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FIRST RECORDS OF *CANDELARIELLA EFFLORESCENS* (LICHENIZED ASCOMYCOTA) IN POLAND

DARIUSZ KUBIAK & MARTIN WESTBERG

Abstract. *Candelariella efflorescens* R. C. Harris & W. R. Buck is reported as new for Poland. Its known localities, data on its ecology and total distribution, and a description of diagnostic features differentiating *C. efflorescens* from other similar species are given, with a map of its distribution in Poland based on revised herbarium specimens.

Key words: lichens, *Candelariella efflorescens*, new records, distribution, ecology, Poland

Dariusz Kubiak, Department of Mycology, Warmia and Mazury University in Olsztyn, Oczapowskiego 1A, 10-719, Olsztyn, Poland; e-mail:darkub@uwm.edu.pl
Martin Westberg, Swedish Museum of Natural History, Cryptogamic Botany, P.O. Box 50007, S-104 05 Stockholm, Sweden; e-mail: martin.westberg@nrm.se

INTRODUCTION

The genus *Candelariella* (Candelariaceae, Ascomycota) includes about fifty species worldwide (Westberg 2004), only eight of which are known in Poland (Fałtynowicz 2003). Many if not most species are still poorly known on a worldwide scale, and there probably are a large number of yet-undescribed species (Westberg *et al*. 2007). Within this large genus are five species recognized by the presence of soredia: *C. medians* (Nyl.) A. L. Sm., *C. sorediosa* Poelt & Reddi, *C. xanthostigmoides* (Müll. Arg.) R. W. Rogers, *C. efflorescens* R. C. Harris & W. R. Buck and *C. reflexa* (Nyl.) Lettau. *Candelariella medians* is a large placodioid species growing on calcareous rocks in Europe, and the others are small corticolous species. Of these, only *C. efflorescens* is characterized by having polysporous asci. *Candelariella sorediosa* was described by Poelt and Reddi (1969) from Nepal, but it is a poorly understood species and the name has been used rather infrequently in Asia (Aptroot & Sparrius 2003), Europe (Poelt & Vězda 1977) and South America (Sipman 1992). *Candelariella xanthostigmoides* was described from Australia (see Rogers 1982) and recently was reported and described in detail from North America (Lendemer & Westberg 2010). *Candelariella efflorescens* and *C. reflexa* both occur in Europe but only *C. reflexa* has been noted so far in Poland. This species has been known in Poland since the 1980s (Fałtynowicz 2003, see Nowak & Tobolewski 1975) but has been recorded infrequently (Fałtynowicz 2003; Kukwa 2005; Kubiak & Kukwa 2008). In 2010, richly fertile, sorediate specimens of *Candelariella* were found in northern Poland (Fig. 1). Morphologically the material resembles *C. efflorescens*,

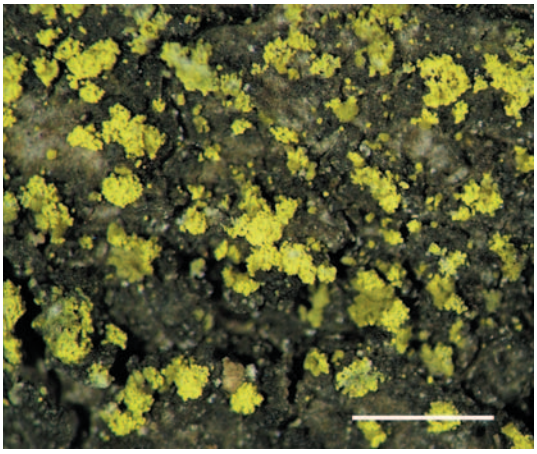

Fig. 1. *Candelariella efflorescens* R. C. Harris & W. R. Buck (*D. Kubiak*, OLTC L–2885). Scale bar = 1 mm.

and microscopy revealed that the specimens had polysporous asci. *Candelariella efflorescens* is a new lichen for Poland and a neglected and rarely recorded species in Europe.

Material and methods

All sorediate specimens of the genus *Candelariella* deposited in the first author's collection (OLTC L) were examined. These specimens originate from northern and central Poland. All localities of *C. efflorescens* are listed and mapped (Fig. 2) in the ATPOL grid square system (Zając 1978; modified by Cieśliński & Fałtynowicz 1993). The physiographic division of Poland used here is based on Kondracki (2001).

