Caloplaca soralifera, a new species from Europe

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Vondrák, J. & Hrouzek, P. 2006: Caloplaca soralifera, a new species from Europe. *Graphis Scripta 18*: 6–15. Stockholm. ISSN 0901-7593.

Caloplaca soralifera Vondrák & Hrouzek is described as new. It belongs to a group of sorediate *Caloplaca* species lacking anthraquinones in the thallus. It has been found in six countries in Europe. An overview of similar *Caloplaca* species from Europe and North America is presented. *C. chlorina* and *C. xerica* are compared with the new species in detail. Based on HPLC-MS analysis the anthraquinone contents in *C. chlorina*, *C. soralifera*, and *C. xerica* were investigated.

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Within the large genus *Caloplaca*, there is a group of sorediate *Caloplaca* species lacking anthraquinones in their thalli including soralia. Without yellow, orange or reddish pigments in the thallus, the members of this group are often rather inconspicuous – especially when they form sterile populations. This group is not homogeneous and includes species with different apothecial morphology and anatomy (Tab. 1).

In 2002, we first found some strange specimens of a species belonging to this group growing on asphalt pathways and old concrete panels in urbanized areas. We found that these samples belonged to a taxon which failed to fit any of the previously known species, and that it needed to be described.

Materials and methods

The new species is described mainly on material collected by the first author in 2002–2005. Vouchers are currently deposited in the herbarium of the Faculty of Biological Sciences at the University of South Bohemia in České Budějovice (CBFS). Several samples from BM, PRM, and GZU were also included in the study. For HPLC-MS analysis, *Caloplaca chlorina* samples CBFS 1982, 2055, 2056, 3120, *C. soralifera* samples CBFS 1169, 1199, 1200, 1474, 1760, 2527, 2795, and *C. xerica* samples CBFS 1124, 1798, 2181, 2496 were used.

The light microscopy measurements used for statistical calculations were performed with an oil-immersion lens on material mounted in water and achieved an accuracy of 0.5 µm or 1 µm, eventually 10 µm in larger structures. The measurements are given as (min.–)X–SD–X–X+SD(–max.), where X = mean value and SD = standard deviation. Total numbers of measurements (n) are given in parentheses. In each specimen, two to five measurements were done.

HPLC-MS analysis: Thirteen samples of apothecia and three thallus samples were extracted with pure acetone as described by Søchting (1997). Extracts composition was analyzed with HP Agilent mass spectrometer

HP 100 MSD SL-Ion trap. The extracts were subjected to analysis on reversed phase column (Zorbax XBD C8, 46×150 mm, 5 µm) at 35 °C using gradient MeOH/30 % MeOH + 1 % phosphoric acid (Søchting 1997). Absorbance was read at 270 nm. The peaks were identified

Table 1. List of the European and North American sorediate *Caloplaca* species, which lack anthraquinones in their thalli and soralia. The ecology given follows the references in the last column.

Species	Substrate	References
Caloplaca ahtii Søchting	bark	Søchting 1994
Caloplaca albolutescens (Nyl.) H.Olivier	concrete, calcareous sandstones, rarely other base-rich rocks	Wade 1965, Wirth 1995
Caloplaca alstrupii Søchting	bark	Søchting 1999
Caloplaca chlorina (Flot.) H.Olivier	nutrient-rich siliceous stones and rocks in rather damp situations, bark of trees	Wetmore 1996, Søchting 1994, Tønsberg 1992
Caloplaca demissa (Körb.) Arup & Grube	vertical or overhanging base-rich siliceous rocks	Arup & Grube 1999
Caloplaca erodens Tretiach, Pinna & Grube	hard limestone	Tretiach et al. 2003
C. jemtlandica var. *cerinosora* Hansen, Poelt & Søchting	bark of *Salix glauca* in Greenland	Hansen et al. 1987, Søchting 1994
Caloplaca obscurella (Lahm ex Körb.) Th.Fr.	bark	Søchting 1994, Tønsberg 1992
Caloplaca pinicola Wetmore	bark and wood of conifers in North America	Wetmore 2004
Caloplaca scythica Khodosovtsev & Søchting	twigs of small shrubs in steppe habitats near the Black Sea	Kondratyuk et al. 1998
Caloplaca soralifera Vondrák & Hrouzek	concrete, asphalt, base-rich siliceous rocks and pebbles	this study
Caloplaca sorocarpa (Vain.) Zahlbr.	twigs of alpine shrubs	Poelt 1955, Søchting 1994
Caloplaca teicholyta (Ach.) J.Steiner	base-rich siliceous and calcareous rocks; calcareous stone, mostly walls and monuments; concrete and mortar	Laundon 1992, Wirth 1995
Caloplaca ulcerosa Coppins & P.James	bark of *Acer* and *Ulmus*	Coppins & James 1979, Søchting 1994
Caloplaca virescens (Sm.) Coppins	bark	Laundon 1992

