *Teloschistes* occur in the areas derived from Laurasia, and these are also the most widespread *Teloschistes* species in the southern Hemisphere.

DNA-data from the nuclear ribosomal ITS1-5.8S-ITS2 region also fully support the separation of *Seiophora* from *Teloschistes* (P. Frödén, unpublished data).

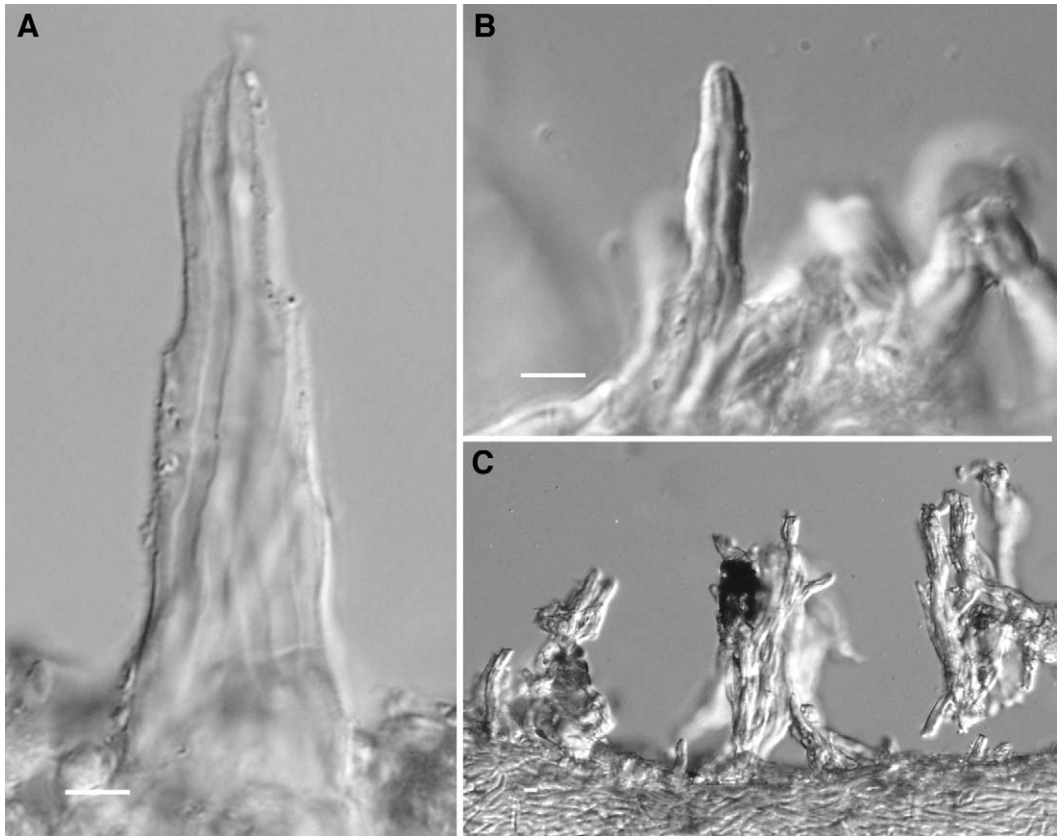


FIG. 5. *Seiophora* and *Teloschistes*, hairs. A, multiseriate hairs of *S. lacunosa* (V. P. Savicz: *Lichenotheca Rossica decas 5* no 44, Kazakhstan, Kumaschkino, Keller & Lejse s. n., LD); B, simple hairs of *T. puber* (South Africa, Melkbosch strand, Garside 5040a, LD); C, loosely conglutinated hairs of *T. puber* (same specimen as B). Scales: A, B & C = 5 μ m.