Results

Candelariella efflorescens R. C. Harris & W. R. Buck Figs 1 & 2

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Thallus granular to areolate; granules or areoles rounded, flattened to somewhat convex, scattered, to *ca* 0.2 mm diam., soon dissolved and obscured by soredia; surface green-yellow to yellow, smooth, matte; soralia first formed from the edge of the areoles, discrete, 0.15–0.30 mm wide or becoming confluent forming a widespread sorediate crust, soredia yellow, 15–40(–50) µm diam. Apothecia rare, lecanorine, rounded, 0.25–0.40 mm diam., disc flat to somewhat convex, ± concolorous with the thallus; thalline margin granular, sometimes sorediate, often partly excluded in later stages. Asci clavate, 24–30-spored, 52 × 21–22 µm; ascospores simple or sometimes with a thin septum, oblong to narrowly ellipsoid, 10–14 × 3.3–4.0 µm. Pycnidia not seen.

Affinities. *Candelariella efflorescens* is relatively easy to find during field investigations because of its yellow thallus, characteristic for most species of this genus. Morphologically the species is somewhat variable but the sorediate thallus in combination with polysporous asci are sufficient for its correct determination. *Candelariella reflexa* (*C. reflexa* s.str.) is known as a morphologically distinct species, separated from *C. efflorescens* not only by spore number but by its larger thallus which is sorediate from the center of the areoles. It differs from *C. efflorescens* by its distinctly effigurate thallus, with lobes up to 0.6 mm long. When well developed it can have an almost rosette-like thallus. Furthermore, the soredia are larger than in *C. efflorescens* (*ca* 30–80 µm in diam.) and are formed in ± crateriform soralia arising in the center of the thallus and not from the margin as in *C. efflorescens*. *Candelariella efflorescens* may also be confused with sorediate species of the genus *Candelaria*, especially in specimens with poorly developed thalli. Such specimens may belong to *Candelaria pacifica* M. Westb. & Arup. (Westberg & Arup 2010), a recently described species common in northwestern Europe and also known from Poland (Westberg & Arup 2011).

Habitats and distribution in Poland. *Candelariella efflorescens* is a corticolous species, in Poland growing on a wide range of deciduous trees and shrubs (e.g., *Acer platanoiodes*, *A. pseudoplatanus*, *Crataegus* sp., *Fagus sylvatica*, *Fraxinus excelsior*, *Populus* spp., *Pyrus* sp., *Quercus robur*, *Robinia pseudoaccacia*, *Salix* sp., *Sambucus nigra* and *Ulmus glabra*). The species has been recorded on tree trunks as well as on wood of dead branches of trees. The specimens of *C. efflorescens* reported here were growing on roadside trees, in old parks and forests, in moderately shaded and humid conditions. In forests it was recorded most frequently on their edges, only once noted inside a forest community of natural character. So far, *C. efflorescens* has been found at 30 localities in Poland (13 10×10 km ATPOL squares) distributed in the northern and central parts of the country (Fig. 2).

World distribution. *Candelariella efflorescens* is a widespread species recorded in temperate parts of North America and Europe (Westberg 2007). In Europe the species is known from scattered localities distributed from the north to south parts of the continent. *C. efflorescens* is known from Lithuania (Motiejūnaitė *et al.* 1998), Germany (Scholz 2000), Austria (Hafellner & Türk 2001), Switzerland (Clerc 2004), Norway and Sweden (Santesson *et al*. 2004), Ukraine (Khodosovtsev

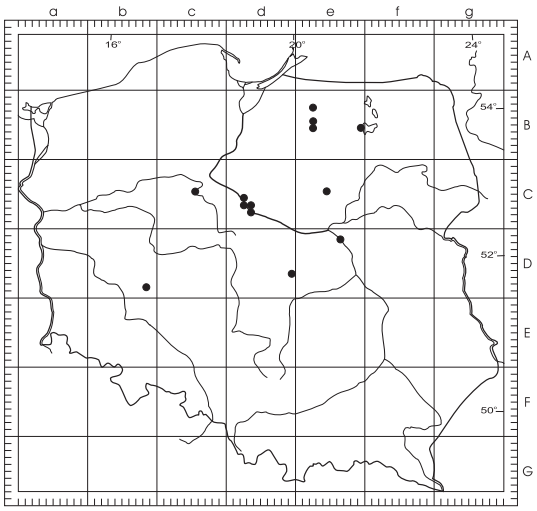

Fig. 2. Distribution of *Candelariella efflorescens* R. C. Harris & W. R. Buck in Poland, based on revised herbarium specimens.