according to retention times, absorbance spectra and in some cases according to obtained molecular weights.

The nomenclature follows Nimis & Martellos (2003).

Caloplaca soralifera Vondrák & Hrouzek *sp. nov.*

Caloplacae xericae similis sed differt thallo soredioso. Soralia ad marginem areolarum thalli disposita, raro totam superficiem thalli obducentia. Soredia grisea vel griseo-violacea, (22–)26–34–42(–50) µm diametro, pigmentum "Sedifolia-grey" dictum continentia.

Type: 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, 28 December 2004, J. Vondrák 3332 (PRM holotype; isotypes will be distributed in the first fascicle of *Selected exsiccates of Caloplaca*, no 22).

Thallus crustose and areolate to sub-squamulose, (50–)80–104.5–120(–140) µm thick (n=15), dark to pale grey, but often whitish pruinose (Fig. 1). Areoles flat to convex, (0.2–)0.3–0.45–0.6(–0.8) mm in diameter (n=30). Dark grey to violet-grey soralia are produced on the margins of the areoles and squamules. Occasionally, the soralia expand to cover the whole thallus surface. Soredia (22–)26–34–42(–50) µm in diameter (n=40). Cortex greyish to violet-grey in section, (5–)9–18–27(–35) µm thick (n=15), consisting of a loose or tight paraplecten-chymatous tissue of cells (3.5–)4.0–5.0–6.0(–7.0) µm in diameter (n=15) and covered by a thin epinecral layer, 2.0–5.0–8.0(–12.0) µm thick (n=15). Algal layer consisting of a mixture of algal cells (4.0–)6.0–10.0–14.0(–20.0) µm in diameter (n=40) and ± isodiametric fungal cells (2.5–)3.5–5.0–6.5(–11.0) µm in diameter (n=30). Medulla inconspicuous. Soredia and cortex K+ violet, C+ violet, N+ grey-violet, containing the pigment Sedifolia-grey (Meyer & Printzen 2000).

Apothecia (0.2–)0.35–0.5–0.65(–1.0) mm in diameter (n=30) with orange, dark orange or brown disc, yellow to orange true exciple and grey or whitish pruinose thalline exciple (Fig. 2) without anthraquinones. True exciple always well-developed, (30–)48–69.5–91(–110) µm thick (n=15), consisting of long and narrow, thin-walled cells. Outer cells (3.0–)3.5–4.5–5.5(–6.0) µm wide and inner cells (1.0–)2.0–3.0–4.0(–5.0) µm wide (both n=30). True exciple continuing into hypothecium as a c. 10–30 µm thick tight tissue of long and narrow cells in the lowermost part of hypothecium. Thalline exciple (50–)60–90–120(–130) µm thick (n=15), often covered by a pruinose layer,

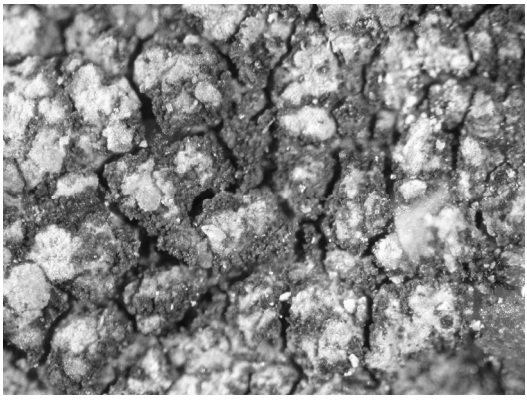

Figure 1. Thallus of *Caloplaca soralifera* with abundant soralia (isotype material).

