

## Note on *Caloplaca soralifera* (Teloschistaceae, lichenized Ascomycetes) in Poland

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### Abstract

*Caloplaca soralifera* is reported for the first time from Poland. The species belongs to the group of sorediate representatives of *Caloplaca* lacking anthraquinones in the thallus. Detailed description of the species along with taxonomic comment is provided and its known distribution in the country is discussed and illustrated.

**Keywords:** lichenized fungi, *Caloplaca*, new record, distribution, taxonomy

### Introduction

In accordance with the recent development of taxonomic studies on *Caloplaca* global and local knowledge of the genus increased rapidly [1-5]. Hundreds of species received modern circumscription and great number of new ones were described in the recent decade [6-8]. The ongoing revision of the *Caloplaca* genus in Poland indicated several species new to the country [9,10]. Further study resulted in discovery of *C. soralifera* Vondrák & Hrouzek that is here reported for the first time from the area of Poland.

*Caloplaca soralifera* is most recently described species and belongs to the group of sorediate representatives of *Caloplaca* lacking anthraquinones in the thallus [11]. When fertile, the species is distinctive due to zeorine, orange colored apothecia. However, *C. soralifera* also occurs in a sterile form that is inconspicuous and probably often overlooked. *Caloplaca soralifera* was mainly reported from man-made substrata so far, e.g. concrete and mortar in rural/urbanized areas. The distribution range of this species is expanding [11].

The species is characterized in detail and a taxonomic discussion explaining the differences between most similar species is provided in the paper; its distribution and ecology is also discussed.

### Material and methods

The material was studied from the following herbaria: CBFS, H, KRAM, KRAP, KTC, MIN, POZ, PRM, UGDA.

Morphological characters were examined on dry material using a dissecting microscope. Anatomical characters were measured on hand-cut sections and squash preparations mounted in water. The structure of paraphyses and cortical tissues were observed in 25% KOH (K). The granulation of tissues was observed in polarized light; pol+/pol- means that the granules reflect or do not reflect polarized light. The solubility of granules and/or crystals was tested with K and 65% nitric acid (N). K and N were also used for spot test reactions. The terminology for tissues follows [2,12,13].

#### Material used for comparison

*C. albolutescens* (Nyl.) H. Olivier. United Kingdom. England, Tyneside, Northumberland, Stocksfield, 1878, W. Johnson (H-Nyl. 29845, holotype of *Lecanora albolutescens* Nyl.).

*C. concreticola* Vondrák & Khodosovtsev. Ukraine. Khersonska oblast, Chaplinskiy district, ca. 4.5 km W of village Zaozerne, Kakhovskiy water channel, 2006.06.07, J. Vondrák & J. Šoun (CBFS JV4636, holotype).

*C. pratensis* Wetmore. USA. North Dakota, Oliver Co., The Nature Conservancy's Cross Ranch Preserve, Sangor Ghost Town, 2007.06.05, M. K. Advaita 6100 (MIN, holotype).

*C. xerica* Poelt & Vězda. Bulgaria. Eastern Rodopi Mts., Ljubimec, Malko Gradište, 2004.04.19, J. Vondrák 2181 (CBFS). Turkey: Eastern Turkey, Artvin, 2007.04.29, J. Vondrák 6443 (CBFS).

*C. teicholyta* (Ach.) J. Steiner. Poland. Pojezierze Kujawskie, Wrząca Wielka, 1983.10.19, Z. Tobolewski & J. Sierakowska (POZ). Israel. Jordan Valley, Beth-Shean, 1996.06.22, J. J. Wójcicki & M. Sugiera (KRAM-L 44784).

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## Results

### Description of the species

*Caloplaca soralifera* Vondrák & Hrouzek, *Graphis Scripta* 18: 6 (2006).

**HOLOTYPE:** The Czech Republic, Central Bohemia, Rakovník Distr., Křivoklát, Kalubice, by the small pond in the village, alt. 348 m, 50°02'56.3"N 13°49'30.4"E, on horizontal side of concrete wall, 2004.12.28, J. Vondrák 3332 (PRM!).

