

Lichenostigma svandae, a new lichenicolous fungus on *Acarospora cervina*

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Abstract: The new species *Lichenostigma svandae* is described. It is known exclusively from *Acarospora cervina*, where it forms black stromatic hyphal strands and black sack-shaped ascomata on the host thallus surface. It is similar to *L. elongatum* and *L. rouxii*, but differs in a few characters. A short overview of the known *Lichenostigma* species is provided.

Key words: *Arthoniales*, Crimean Peninsula, *Lichenotheliaceae*, Ukraine.

Introduction

The strictly lichenicolous genus *Lichenostigma* Hafellner (*Lichenotheliaceae*, *Arthoniales sensu* Ihlen 2004) is characterized mainly by the dark pigmented pseudoparenchymatous ascomata, \pm subglobose asci arising in cavities in ascomatal tissue, absence of interascal filaments, and the *Arthonia*-type asci (Hafellner 1982). Two subgenera are recognized: *Lichenostigma* with cushion-like ascomata, not connected to dark superficial hyphal strands, and *Lichenogramma* Nav.-Ros. & Hafellner with sack-shaped superficial ascomata connected to superficial stromatic or simple hyphal strands (cf. Calatayud & Barreno 2003).

Since 1982, when the genus *Lichenostigma* was described (Hafellner 1982), 14 species have been described (after *Index Fungorum*), most of which are strongly host-specific to one species or a few taxa within a single genus; the only exception is *L. maureri* Hafellner, which is known from various fruticose lichens (cf. Ihlen 2004). While

some species are known to be almost cosmopolitan, some appear to be rare, being currently known only from a few sites (Table 1).

In 2005, a fertile *Lichenostigma* found by the authors on the thallus of *Acarospora cervina* in the Czech Republic, was initially identified as *L. elongatum* (Vondrák 2006). Later, further specimens of *Lichenostigma* growing on *A. cervina* were found in the Crimean Peninsula (Ukraine). Detailed investigation of their morphology showed that they differed from all other known *Lichenostigma* species. Having dark pigmented superficial vegetative hyphae and superficial sack-shaped ascomata, this new species belongs to the subgenus *Lichenogramma* and is formally described here.

Materials and Methods

The light microscopy measurements used for statistical calculations were made on hand-cut sections and squash preparations under an oil-immersion lens after pre-treatment with 10% KOH solution in water. An accuracy of 1 μ m, eventually 10 μ m in ascomata measurements was achieved. The measurements are given as (min. $-$) \bar{x} $-$ SD $-$ \bar{x} $+$ SD (max.), where \bar{X} = mean value and SD = standard deviation. At least five measurements were made for each specimen and the total number of measurements (n) is given in parentheses. The nomenclature of *Lichenostigma* species and names of the host species follow the references in Table 1. Names of lichen-forming fungi used in the text follow Hafellner & Türk (2001)

Material used for comparison: ***Lichenostigma elongatum***. **Bulgaria:** *The Rhodopes:* Kurdzhali,

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TABLE 1. *The hosts, ecology and distribution of Lichenostigma species*

