ISSN (print) 0093-4666 ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/121.139

Volume 121, pp. 139–145 *July–September 2012*

Lichenological notes 5: Neotypification of *Sarcogyne magnussonii* (*Acarosporaceae*)

Kerry Knudsen [1*] & Jana Kocourková [2]

[1] *The Herbarium, Department of Botany and Plant Sciences, University of California, Riverside, CA 92521-0124, U.S.A.*

[2] *Department of Ecology, Faculty of Environmental Sciences, Czech University of Life Sciences, Prague, Kamýcká 129, Praha 6 - Suchdol, CZ–165 21, Czech Republic*

Correspondence to: *Knudsen@ucr.edu* [1*], *kocourkovaj@fzp.czu.cz* [2]

Abstract — *Sarcogyne magnussonii* is neotypified and its description revised based on new specimens from Canada.

Key words — biodiversity, calciphiles, North America, typification

Introduction

The holotypes for four species of *Sarcogyne* described from single specimens from North America (Magnusson 1935) were missing when the first author began studying the genus as part of the Sonoran lichen flora project in 2004. Three of these were in the herbarium of Maurice Bouly de Lesdain and were presumed destroyed in the bombing of Dunkirk in France during WW2: *Sarcogyne novomexicana* H. Magn., *Sarcogyne integra* B. de Lesd. ex H. Magn., and *Sarcogyne magnussonii*. The holotype of the fourth species, *Sarcogyne athroocarpa* H. Magn., was in the Farlow Herbarium (FH), but the *Sarcogyne* is missing from the rock of the type on which there only remains a *Lecidea* taxon that was misidentified as *Sarcogyne "privigna*" auct. non (Ach.) A. Massal. and unambiguously fails to match the protologue (Magnusson 1935). No *Sarcogyne athroocarpa* was found on a duplicate of this collection in NY, only another specimen of the misidentified *Lecidea* species.

Knudsen & Lendemer (2005) designated a neotype for *Sarcogyne novomexicana* that was deposited in the Uppsala Herbarium (UPS) with a duplicate deposited in the New York Botanical Garden (NY). *Sarcogyne novomexicana* has proved to be a rare calcicolous species known currently only from California from Joshua Tree National Park in Riverside County, the San Bernardino Mountains in San Bernardino County, and Yosemite National Park

in Mariposa County (Knudsen & Kocourková, unpublished data; Knudsen & Standley 2007).

The types of *S. integra* and *S. magnussonii* were from the mountains of New Mexico and *S. athroocarpa* was from the mountains of Colorado. Despite our attention to these taxa, we found no material from western North America that could be attributed to these three species. We hypothesized they belonged to a distinctive North American biogeographic unit of lichen distribution we have noted during our taxonomic studies. It encompasses northeastern North America from the Rockies to the Atlantic with the ranges of some species extending south into non-Sonoran Mexico and west into Sonoran Arizona. For instance, *Acarospora chrysops* (Tuck.) H. Magn., *A. janae* K. Knudsen, and *A. tuckerae* K. Knudsen share this distributional pattern (Knudsen 2007; Knudsen et al. 2011; Lendemer 2010). In 2009 and 2010, the lichenologist Colin Freebury (CANL) sent us specimens of a *Sarcogyne* from the northern border of this biogeographical unit on a calcareous conglomerate boulder in Grasslands National Park, in Saskatchewan, Canada (Plate 1). We were surprised when these specimens matched the description of *Sarcogyne magnussonii* (Magnusson 1935). We revise Magnusson's description and designate a neotype to be deposited at CANL and isoneotype at UCR.

Materials & methods

Specimens were examined from CANL, COLO, FH, NY, and UCR. Specimens have been examined using standard microscopical techniques. Structures were studied in water and 10% KOH [K]. Amyloid reactions were tested in Lugol's iodine [I] with and without pretreatment with K. Ascospore measurements were made in water with an accuracy of 0.5 µm. Macrophotographs were taken with a digital camera Olympus DP72 mounted with Quick Photo Camera 2.3 on an Olympus SZX 7 Stereomicroscope. The illustrations were prepared using Adobe Photoshop. The pictures of neotype locality were taken by Colin Freebury.

The species

Sarcogyne magnussonii B. de Lesd., Ann. Crypt. Exot. 5: 107 (1932). Plates 1, 2

Type: **U.S.A. New Mexico.** environs of Las Vegas, Brouard s.n. (Hb. B. de. Lesd, n.v., presumed destroyed). **CANADA. Saskatchewan.** Grasslands National Park, sloped grassland with scattered boulders, 49°10.903′N 107°41.346′W, 795 m, common on a conglomerate boulder of glacial erratic, composed of mostly rounded quartz pebbles held together by calcite May 2, 2010. C. Freebury 1260 (CANL, **neotype designated here;** UCR, isoneotype).