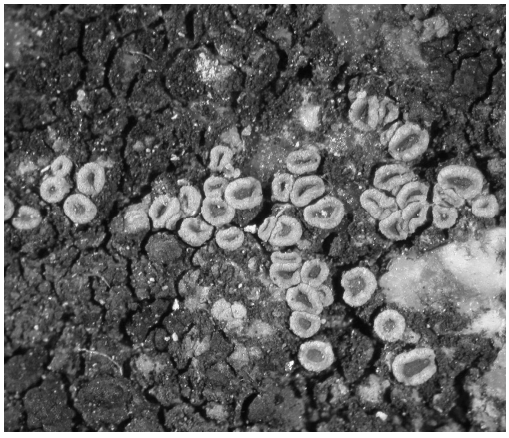

Figure 2. Apothecia of *Caloplaca soralifera* (isotype material).

up to 35 µm thick. True exciple/thalline exciple ratio strongly fluctuating and depending on the apothecium development. Hypothecium hyaline, (40–)60–80–100(–110) µm high (n=15), consisting of irregular arranged hyphae. Hymenium hyaline, (70–)72–83–94(–100) µm high (n=15). Oil drops commonly occurring in hymenium and hypothecium. Asci (50–)52–60–69(–80) × (12–)13–17–20(–23) µm in size (n=15). Paraphyses c. 1.5–3.0 µm wide, branched and rarely anastomosed. Paraphyse tips 2.5–3.5–4.5(–6.5) µm wide (n=30), 1–4 upper cells broadened. Spores polarilocular, hyaline, (11.5–)12.0–13.0–14.0(–15.5) × (4.0–)5.0–6.5–8.0(–10.0) µm (n=30). Septum of mature spores 3.5–4.5–5.5(–7.5) µm thick (n=30). Apothecia C– (epihymenium weakly and slowly C+ orange-red in cross-section), K+ violet-red, PD–.

Pycnidia chambered, immersed in the thallus surface, c. 100–150 µm in diameter, of the same colour or somewhat darker than the thallus. Wall of pycnidia grey in section, containing Sedifolia-grey. Conidiophores branched and anastomosed. Conidia produced terminally and laterally, ellipsoid, (2.5–)2.75–3–3.25(–3.5) × 1.0–1.25–1.5 µm (n=15). Conidiogenous cells isodiametric, triangular or elongated, (3.0–)3.5–4.5–5.5(–6.5) µm in diameter (n=18).

For apothecial anatomy, shape of spores and conidiophores, see Fig. 3.

Chemistry. No antraquinone content was recorded in the thallus of *Caloplaca soralifera* but the presence of the pigment Sedifolia-grey, which is insoluble in acetone, was detected in the cortex and the soredia. In the apothecia of *C. soralifera*, the dominant component was parietin (81.8±4.7 %). Lower contents (0–12 %) of other anhraquinones (fragilin, emodin, emodial, emodic acid and 7-chloremodin) were found (Tab. 2). Similar composition was observed in apothecia of *C. chlorina*, where parietin was the dominant component (88.1±6.5 %) and presence of fragilin (4.5±3.2 %) and emodin (5.1±2.6 %) was confirmed. Although these two species have similar composition, differences can be found in less abundant anthraquinones (emodic acid and 7-chloremodin) and also in concentrations of parietin, fragilin and emodin. The composition of *C. soralifera* and *C. chlorina* is clearly different from the anthraquinone content of *C. xerica*, where fragilin is the dominant component, whereas emodin and especially