Species	Subgenus	Hosts	Known distribution	References
“ <i>Lichenostigma arctoparmeliae</i> ” R. Sant. (ined.)		<i>Arctoparmelia centrifuga</i> , <i>A. incurva</i>	Norway, Sweden	Santesson <i>et al.</i> (2004)
<i>Lichenostigma cosmopolites</i> Hafellner & Calat.	<i>Lichenogramma</i>	<i>Xanthoparmelia</i> spp. (29 species)	Extratropical regions of the world	Calatayud <i>et al.</i> (2002), Hafellner & Calatayud (1999)
<i>Lichenostigma diploiciae</i> Calat., Nav.-Ros. & Hafellner	<i>Lichenogramma</i>	<i>Diploicia subcanescens</i>	Azores, Canary Islands, Spain	Calatayud <i>et al.</i> (2002)
<i>Lichenostigma elongatum</i> Nav.-Ros. & Hafellner*	<i>Lichenogramma</i>	<i>Aspicilia</i> spp., <i>Lobothallia radiosa</i>	Cosmopolitan	Calatayud <i>et al.</i> (2002), Navarro-Rosinés & Hafellner (1996)
<i>Lichenostigma epipolinum</i> Nav.-Ros., Calat. & Hafellner*	<i>Lichenogramma</i>	<i>Diplotomma epipolinum</i>	Mediterranean, Afghanistan	Calatayud <i>et al.</i> (2002)
<i>Lichenostigma gracilis</i> Calat., Nav.-Ros. & Hafellner	<i>Lichenogramma</i>	<i>Acarospora fuscata</i>	Spain	Calatayud <i>et al.</i> (2002)
<i>Lichenostigma hyalosporum</i> Kalb & Hafellner*	<i>Lichenostigma</i>	<i>Haematomma eremaeum</i>	Western Australia (three sites only known)	Kalb <i>et al.</i> (1995)
<i>Lichenostigma maureri</i> Hafellner	<i>Lichenostigma</i>	<i>Alectoria sarmentosa</i> , <i>Evernia</i> spp., <i>Letharia vulpina</i> , <i>Pseudevernia furfuracea</i> , <i>Ramalina fraxinea</i> , <i>Usnea</i> spp.	Cosmopolitan	Calatayud & Barreno (2003), Hafellner (1982), Ihlen (2004)
<i>Lichenostigma radicans</i> Calat. & Barreno		Vagrant <i>Aspicilia</i> species	Spain	Calatayud & Barreno (2003)
<i>Lichenostigma rouxii</i> Nav.-Ros., Calat. & Hafellner	<i>Lichenogramma</i>	<i>Squamarina cartilaginea</i> and <i>S.</i> <i>stella-petraea</i>	Mediterranean Europe and dry valleys in the Alps	Calatayud <i>et al.</i> (2002)
<i>Lichenostigma rugosum</i> G. Thor*	<i>Lichenostigma</i>	<i>Diploschistes</i> spp. (seven species)	Europe, the Near East, northern Africa, North America	Calatayud & Barreno (2003), Thor (1985)
<i>Lichenostigma semiimmersum</i> Hafellner*	<i>Lichenogramma</i>	<i>Buellia elegans</i> and <i>B. zoharyi</i>	Asia, Europe, Greenland, North America	Calatayud <i>et al.</i> (2002), Hafellner (1999)
<i>Lichenostigma subradians</i> Hafellner, Calat. & Nav.-Ros.	<i>Lichenogramma</i>	yellow <i>Acarospora</i> species	Dry areas in North and Central America, Near East, and Canary Islands	Calatayud <i>et al.</i> (2002)
<i>Lichenostigma supertegens</i> Ihlen & R. Sant.	<i>Lichenostigma</i>	<i>Aspicilia supertegens</i>	Sveden, Norway	Ihlen (2004)
<i>Lichenostigma svandae</i> Vondrák & Šoun sp. nov.	<i>Lichenogramma</i>	<i>Acarospora cervina</i>	Crimean Peninsula, Czech Republic	this paper

Note: the species indicated by an asterisk were described as *Lichenostigma elongata*, *L. epipolina*, *L. rugosa*, and *L. semiimmersa*. As suggested by Santesson *et al.* (2004), the epithets should be corrected to “*elongatum*, *epipolinum*, *rugosum*, and *semiimmersum*”.

Dolishte, limestone rocks in valley c. 1 km W of village, alt. 300 m, 41°38'N, 25°35'E, on *Lobothallia radiosa*, 2004, *ř. Vondrák* (CBFS 2193).—**Greece:** Crete: Rethimno, ruin of fort Fortezza, on *Aspicilia* sp., 2005, *ř. Vondrák* (CBFS 4093).—**Hungary:** Bükk Mts: Miskolc, Mályinka, rocks on E-slope below ruin Dédes-vár, alt. c. 570 m, on *Lobothallia radiosa*, 2006, *ř. Vondrák* & *ř. Šoun* (CBFS 4377).—**Ukraine:** Crimean Peninsula: Bakhchysarai (Бахчисарай), limestone cliffs above town, alt. c. 300 m, 44°45'04.68"N, 033°53'06.88"E, on *Lobothallia radiosa*, 2006, *ř. Vondrák* & *ř. Šoun* (CBFS 4586).

Lichenostigma rouxii. **Ukraine:** Crimean Peninsula: Feodosiia (Феодосия), limestone hill SWW of village Koktebel' (Коктебель), alt. c. 300 m, 44°57'19.57"N, 035°12'39.26"E, 2006, *ř. Vondrák* & *ř. Šoun* (CBFS 4592); Sudak (Судак), above village Veseloe (Веселое), alt. c. 200 m, 44°50'57.04"N, 034°52'05.87"E, 2006, *ř. Vondrák* & *ř. Šoun* (CBFS 4590).