2005), Denmark (Søchting & Alstrup 2008) and Montenegro (Bilovitz *et al*. 2010).

Discussion

Revision of the ample collections originating from northern and central Poland showed that *Candelariella efflorescens* is a rather frequent species at least in those two regions of the country, and there are reports on the occurrence of this lichen in neighboring countries (Motiejūnaitė *et al.* 1998, 2008; Vondrák *et al.* 2010). All specimens reported here were originally determined and then published as *C. reflexa* (Kubiak 2005, 2008; Kubiak & Szczepkowski 2006; Kubiak & Kukwa 2008; Kubiak *et al.* 2010), raising the question of whether *C. reflexa* indeed occurs in Poland. As this report shows, the species is not well understood in Poland. The name *C. reflexa* has been used globally for 8-spored, sorediate specimens (Lendemer & Westberg 2010). Morphologically the North American collections (previously determined as *C. reflexa* s.l.) are similar to *C. efflorescens* (sterile material is not possible to determine to species). Lendemer and Westberg (2010) suggested that this material is identical to *Candelariella xanthostigmoides* from Australia (Filson 1992). Previously, *C. xanthostigmoides* was known from North America and Australia, and the presence of *C. xanthostigmoides* in Europe requires further analysis (Lendemer & Westberg 2010).

Specimens examined. POLAND. Pojezierze Olsztyńskie lakeland: Be-22 – Smolajny, manorial park, 54°01′36″N/20°24′16″E, on *Populus* sp., 5 May 2006, *leg. D. Kubiak* & *P. Stępień* (OLTC L–2745), Wichrowo forest division, forest section 402, 54°02′04.2″N/20°23′36.9″E, on *Quercus robur*, 20 May 2010, *leg. D. Kubiak* (OLTC L–3454); Be-42 – Olsztyn, Żurawia St., 53°47′20″N/20°22′59″E, on *Populus* sp., 3 Oct. 2002, *leg. D. Kubiak* (OLTC L–1870), Las Miejski forest, 53°47′35″N/20°28′31″E, on *Fraxinus excelsior*, 26 March 2007, *leg. D. Kubiak* (OLTC L–2890); Be-52 – Olsztyn, Żurawia St., 53°47′05″N/20°23′14″E, on *Acer platanoides*, 18 Sept. 2002, *leg. D. Kubiak* (OLTC L–2885), Szarych Szeregów St., 53°46′22″N/20°27′30″E, on *Acer platanoides*, 4 July 2002, *leg. D. Kubiak* (OLTC L–2886), Bławatna St., 53°45′59″N/20°26′34″E, on *Salix* sp., 12 Oct. 2002, *leg. D. Kubiak.* (OLTC L–2887), Metalowa St., 53°45′39″N/20°29′41″E, on *Acer platanoides*, 1 June 2003, *leg. D. Kubiak* (OLTC L–2888), Jeziorna St., 53°46′30″N/20°26′11″E, on *Populus* sp., 24 March 2007, *leg. D. Kubiak* (OLTC L–2980), Kortowo I university campus, 53°45′38″N/20°27′36″E, on *Acer platanoides*, 16 Nov. 2006, *leg. D. Kubiak* (OLTC L–2917), Kortowo I university campus, 53°45′30″N/20°27′24″E, on *Acer platanoides*, 2 July 2007, *leg. D. Kubiak* (OLTC L–2903), Kortowo I university campus, 53°45′31″N/20°27′26″E, on *Pyrus* sp., 4 June 2010, *leg. D. Kubiak* (OLTC L–3021), Kortowo I university campus, 53°45′39.9″N/20°20′36.5″E, on *Ulmus glabra*, 4 June 2010, *leg. D. Kubiak* (OLTC L–3463, S), ibid. on *Robinia pseudoaccacia*, 4 June 2010, *leg. D. Kubiak* (OLTC L–3457, dupl. in S; OLTC L–3458, 3459), Kortowo I university campus, 53°45′32″N/20°27′39″E, on *Acer platanoides*, 2 June 2010, *leg. D. Kubiak* (OLTC L–3456, S), Kudypy forest division, forest section 345, 53°45′19.8″N/20°26′36.4″E, on *Fagus sylvatica*, 30 Apr. 2010, *leg. D. Kubiak* (OLTC L–3460). Pojezierze Mrągowskie lakeland: Be-59 – 1 km W of Krutyń, 53°41′15″N/21°25′29″E, on *Acer pseudoplatanus*, 17 July 2008, *leg. D. Kubiak* (OLTC L–2972, S). Pojezierze Gnieźnieńskie lakeland: Cc-45 – Lubostroń, manorial park, 52°54′18″N/17°52′39″E, on *Sambucus nigra,* 10 Oct. 2004, *leg. D. Kubiak* (OLTC L–2706). Kotlina Toruńska basin: Cd-52 – 1 km NE of Siarzewo, Wyspa Zielona island, 52°52′03.4″N/18°52′04.7″S, on *Populus* (wood), 16 Apr. 2011, *leg. D. Kubiak* (OLTC