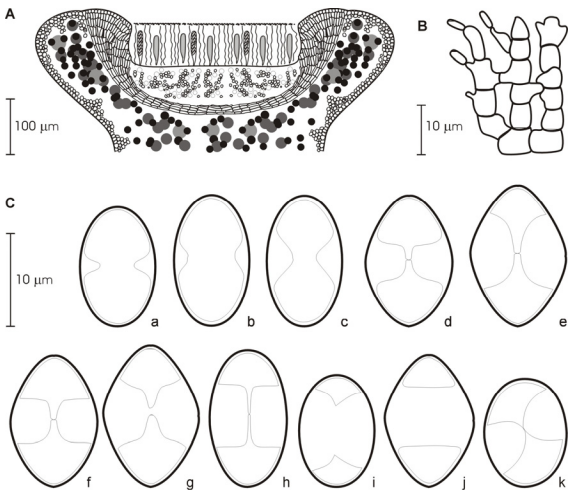

Figure 3. *Caloplaca soralifera*. A, Vertical cross-section through apothecium. B, Conidiophores with lateral and apical conidiogenous cells and with attached conidia. C, Ascospores (a-c, young spores; d-h, mature spores; i-k, old and deformed spores).

Table 2. Anthraquinone composition of apothecia samples of *Caloplaca chlorina*, *C. soralifera*, and *C. xerica*. Abbreviations: CIR – citreorosein, EML – emodial, EMC – emodic acid, PRC – parietinic acid, EMD – emodin, CLE – 7-chloremodin, PAR – parietin, FRG – fragilin.

	CIR	EML	EMC	PRC	EMD	CLE	PAR	FRG
Caloplaca soralifera								
CBFS 1169	0,9	3	0,9	0	2,7	0	81,5	11
CBFS 1328	1	2,6	1	0	2,4	4,5	80,2	8,3
CBFS 1199	0,3	0	0,5	0	1,1	0,6	81	16,5
CBFS 1200	7,1	0	0,9	0	1,8	0	83,7	6,6
CBFS 1474	0,6	0,9	0	0	1,3	1	73	23,1
CBFS 1760	0	0	0	0	0	5,5	89,6	4,8
CBFS 2795	0,4	1,6	0,4	0	5	0	84,8	7,8
	1,5±2,5	**1,2±1,3**	**0,5±0,4**	**0±0**	**2,0±1,4**	**1,7±2,3**	**82,0±5**	**11,2±6,5**
Caloplaca chlorina								
CBFS 1982	0,9	2,1	0,0	0,0	6,9	0,0	83,2	6,9
CBFS 3120	0,9	1,7	0,0	0,0	3,1	0,0	87,6	6,8
CBFS 2055	0,0	0,0	0,0	0,0	2,6	0,0	97,4	0,0
CBFS 2056	1,1	2,2	0,0	0,0	7,9	0,0	84,3	4,5
	0,7±0,5	**1,5±1,0**	**0±0**	**0±0**	**5,1±2,6**	**0±0**	**88,1±6,5**	**4,5±3,2**
Caloplaca xerica								
CBFS 1124	0,0	0,0	0,5	1,7	0,0	5,1	0,0	92,7
CBFS 1798	0,0	0,0	0,4	1,1	0,0	6,4	0,0	92,1
CBFS 2128	0,0	0,0	1,5	3,5	0,0	5,8	0,0	89,2
CBFS 2496	0,0	0,0	1,3	1,7	0,0	8,5	0,0	88,5
	0±0	**0±0**	**0,9±0,6**	**2,0±1,0**	**0±0**	**6,5±1,5**	**0±0**	**90,6±2,1**

parietin are missing (total absence of parietin ion m/z=285). According to our observation, these species belong to different chemosyndroms, as defined by Søchting (1997, 2001). While the anthraquinone content of the apothecia in *C. xerica* is similar to chemosyndrom B (Søchting 2001), *C. chlorina* and *C. soralifera*, containing parietin as a major compound, belong to chemosyndrom A (Søchting 1997). HPLC-chromatograms of *Caloplaca chlorina*, *C. soralifera*, and *C. xerica* are given in Fig. 4.