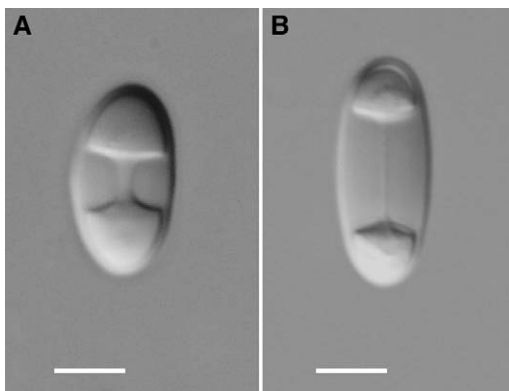


FIG. 6. *Seiophora* and *Teloschistes*, spores. A, *S. lacunosa* (Spain, Andalusia, Punta del Sabinar, Sochting 9649, C); B, *T. flavicans* (Mexico, 32 miles SE of Gusave, Nash 12262, ASU). Scales: A & B = 5 μ m.

The species taxonomy of *Seiophora* is in need of a revision but this is beyond the scope of the present study. Morphological and molecular work is underway and detailed descriptions of the taxa and keys will be presented in a future paper.

***Seiophora* Poelt emend. Frödén**

Flora 174: 440 (1983); type: *Seiophora magara* (Kremp.) Poelt [= *Parmelia villosa* Ach.]

***Seiophora aurantiaca* (R. Br.) Frödén comb. nov.**

Borrera aurantica R. Br., *Chloris Melvilliana*: 47 (1823).—*Teloschistes arcticus* Zahlbr., *Catal. Lich. Univ.* 7: 311 (1931), *nomen novum* for *Borrera aurantica* R. Br.