The Species

Lichenostigma svandae Vondrák & Šoun sp. nov.

Habitu sporarum *Lichenostigmati rouxii* valde affinis, sed evidenter hyphis vegetativis catenas non plus quam 500 μ m longas formantibus et omnino unum usque duo ascomata parientibus differt. A *Lichenostigmate elongatum* species haec sporis uniseptatis usque biseptatis recedit.

Typus: Ukraine, Crimean Peninsula, Feodosiia (Феодосия), limestone hill in protected area "Karadag-skiy Zapovednik", SWW of village Koktebel' (Коктебель), alt. c. 300 m, 44°57'19.57"N, 035°12'39.26"E, on *Acarospora cervina* on sun-exposed limestone rock, 13 June 2006, *ř. Vondrák* & *ř. Šoun* (CBFS 4582—holotypus; BM, GZU, H, M—isotypi).

(Figs 1 & 2)

Vegetative hyphae superficial, irregular dark net-like patches over a thick epinecral layer of the host thallus (Fig. 1A–C) and over apothecial discs. Brownish black non-radiating hyphal strands sparingly branched; in section, formed by 1–4 rows of cells (Fig. 2B), (7–)10.3–17.6–24.9(–38) μ m wide ($n=38$), (7–)9.5–14.5–19.5(–25) μ m high ($n=25$), and max. 500 μ m long. Short root-like hyphae (max. c. 30 μ m long) growing out and downwards from the hyphal strands penetrating the cortical layer of the host (Fig. 2B). Hyphal strands formed by paraplectenchymatous stromatic tissue of thin-walled cells (4–)5.0–6.0–7.0(–8) μ m

diam. ($n=43$); its black granular pigmentation fixed on the surfaces of outer cells.

Ascomata 1–2 per strand, black, superficial, sack-shaped (Fig. 1D), (50–)70.0–97.7–125.4(–160) \times (20–)29.9–42.3–54.7(–70) μ m in size ($n=26$), length/breadth ratio c. 2.3; height/breadth ratio c. 1.0. *Ascomata* formed by stromatic tissue similar to that in vegetative hyphae. *Asci* 6–8-spored, broadly clavate to subglobose (Fig. 1E), 1–3 per ascocarp observed. *Ascospores* colourless at first, then greyish, and becoming brownish when old, 1–2 septate (2-septate ascospores rare, but observed in most collections), broadly ellipsoid, with rounded apices, and usually slightly constricted at the septa (Fig. 2A), (11–)11.7–12.7–13.7(–15) \times (6–)6.5–7.4–8.3(–10) μ m ($n=48$), length/breadth ratio c. 1.7; with c. 1 μ m thick wall and a finely granular surface ornamentation. *Anamorph* unknown.

Chemistry. Ascomatal tissue and asci I–, KI–.

Etymology. Named after the bus driver Jaroslav Švanda, who made the excursion to the Crimean Peninsula, where the type material was collected, possible.

Ecology and distribution. *Lichenostigma svandae* occurs on thalli and apothecia of *Acarospora cervina* growing on sun-exposed limestone rocks. In some sites, *A. cervina* was also parasitized by *Caloplaca inconnexa* (Nyl.) Zahlbr., *Intralichen christiansenii* (D. Hawksw.) D. Hawksw. & M. S. Cole, *Muellerella pygmaea* var. *athallina* (Müll. Arg.) Triebel, and *Stigmidium rouxianum* Calatayud & Triebel. Other lichens associated with the parasitized *A. cervina* were *Aspicilia contorta*, *Caloplaca coronata*, *C. inconnexa*, *C. polycarpa*, *C. teicholyta*, *Candelariella rhodax*, *Lobothallia radiosa*, *Placocarpus schaeferi*, *Protoparmeliopsis muralis*, *Rinodina lecanorina*, *Verrucaria nigrescens*, and *Xanthoria papillifera*. In the localities where *Lichenostigma svandae* was collected, *L. elongatum* commonly grew on *Aspicilia contorta* and *Lobothallia radiosa*. *Lichenostigma rouxii* was also observed to