Thallus epilithic, ± thin, 150-250 µm thick, areolate, irregular in shape, pale to dark grey, usually white pruinose; soralia present, marginal, soredia dark violet-grey, 20-50 µm diam. Areoles flat to strongly convex, scattered or crowded. Thallus cortex inconspicuous, almost completely obscured by hyaline crystals (pol+, insoluble in K, soluble in N), or seldom cortex well visible, up to 35 µm wide, pale greyish, paraplectenchymatous, with necral layer ca. 5.0-8.5 µm wide; algae intermixed with distinct isodiametric fungal cells, without crystals.

Apothecia zeorine, crowded to more rarely scattered, sessile, round or angular and flexuous due to mutual compression, 0.3-0.8 mm diam.; disc flat, orange to dark orange; proper margin thick, persistent, raised above the disc, smooth, paler than disc; thalline margin thin, usually white pruinose. Parathecium well developed, 85-100(-110) µm thick, prosoplectenchymatous, lumina of cells elongated and narrow. Amphithecium present, with abundant algae, cortex indistinct, obscured by hyaline crystals (pol+, insoluble in K, soluble in N). Epihymenium granular, yellowish orange, K+ red. Hymenium hyaline, 68-77(-110) µm tall. Paraphyses simple to slightly branched, apical cells not thickened to slightly thickened, up to 5 µm wide. Hypothecium hyaline, with irregular hyphae, sometimes with oil droplets. Asci 8-spored, spores polaribilocular, thin-walled, broadly ellipsoid, 12-15.3(-17) × 5-8.5(-10) µm, isthmus 3.4-5.4(-6.8) µm wide.

Pycnidia inconspicuous, immersed in thallus; conidia colorless, ellipsoid, 2.5-3.5 × ca. 1.5 µm.

Spot test reactions: thallus and soredia K+ violet, N+ violet; apothecial disc and proper margin K+ red.

### Distribution and ecology

The species was recorded on scattered sites both in the area of northern and southern Poland (Fig. 1). It is perhaps much more widespread in the country but undercollected.

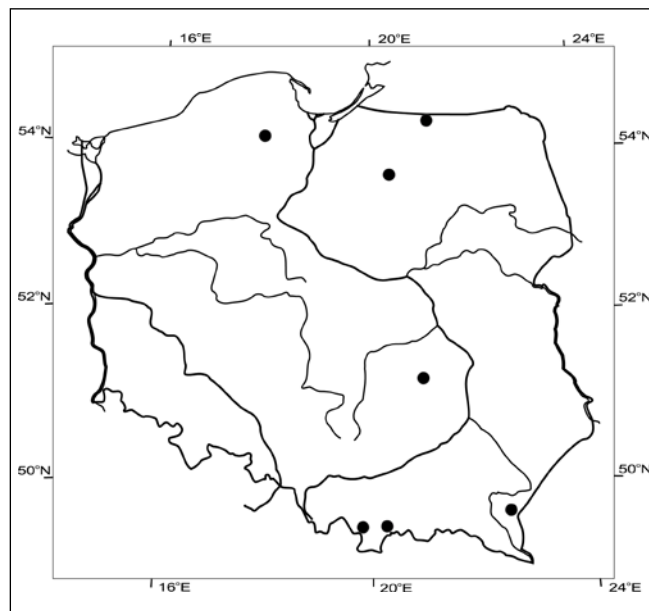
Until now *Caloplaca soralifera* has been reported from the following European countries: Austria, Bulgaria, the Czech Republic, Germany, Slovakia, Romania [11], Britain [14] and Ukraine [15]. It has been also recorded from USA [4].

The species usually grows on artificial substrata (e.g., concrete, mortar, asphalt, nutrient-rich siliceous stones), and only rarely on natural ones (e.g., calcareous or base-rich siliceous rocks) [11]. In Poland the species was found on both considered substrate types – mainly on concrete and less frequently on calcareous stones.