Variability. The thallus colour of *Caloplaca soralifera* varies noticeably from very pale to dark grey. When growing on lime-rich substrates, most commonly on concrete, it has almost a whitish colour caused by a pruina. The colour of the apothecia changes during the development. Young apothecia usually have orange discs and yellowish exciples with whitish pruina on the outer margin, while older apothecia can have dark red or almost black discs and reddish true exciples. The darkening of older apothecia is often caused by the

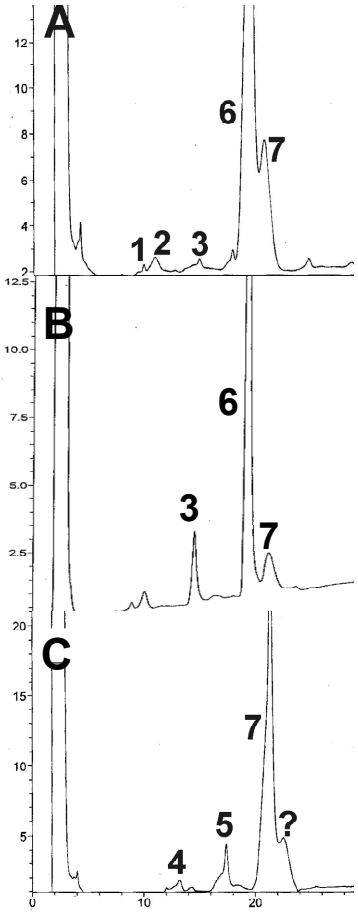

Figure 4. HPLC-chromatograms. A. *Caloplaca soralifera* (CBFS 1169). B. *Caloplaca chlorina* (CBFS 3120). C. *Caloplaca xerica* (CBFS 1798). (1. citreorosein, 2. emodial, 3. emodin, 4. emodic acid, 5. 7-chloremodin, 6. parietin, 7. fragilin).

parasitic hyphomycete *Intralichen christiansenii* (D.Hawksw.) D.Hawksw. & M.S.Cole. Strong variability is also observable in the ratio of thalline exciple vs. true exciple. While the young apothecia appear to be biatorine (without outer thalline margin), the proportion of outer grey margin increases in older apothecia. In extreme cases, the old ascocarps can resemble lecanorine apothecia.

Ecology. *Caloplaca soralifera* usually grows on artificial substrata, such as asphalt, concrete, mortar or nutrient-rich siliceous stones, very often on pebbles on railroads. Only rarely it occurs in natural habitats such as calcareous and base-rich siliceous rocks. It was once recorded on bark of a lime tree and on a dust-impregnated wood. It occurs most frequently on exposed horizontal sides, but some records come from vertical sides of various expositions. The species *Caloplaca crenulatella*, *C. flavocitrina*, *Lecanora muralis* and *Verrucaria nigrescens* frequently occur together with *C. soralifera*.

Distribution. *C. soralifera* is currently known from Austria, Bulgaria, the Czech Republic, Germany, Slovakia and Romania (Fig. 5). In the Czech Republic, where the species has been most frequently recorded, it seems to be very common. Its vertical distribution range from 220 to 1450 m.

Discussion. *Caloplaca furax*, *C. spalatensis* (syn. *C. areolata*) and *C. xerica* are very similar to *C. soralifera* in the apothecium structure. All three species have zeorine apothecia with an excipular tissue that continues in the lowermost part of the hypothecium (Fig. 3A). *C. furax* irregularly produces large lobules on the thallus surface, its thallus is delimited by conspicuous marginal lobes and it never produces soredia (GZU, isotype!, Murc. lichenotheca no. 3039). In addition, Egea & Llimona (1983) considered *C. furax* a strictly parasitic species on *Aspicilia* sp. *Caloplaca spalatensis* does not produce any structures for vegetative dispersal and has flat areoles (W, holotype of *C. areolata*!, samples in GZU!). It occurs on calcareous bird perching boulders in the Mediterranean (Martellos & Nimis 2000). We consider *C. xerica* (GZU, holotype!) the most similar species to *C. soralifera*, even if the former never produces soredia. Based on morphology, *C. soralifera* represents a sorediate counterpart to *C. xerica*,

Table 3. Comparison of *Caloplaca chlorina*, *C. soralifera* and *C. xerica* in selected characters and substrate ecology.