L–3464), ibid. on *Salix* (wood), 16 Apr. 2011, *leg. D. Kubiak* (OLTC L–3465), 1 km NE of Szpitalka, 52°48′41.0″N/18°54′33.0″S, on *Populus* sp., 8 July 2010, *leg. D. Kubiak* (OLTC L–3451), 0.5 km SW of Miszek, 52°49′34.5″N/18°54′37.3″S, on *Populus* sp., 6 July 2010, *leg. D. Kubiak* (OLTC L–3452), ibid. on *Salix*, 6 July 2010, *leg. D. Kubiak* (OLTC L–3453); Cd-62 – 0.5 km W of Stary Bógpomóż, Stary Bógpomóż island, 52°44′41.5″N/18°58′06.5″S, on *Salix* sp., 16 Apr. 2011, *leg. D. Kubiak* (OLTC L–3466), 0.5 km E of Gąbinek Gąbinek island, 52°44′25.7″N/18°58′06.8″S, on *Salix* sp., 16 Apr. 2011, *leg. D. Kubiak* (OLTC L–3467); Cd-63 – 0.5 km S of Rachcinek, 52°43′42.4″N/19°01′06.5″S, on *Populus* sp., 5 July 2010, *leg. D. Kubiak* (OLTC L–3450); Cd-73 – Włocławek, Kulin, 52°39′50.7″N/19°07′53.0″S, on *Populus alba*, 17 Apr. 2011, *leg. D. Kubiak* (OLTC L–3468), Włocławek, Kulin, 52°39′55.2″N/19°08′17.5″S, on *Crataegus* sp., 17 Apr. 2011, *leg. D. Kubiak* (OLTC L–3471). Wysoczyzna Ciechanowska: Ce-44 – Opinogóra, manorial park, 52°54′24″N/20°42′41″E, on *Fraxinus excelsior*, 11 July 2009, *leg. D. Kubiak* (OLTC L–3022), Opinogóra, manorial park, 52°54′20″N/20°42′47″E, on *Acer platanoides*, 11 July 2009, *leg. D. Kubiak* (OLTC L–3023). Wysoczyzna Kaliska upland: Db-88 – 1 km SE of Roszkówko, on *Salix* sp., 15 Feb. 1999, *leg. D. Kubiak* (OLTC L–145). Wzniesienia Łódzkie hills: Dd-69 – Rogów, arboretum, 51°49′30″N/19°54′09″S, on *Salix* sp., 22 Sept. 2004, *leg. D. Kubiak* (OLTC L–2193). Kotlina Warszawska basin: De-16 – Warszawa, Lasek Bielański forest, forest section 4, 52°17′40″N/20°56′55″S, on *Acer platanoides*, 12 July 2009, *leg. D. Kubiak* (OLTC L–3380).

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