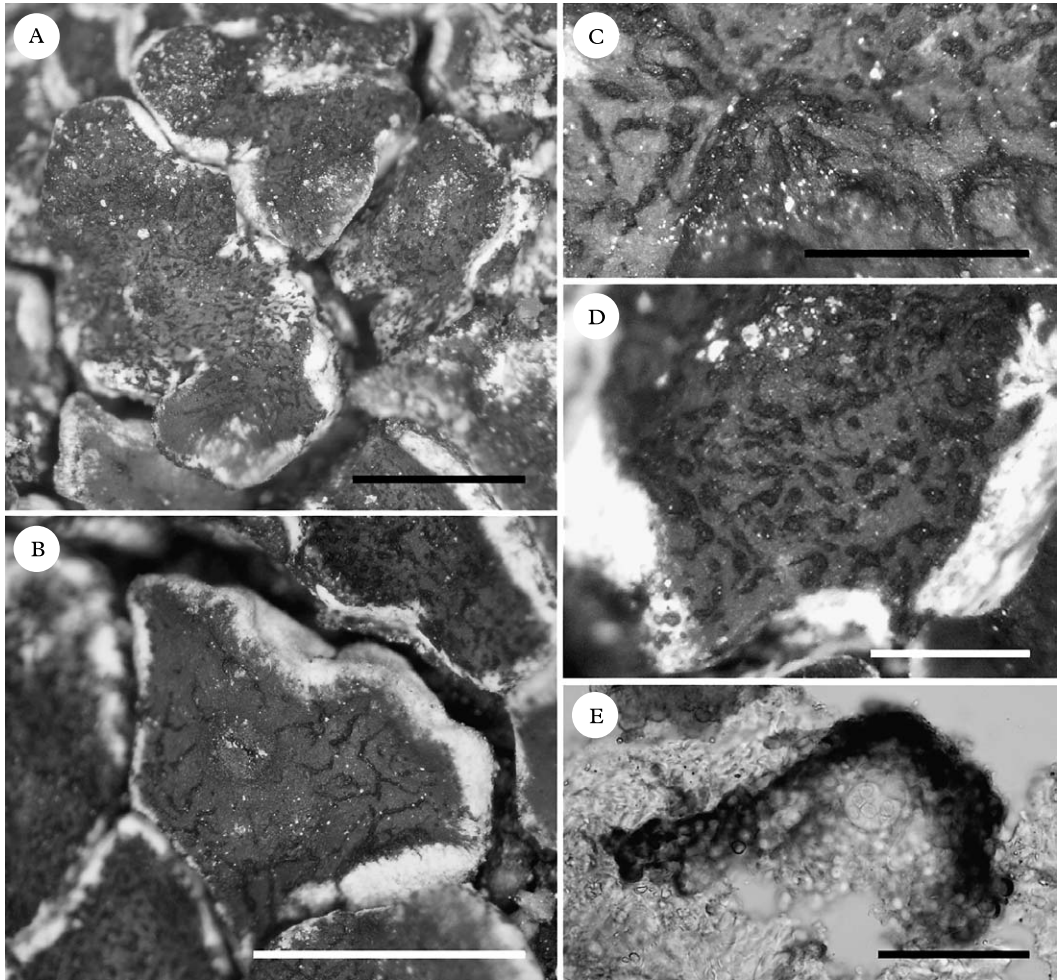


FIG. 1. *Lichenostigma svandae* (isotype). A, strongly infected thallus of *Acarospora cervina*; B, detail of young vegetative strands; C, detail of mature thalli; D, detail of ascomata; E, cross-section of an ascoma with a young ascus containing colourless ascospores. Scales: A, B=1 mm, C, D=0.5 mm, E=50 μ m.

occur on *Squamarina cartilaginea* in the neighbourhood of *L. svandae*. *Lichenostigma svandae* is known from only five sites (at altitudes ranging from 100 to 350 m) in the Crimean Peninsula (Ukraine) and one locality in the Czech Republic.

Remarks. *Lichenostigma svandae* is the only known *Lichenostigma* occurring on *Acarospora cervina*. Two more species, *L. gracilis* and *L. subradicans* also overgrow *Acarospora* species, the former on *A. fuscata* and the latter on yellow *Acarospora* species,

but both clearly differ from the new species in possessing only smaller 1-septate ascospores and in their radially arranged, strongly branched vegetative strands in young thalli (Calatayud *et al.* 2002).