Character	*Caloplaca chlorina*	*Caloplaca soralifera*	*Caloplaca xerica*
Ascospores	11–14(–15.5) × 5.5–7 µm	(11.5–)12–13–14(–15.5) × (4–)5–6.5–8(–10) µm	11–18 × 5.5–7 µm
Ascospore septum	3.5–5.5 µm	3.5–4.5–5.5(–7.5) µm	2.5–6 µm
Exciple	lecanorine	zeorine	zeorine
Thallus colour	olive grey to dark grey	grey or whitish pruinose	dark grey or blackish
Thallus pigmentation	*Sedifolia*-grey	*Sedifolia*-grey	*Sedifolia*-grey
Thallus surface	smooth or rarely pruinose, areoles flat to convex	smooth or pruinose, areoles mostly convex	blastidiate
Vegetative reproduction	soredia, consoredia, isidia-like projections	soredia	isidia, blastidia
Chemosyndrome	A	A	B
Substrate	nutrient-rich siliceous stones and rocks in rather damp situations, bark of trees	concrete, asphalt, mortar (rarely on base-rich siliceous rocks)	xerothermic habitats on base-rich siliceous rocks
References	Tønsberg (1992), Wetmore (1996)	this study	Poelt (1975)

thus the belonging to different chemosyndromes is surprising.

When sterile, *C. soralifera* can be confused also with *C. chlorina* but this species usually has a non-pruinose thallus. When fertile, *C. chlorina* clearly differs in its typical lecanorine apothecial margin. Morphological characters of *C. chlorina*, *C. soralifera* and *C. xerica* are given in Tab. 3.

In the investigated localities, *C. soralifera* is usually a common or even predominant species. Therefore, it is surprising that it has not been described so far. During three years of collecting this species, the abundance of *C. soralifera* has obviously increased in some localities. As investigated by van Herk et al. (2002), many nitrophilous and basiphilous lichen species have recently extended their distribution areas because of increasing temperatures. Some species recently described from Western Europe are reported to be rapidly spreading as neophytics (e.g. Aptroot & van Herk 1999a, b). Possibly, the extending of the substratum range of *C. soralifera* to include various artificial substrata has recently taken place. Its distribution range is apparently expanding. We suppose it will be found in many new European countries in the future.