Description — Thallus epilithic, white, about 0.3 mm thick, covering several cm, cracked not areolate, farinose, coating the substrate, unstratified, ecorticate of gelatinized hyphae or polysaccharide secretions mixed with abundant large crystals not dissolving in K, with some distinct hyphae 4–5 µm

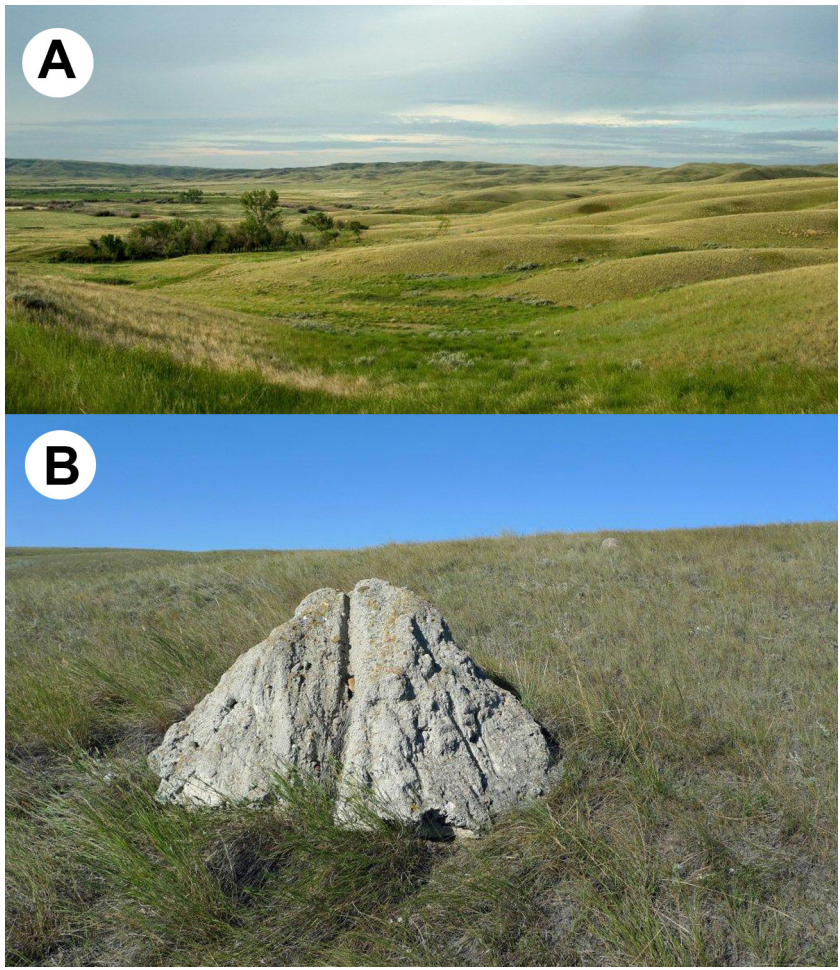

Plate 1. *Sarcogyne magnussonii.* A, Locality of *S. magnussonii* in the Grasslands National Park in Saskatchewan, Canada. B, Solitary boulder with *S. magnussonii*.

wide, and with scattered algal cells, sometimes forming a thin continuous to broken layer (some non-fertile parts of the thallus are necrotic lacking distinct hyphae or lichenized algae or pycnidia, formed only of gelatinized hyphae or polysaccharide secretions and crystals). Apothecia dispersed, emergent, 0.3–1.5 mm in diam., broadly attached with thin algal layer beneath the hypothecium; disc usually smooth, reddish-black and epruinose, becoming only slightly redder when wetted, with thin, smooth, black margins, slightly elevated above the disc, not becoming convex, stipitate, or immarginate and

Plate 2. *Sarcogyne magnussonii* (C. Freebury 1260, isoneotype, UCR), thallus with apothecia. Scale bar = 1 mm.

with no signs of vegetative division. Exciple 100–150 µm thick, of radiating hyphae, outer layer blackish, internally reddish-brown to hyaline, apices expanded up to 6 µm. Hymenium 80–100(–120) µm tall, I+ blue turning yellow-green or red, K/I+ blue, epihymenium 10–15 µm tall, yellowish-brown, paraphyses mostly 2 µm thick, septate, rarely constricted at septa, cells up to 10 µm long, the upper three or four becoming shorter, 3–5 µm long, apices firmly conglutinate, expanded to 3.0–3.5 µm or barely expanded, clavate or not. Asci clavate, 60–70 × 18–20 µm, 100–200 ascospores per ascus. Ascospores various, 4–6 × 2–3 µm, mostly 2 µm wide, often with 1 or 2 oil drops. Subhymenium poorly differentiated from hymenium 30–50 µm thick, I+ blue. Hypothecium narrow, prosoplectenchymatous, c. 10–15 µm thick, poorly differentiated, merging into the exciple. Algal layer beneath the apothecium, usually thin, 20–30 µm thick, algal cells mostly 10 µm diam. Medulla prosoplectenchymatous and gelatinized, continuous with attaching hyphae and thallus, obscure with crystals not dissolving K, and with scattered algal cells, up to 200 µm high. Pycnidia visible as black dots, globose, 50–100 µm in diam. Conidia hyaline, simple, either globose (1 × 1 µm) or minutely bacilliform (1.0 × 1.5 µm). Spot tests negative, containing no apparent exolites.