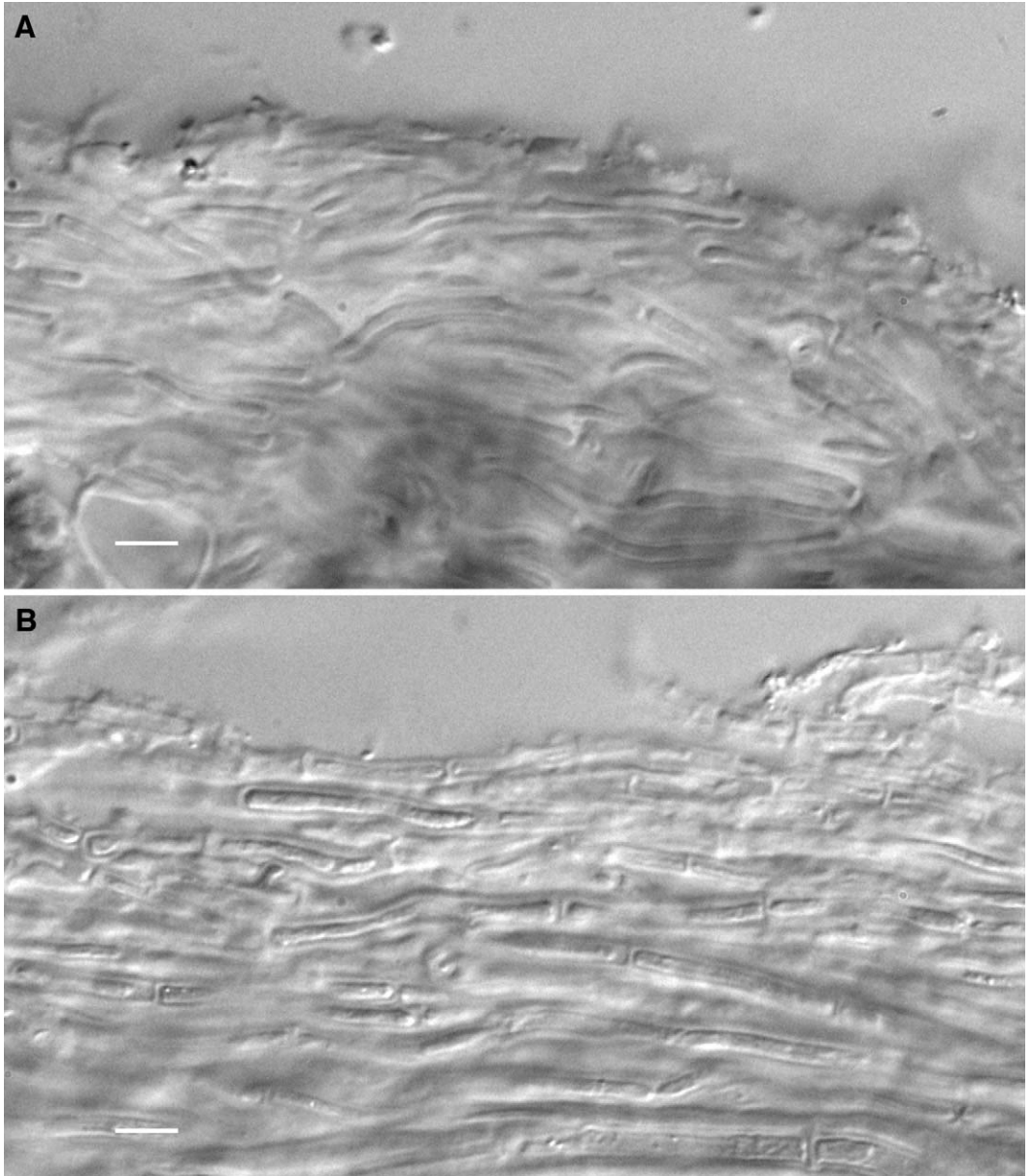


FIG. 7. *Seiophora* and *Teloschistes*, cortex. A, *S. lacumosa* (V. P. Savicz: Lichenotheca Rossica decas 5 no 44, Kazakhstan, Kumaschkino, Keller & Lejse s. n., LD); B, *T. exilis* (Equador, Chimborazo, 5 km SE of Pungala, Arvidsson, Lindqvist & Lindström 6480, GB). Scales: A & B=5 μ m.

(*non Teloschistes aurantiacus* (Lightf.) Norman); type: Winter Harbour, 23 July 1820 (BM!—lectotypus selected here); other original material: Melville Island, leg. Sabine (E!); Melville Island (BM!, H-NYL 32840!).

Borrera aurantiaca R. Br. was described by Robert Brown in *Chloris Melvilliana* (1823), which is an independent paginated preprint of his work published a year later (Brown

1824). As the combination *Teloschistes aurantiacus* (Lightf.) Norman had already been made, Zahlbruckner (1931) gave it a new name, *T. arcticus* Zahlbr. Lambert (1966), who rediscovered the species, wrote “the type specimen” in the legend to Fig. 1, which is a picture of *S. aurantiaca* (called *T. arcticus*), but this is apparently a typographic error. He is really referring to Fig. 2, which is the type of *T. nodulifer* (Nyl.) Hillmann. The only material of *S. aurantiaca* that is cited, apart from his own material, is a specimen from H-NYL (no. 32840). This specimen is possibly type material, but it is definitely not the specimen depicted in Fig. 1. Most probably Fig. 1 in Lambert (1966) is one of his own specimens and he was not intentionally making a typification of *Borreria aurantiaca*. The lectotype designated here has been in Robert Brown’s personal herbarium and was collected at Winter Harbour on Melville Island.

***Seiophora austroarabica* (Sipman)
Frödén comb. nov.**

Teloschistes austroarabicus Sipman, *Willdenowia* 32: 128 (2002); type: Oman, Dhofar, Jabal Nuss at Ras Nuss, 17°14'N, 55°12'E, 300 m, dry, leeward NW slopes, on *Boscia arabica*, 7 x 1998, N. Kilian & P. Hein NK5545a (B—holotypus not seen); Oman, Dhofar, Jabal Nuss E of Jabal Samhan, N of village Hadbin, coord. 17°14'N, 55°13'E, alt. 640 m rocky slopes with monsoon-affected vegetation, epiphyte on *Euphorbia balsamifera*, 7 x 1998, P. Hein & N. Kilian PH5479a (B!—paratypus).