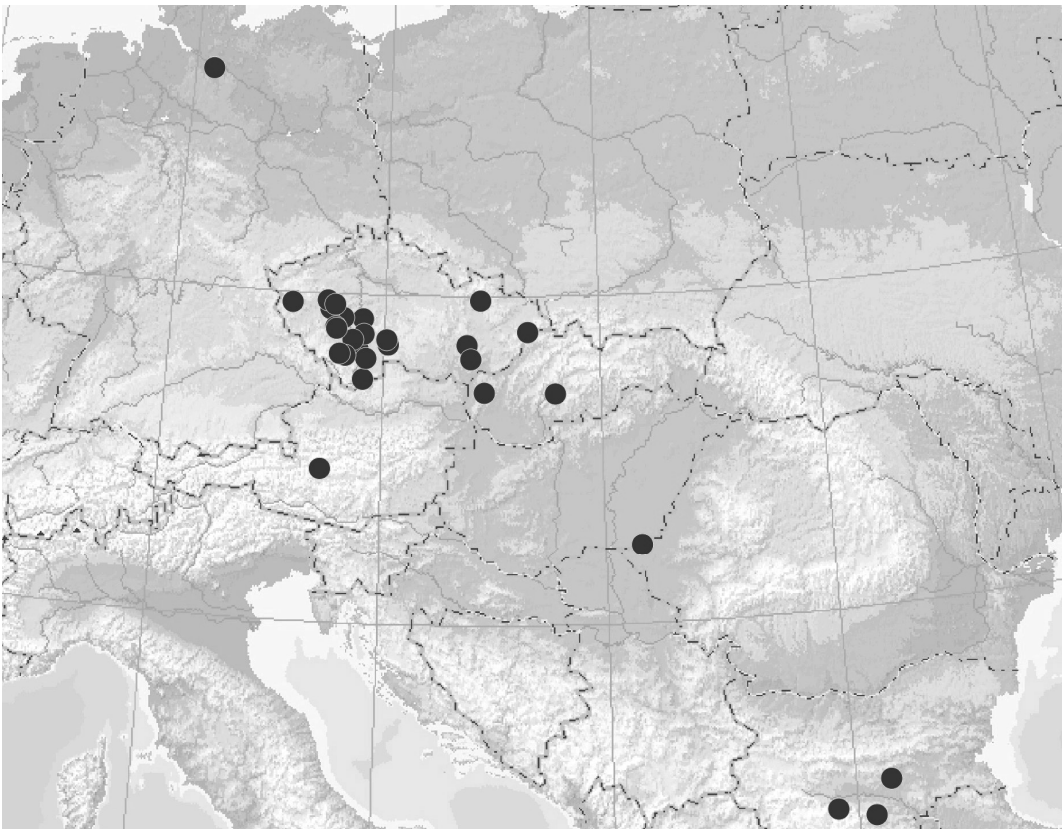

Figure 5. Known distribution of *Caloplaca soralifera* in Europe.

Specimens examined: **Austria.** *Steiermark*: Ennstal, Pichl bei Schladming, eiszeitliche Moränen N Pichlmayrgut, alt. 800 m, on nutrient-rich sunny limestone, 1991, Berger (GZU, sub *Caloplaca albolutescens*). **Bulgaria.** Kurdzhali, Shiroko Pole, protected area "Sredna Arda", c. 5 km E of village, 41°37'N, 25°31'E, alt. c. 240 m, on concrete near railway station "Sredna Arda" and on concrete wall above railway, 2004, Vondrák (CBFS 2009, 2012); Plovdiv, Asenovgrad, Dobrostan, Sv. Iliya chapel above village, 41°56'N, 24°54'E, alt. 1320 m, on mortar, 2004, Vondrák (CBFS 1994); Stara Zagora, Mihaylovo, railway station, 42°16'N, 25°31'E, on horizontal side of concrete, 2004, Vondrák (CBFS 2068). **Czech Republic.** Benešov u Prahy, railway station, on horizontal side of concrete panel, 2005, Vondrák (CBFS 3008); Beroun, Nižbor, small rocky outcrop in S edge of village, 49°59'57.2"N, 14°00'03.6"E, alt. 220 m, on S-exposed base-rich, schist rock, 2005, Vondrák (CBFS 2501); Choceň, in town, on Tichá Orlice riverside, alt. c. 300 m, on horizontal side of concrete wall, 2005, Vondrák (CBFS 3033); České Budějovice, park "Stromovka", 48°58'20"N, 14°27'30"E, alt. 390 m, on concrete wall, 2003, Vondrák (CBFS 960); České Budějovice, Dubné, Záboří, in village, on horizontal side of concrete panel, 2003, Vondrák (CBFS 1199); Frýdlant nad Ostravicí, Čeladná, Podolánky, nearby hotel "Srdce Beskyd", alt. c.700 m, on concrete in pathway, 2005, Vondrák (CBFS 3154); Hořovice, Točník, in village, 49°53'20"N, 13°53'10"E, alt. 340 m, on horizontal side of concrete panel, 2003, Vondrák (CBFS 1197); Jindřichův Hradec, Jarošov nad Nežárkou, weir on Nežárka river near town, alt. 475 m, on granite stones in concrete wall, 2005, Vondrák (CBFS 3117); Jindřichův Hradec,