Morphologically, *L. rouxii* and *L. elongatum* are similar to the new species, but the former differs in its more isolated, less branched and longer vegetative strands (0.5–1 mm) with 2–3 ascocarps per strand (Calatayud *et al.* 2002), and the latter always has 1-septate ascospores (Navarro-Rosinés & Hafellner 1996).

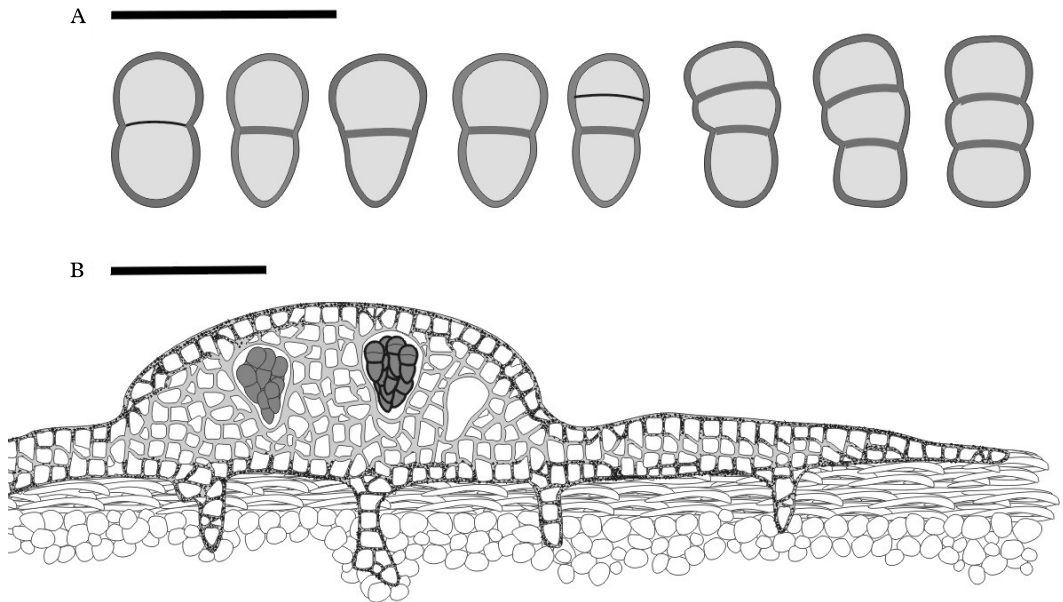


FIG. 2. *Lichenostigma svandae* (isotype). A, 1–2-septate ascospores; B, section of an ascoma and vegetative strand. Scales: A=20 μm , B=50 μm .

Two further species, *Lichenostigma epipolinum* and *L. semimmersa* differ in their non-stromatic vegetative strands usually formed by a single row of cells and *L. diploiciae* has 1-septate to submuriform ascospores. All species of the subgenus *Lichenostigma* have immersed hyaline vegetative hyphae and cushion-like ascomata (Calatayud *et al.* 2002; Calatayud & Barreno 2003).

Additional specimens examined. Czech Republic: South Moravia: Mikulov, southern peak of Mt Šibeničnik c. 2 km S of town, alt. 240 m, 48°47'15.2"N, 16°37'48.0"E, 14 viii 2005, *ř. Vondrák & ř. Šoun* (CBFS 3888).—**Ukraine:** Crimean Peninsula: Bakhchysarai (Бахчисарай), limestone cliffs above town, alt. c. 300 m, 44°45'04.68"N, 033°53'06.88"E, 9 vii 2006, *ř. Vondrák & ř. Šoun* (CBFS 4585); Bakhchysarai (Бахчисарай), Mashino (Машино), on base of limestone cliff 500 m NW from the village, alt. c. 350 m, 44°42'03.87"N, 033°54'26.49"E, 10 vii 2006, *ř. Vondrák & ř. Šoun* (CBFS 4583); Feodosiia (Феодосия), limestone hill SWW of village Koktebel' (Коктебель), alt. c. 200 m, 44°57'31.12"N, 035°12'22.93"E, 13 vii 2006, *ř. Vondrák & ř. Šoun* (CBFS 4587); Kercz Peninsula (Керченский полуостров), Орукский зарповедник (Орукский заповедник), coastal cliffs, alt. c. 100 m, 45°01'53.00"N, 036°12'47.94"E, 14 vii 2006, *ř. Vondrák & ř. Šoun* (CBFS 4593).

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