***Seiophora californica* (Sipman)
Frödén comb. nov.**

Teloschistes californicus Sipman, *Willdenowia* 23: 312 (1993); type: Mexico, Baja California, near km 22 on road from Ciudad Constitucion to San Carlos (Route 22), 24°59'N, 111°51'W, on branches in desert scrub on sandy plain with *Acacia constricta*, *Fouquieria diguetii*, etc., 30 m, 8 i 1989, Sipman 25056, LICHENOTHECA LATINOAMERICANA a museo botanico berlinensi edita fasc. 2, curavit H. Sipman anno 1993, No. 98 (B—holotypus not seen; LD!, S!, and UPS!—isotypi).

***Seiophora contortuplicata* (Ach.)
Frödén comb. nov.**

Parmelia contortuplicata Ach., *Synops. Meth. Lich.*: 210 (1814).—*Teloschistes contortuplicatus* (Ach.) Clauzade &

Rondon, in Vězda, *Sched. ad Lich. Sel. Exs.*: nr. 149 (1962); type: Mons Cenis (H-ACH 1303!—lectotype selected here), France Mons Cenis (UPS L00728!—isotype).

***Seiophora lacunosa* (Rupr.) Frödén
comb. nov.**

Ramalina lacunosa Rupr., *Mém. Acad. Sci. St-Petersb.* 6-me ser. t. 6 (Sci nat., t. 5): 235 (1845).—*Teloschistes lacunosus* (Rupr.) Savicz, *Acta Inst. Bot. Acad. Sci. URSS* 2(2): 313 (1934); type: “Ad terram nudam, argillaceam deserti prope Barchotskoi, Mys.” (LE?—not seen).

***Seiophora scorigena* (Mont.) Frödén
comb. nov.**

Evernia scorigena Mont., apud Barker-Webb & Berthelot, *Hist. Natur. Iles Canar.*, t. 3, 2. part: 97 (1840).—*Teloschistes scorigenus* (Mont.) Vain., *Catal. Welwitsch Afric. Plants vol. 2*: 407 (1901); type: “Super scorias vulcanias in lingua terræ vulgo Punta de Melenara dicta insul Canariæ nec alibi legerunt clar. Webb, Berthelot et Despréux” (FI or PC? —not seen).

***Seiophora stenophylla* (Tav.) Frödén
comb. nov.**

Teloschistes villosus v. *stenophyllus* Tav., *Revista Biol.* 4: 142 (1964).—*Teloschistes stenophyllus* (Tav.) Sipman, *Willdenowia* 32: 130 (2002); type: Cabo verde, S. Vicente, Monte Verde, on the rocks, at about 750 m. s. m. K. Byström, 10 v 1959 (LISU 862—holotype not seen).

***Seiophora villosa* (Ach.) Frödén
comb. nov.**

Parmelia villosa Ach., *Meth. Lich.*: 254 (1803).—*Teloschistes villosus* (Ach.) Norman, *Nyt Mag. Naturvid.* 7(3): 17 (1852 preprint), *Nyt Mag. Naturvid.* 7(3): 229 (1853); type: Lusitania (H-ACH 1452!—lectotype selected here).

Physcia magara Kremp., *Verh. zool.-bot. Gesellsch. Wien* 18: 323 (1868).—*Seiophora magara* (Kremp.) Poelt, *Flora* 174: 440 (1983); type: Crescit ad El Arysich in confiniis Aegypti et Syriae, locis desertis, *Kotschy Iter Syriacum* no 1112 (M!—lectotype selected here [see discussion above]; W!—isolectotype); Crescit ad El Arysich in confiniis Aegypti et Syriae, locis desertis, *Kotschy Iter Syriacum* no 1012 (W!—syntypus).

Physcia villosa f. *brevior* Nyl., *Actes Soc. Linn. Bordeaux* 25: 61 (1864).—*Teloschistes brevior* (Nyl.) Hillmann, *Flora* 69: 320 (1930); type: Aegyptus, In *Lycio afro* prope Bir Krer et alibi. G. Ehrenberg (H-NYL 32749!—lectotype selected here).

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