Kamenice nad Lipou, "Hutě" settlement, alt. c. 620 m, on vertical side of concrete panel, 2004, Vondrák (CBFS 3118); Kaplice, Benešov nad Černou, in town, alt. 670 m, on silicate stones in dust-impregnated wall (CBFS 2305, 2312, 2326); Kyjov, at airport, on asphalt, 2003, Vondrák (CBFS 1306); Milevsko, N edge of town, 49°28'N, 14°22'E, alt. 450 m, on concrete on pond-dam, 2004, Vondrák (CBFS 1758); Písek, railway station, on horizontal side of concrete wall, 2003, Vondrák (CBFS 2538); Planá u Mariánských Lázní, in railroad near railway station, on iron-rich pebbles, 2005, Vondrák (CBFS 2996); Prachatice, Husinec, weir on river Blanice above town, alt. c. 520 m, on granite stones and concrete on horizontal side of wall, 2005, Vondrák (CBFS 3002); Prachatice, Husinec, outdoor swimming-pool, 49°03'12.5"N, 13°59'38.8"E, alt. 500 m, on SW-exposed concrete panel, 2005, Vondrák (CBFS 3000); Prachatice, Husinec, Výrov, in village, 49°03'00"N, 13°59'50"E, alt. 520 m, on gneiss stones in garden, 2003, Vondrák (CBFS 1322, CBFS 1352); Prachatice, Těšovice, railway station, 49°02'40"N, 14°01'40"E, alt. 480 m, on asphaltic pathway, 2005, Vondrák (CBFS 2527); Příbram, Jince, in village, on asphalt, 2003, Vondrák (CBFS 1200); Příbram, Jince, "Jinecké Hřebeny" hills, alt. 700 m, concrete on roof of military building, 2003, Vondrák (CBFS 1360); Rakovník, Kalubice, in village, alt. 370 m, 50°03'N, 13°49'40"E, on mortar, 2003, Vondrák (CBFS 1318); on horizontal side of dust-impregnated wooden planks, 2006, Vondrák (CBFS 4232); Rakovník, Pustověty, in village, 50°03'20"N, 13°49'E, on horizontal side of concrete panel, 2003, Vondrák (CBFS 1201); Rakovnik, Skryje, ruin of castle Týřov, 49°58'24.6"N, 13°47'24.1"E, alt. 295 m, on lime-enriched andesitic rock under ruin walls, on sunny S-exposed slope, 2005, Vondrák (CBFS 2762); Rýmařov, Karlov, Mt Vysoká hole, 50°03'40"N, 17°14'E, alt. c. 1450 m, on concrete, 2005, Vondrák & Bartoš (CBFS 1920); Vodňany, Bavorov, small bridge S of village, on horizontal side of concrete panel, 2002, Vondrák (CBFS 1474); Vodňany, Čížčenice, railway station, 49°09'30"N, 14°13'20"E, alt. 390 m, on iron-rich pebbles in railroad, 2003, Vondrák (CBFS 1884, 3013); Vyškov, airport, on asphalt and on vertical concrete plate, 2003, Vondrák (CBFS 1301, 1303); Zdice, in railroad near railway station, 49°54'30.0"N, 13°58'54.1"E, alt. 250 m, on iron-rich pebbles in railroad, 2005, Vondrák (CBFS 2977). **Germany.** Hamburg, Vierlande, Warwisch, on calcareous stone, 1925, Erichsen (PRM 581205, sub *Caloplaca turneriana*). **Slovakia.** Banská Štiavnica, in valley "Kalvaria", alt. 600–700 m, on bark of *Tilia*, 1926, Suza (PRM 640930, in sample of *Physcia teretiuscula*); Malacky, Kuchyňa, Mt Vysoká, alt. 650 m, on limestone rock, 1976, Pišút (BM, PRM, Lich. Slov. Exsic. 275, sub *Caloplaca isidiigera*). **Romania.** Arad, Nadlac, railway station, 46°09'N, 20°47'E, on N-exposed mortar, 2004, Vondrák (CBFS 2132).

Acknowledgements

We thank Prof. Jiří Komárek and Dr Tereza Poštová for the Latin translation of the diagnosis, Dr Marek Stibal for linguistic corrections, and the reviewers for valuable comments to the manuscript.

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NLF-meeting 2007 in Lammi, Finland

In August 10–16 2007 The Nordic Lichen Society will organize the lichenological meeting at Lammi biological station (http://www.helsinki.fi/lammi/), located 124 km north from Helsinki. The Biological station is situated by Lake Pääjärvi and the region is surrounded by diverse nature ranging from cultural landscapes to old growth forests.

We can accommodate 50 people in twin rooms. Breakfast, two meals and transportation from Helsinki city centre to Lammi on 10th August will be included in the registration fee.