Other specimen examined — **CANADA. Saskatchewan:** Grasslands National Park, sloped grassland with scattered boulders, 49° 10.903′ N 107°41.346′ W, 795 m, common on a calcareous conglomerate boulder, June 18, 2009, C. Freebury 829B w/ M. Freebury (CANL).

Discussion

Sarcogyne magnussonii is abundant on a single calcareous conglomerate boulder of glacial erratic in the grasslands of Saskatchewan. The specimens from Canada match well both the scant protologue (Bouly de Lesdain 1932) and the more detailed description of Magnusson (1935).

Ecologically, like *Sarcogyne novomexicana, S. magnussonii* was originally collected on silicate rock but probably is predominately a calciphile. Like *S.* "*privigna*," *S. magnussonii* probably occurs on silicate rock in drainages or seeps where calcium is deposited during evaporation (Knudsen & Kocourková 2011).

Magnusson (1935) compared *Sarcogyne magnussonii* only with *S. similis* H. Magn. He noted that the difference between *S. magnussonii* and the widespread *S. similis* was broader ascospores (5–6.5 × 2.5–3 vs. 4–6 × 1.5 µm). We feel this is a poor character as the ascospore sizes of both species actually overlap and are variable (4–6 × 2–3 vs. 4–6 × 1.5–2.5 µm). The apothecia resemble some apothecia of *S. similis,* but do not become convex, stipitate, or immarginate and show no signs of vegetative division, all secondary characteristics of *S. similis.* The real difference between the two species is the well-developed farinose epilithic thallus of *S. magnussonii* with frequent pycnidia and emergent apothecia.

The only other North America species that sometimes produces a white or dun-colored epilithic thallus is *Sarcogyne arenosa* (Herre) K. Knudsen & Standl. (Knudsen & Standley 2007; Lendemer et al. 2009). That species usually has a chasmolithic thallus that is ecorticate and whitish when visible, often as a ring subtending the exciple. It rarely becomes epilithic, sub-corticate, and sub-areolate on crumbling rock, and can even turn a light brown in full sun. It has a firm texture, while the thallus of *S. magnussonii* is farinose. The thallus of *S. arenosa* is also thin, usually ≤ 0.1 mm thick, while the thallus of *S. magnussonii* is thicker, usually 0.3 mm. *Sarcogyne arenosa* also has mostly narrowly ellipsoid ascospores (3.5–5 × 1–1.5 µm), while the ascospores of *S. magnussonii* are usually wider (2–3 µm). *Sarcogyne arenosa* occurs on both silicate rock and soil as well as calcareous rock and soil, while *S. magnussonii* probably prefers calcareous rock and silicate rock drainages with calcium deposits. The two species may be sympatric in the Midwest or in New Mexico or Texas, but *S. arenosa* is only apparently common in California, from where it was originally described. The two species can be easily separated based on the differences in ascospore sizes and texture and thickness of the thallus.

Six *Sarcogyne* species from Europe and Asia have thinner white ecorticate epilithic or chasmolithic thalli than *S. magnussonii* and occur on calcareous rocks (Knudsen et al. 2009). They all differ especially in having larger or globose ascospores (see the "nivea group" table in Knudsen et al. 2009).

Sarcogyne cretacea Poelt grows on limestone in the Alps in Europe and produces a thicker epilithic thallus than *S. magnussonii,* 5.0 vs. 0.3 mm thick (Knudsen et al. 2009; Poelt 1964). The *S. cretacea* thallus is chalky and firm with distinct rounded contours, confluent individuals, and a dun-colored edge. The *S. magnussonii* thallus is loosely organized without any stratification and without a distinct edge. It is soft and easily abraded. The farinose ecorticate structure of *S. magnussonii* thallus would not support a thallus 5 mm thick as in *S. cretacea*. Otherwise their apothecial size, hymenium height, and ascospore size overlap and do not significantly differ. But *S. cretacea* has longer conidia than *S. magnussonii* (2.0–2.5 × 1.0 vs. 1.0 × 1.0–1.5 μm). The two species can be distinguished by the difference in the thallus structure and thickness and conidial size. Other *Sarcogyne* species are mainly identified by their thallus structure and conidia, for instance *S. crustacea* K. Knudsen & Kocourk. from California and *S. brunnea* K. Knudsen & Flakus from South America (Knudsen & Kocourková 2010; Knudsen et al. 2012).

The neotypification of *Sarcogyne magnussonii* is important for the further study of the North American lichen biota. Its revision will hopefully lead to the discovery of new populations. We are happy to designate the neotype of *S. magnussonii* and now have some hope of discovering populations of *S. integra* and *S. athroocarpa.*

Acknowledgements

We thank our reviewers, Erin Tripp (RSBG) and James C. Lendemer (NY). We thank Colin Freebury (CANL) who re-discovered *Sarcogyne magnussonii*. The work of Jana Kocourková was supported financially by the grant "Environmental aspects of sustainable development of society" 42900/1312/3166 from the Faculty of Environmental Sciences, Czech University of Life Sciences Prague.

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