EXSICCATES SEEN. Wetmore, Telosch. Exsicc. 89, 90, 91 (KRAM).

**SPECIMENS EXAMINED.** Poland. Pomerania Province, Wdzydze Landscape Park, Borsuk village, 53°56'60"N 17°55'35"E, 2006.09.13, L. Śliwa 3638b with E. Adamska & W. Gruszka (UGDA). Warmia-Masuria Province, Nizina Sępopolska lowland, Silginy, 1989.05.04, J. Nowak (KRAM-L 26309). Masurian Lakeland, Równina Mazurska plain, 1 km W of Rustkowo village, by road Nidzica-Wielbark,

1989.04.30, J. Nowak (KRAM-L 26198). Wyzyna Kielecka Upland, Przedgórze Iłżeckie, Klarnerowo, 2.5 km N of Starachowice, 1988.08, A. Lenard (KTC). Eastern Carpathians, Pogórze Przemyskie foothills, Rybotyczne town, by Wiar river, 1993.09.07, J. Nowak (KRAM-L 34222), *ibid.*, 1985.09.10, J. Kiszka (KRAM-L 31524). Western Carpathians: Kotlina Nowotarska, Czarny Dunajec town, 1999.08.08, B. Repa (KRAP), Gorce Mts, Góra Wdźar Mt. above Czorsztyn, 1993.06.17, J. Kiszka (KRAP).



**Fig. 1** Known distribution of *C. soralifera* Vondrák & Hrouzek in Poland.

## Discussion

*Caloplaca soralifera* is characterized by an areolate, grey, often whitish pruinose thallus. The apothecia are zeorine with proper and thalline margins present, orange and grey respectively. The dark violet-grey soredia produced on the margin of thalline areoles and presence of thalline cortex are most diagnostic characters for the species.

*Caloplaca soralifera* is closely related with *C. xerica* [11]. The latter species, however, differs in having esorediate, isidiate thallus and quite different ecology – it occurs mainly in xerothermic habitats and occupies base-rich siliceous rocks. *Caloplaca chlorina* (Flot.) H. Olivier is another similar taxon but it is distinguished by a typical lecanorine apothecia, rarely pruinose thallus and ecology; the species occurs mainly on siliceous stones and rocks (see also [11]). Concerning both habit of thallus and apothecia as well as ecology *C. soralifera* seems related to *C. albolutescens*. In case of the latter species lack of thalline cortex is a helpful, distinguishing character. Moreover, the whole thallus of *C. albolutescens* is filled by crystals on a cross section (pol+, insoluble in K, soluble in N) and the structure of the algal layer is almost invisible, whereas, in *C. soralifera* crystals obscure only the cortex and the structure of algal layer is clearly visible, with distinct isodiametric fungal cells intermixed with algae. What is more, the thallus of *C. albolutescens* is white and tartareous, instead of grey and compact in *C. soralifera*. When sterile, *C. soralifera* could be confused most likely with *C. concreticola*. Beside morphological similarities both taxa occur on the same man-made substrata

such as concrete. The reaction with K of the thallus cortex is a main character distinguishing those species; *C. soralifera* reacts K+ violet, whereas *C. concreticola* does not react with K. When fertile, *C. concreticola* is easily distinguished from *C. soralifera* due to its brownish apothecia [16]. Finally, *C. pratensis* is somewhat similar to *C. soralifera* in the thallus appearance. The former species differs in soredia mainly present on the upper surface of the areoles and brownish apothecia. *Caloplaca pratensis*, however, is known only from North America so far [4].

The studied material from Poland was often misidentified as *C. teicholyta*. The latter species is in fact quite different than *C. soralifera*. It has thick thallus, roundish in outline, and lobate at its margin. The areoles in the center of thallus are dissolved into granules, isidia and soredia giving the surface scruffy-granular appearance. Moreover, *C. teicholyta* rarely forms apothecia; they are distinctly reddish when present.

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