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## **LICHENOSTIGMA ELONGATA SPEC. NOV. (DOTHIDEALES), A LICHENICOLOUS ASCOMYCETE ON LOBOTHALLIA AND ASPICILIA SPECIES.**

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**Abstract.-** The lichenicolous fungus *Lichenostigma elongata* Nav.-Ros. et Haf. spec. nova (Dothideales, Lichenotheliaceae) is described as new. This species lives parasitically on the thalli and apothecia of different species of *Lobothallia* and *Aspicilia*. *L. elongata* is distinguished from *L. maureri* Haf. and *L. rugosa* Thor, the only two species of the genus previously described, in the oblong-elongated shape of the ascocarps and the broader ascospores. For *Lichenostigma* species with elongate ascomata and superficial strands of hyphae the subgenus *Lichenogramma* Nav.-Ros. & Haf. is described.

**Resumen.-** Se describe *Lichenostigma elongata* Nav.-Ros. et Haf. spec. nova. (Dothideales, Lichenotheliaceae), un hongo liquenícola que se desarrolla sobre talos y apotecios de diferentes especies de *Lobothallia* y de *Aspicilia*. *L. elongata* se diferencia de *L. maureri* Haf. y de *L. rugosa* Thor, las dos especies del género anteriormente conocidas, por la forma oblongo-alargada de los ascocarpos y por la mayor anchura de las esporas. Se propone el subgénero *Lichenogramma* Nav.-Ros. & Haf. para las especies de *Lichenostigma* provistas de asomas alargados y con agrupaciones de hifas superficiales.

### **Introduction**

The genus *Lichenostigma* Haf. includes lichenicolous ascomycetes which are mainly characterized by the following characters: The ascocarps contain bitunicate asci developing in a paraplectenchymatous tissue, no interascal filaments are formed; the asci are broadly saccate and contain normally 8 one-septate

ascospores; in early stages of development the ascospores are surrounded by a gelatinous perispore which condenses in a dark outer wall layer when mature (Hafellner 1982).

Until now only two species were known. *Lichenostigma maureri* Haf. (type species) is a weak superficial parasite of various species of *Usnea* and *Pseudevernia furfuracea*; *Lichenostigma rugosa* Thor grows on several species of *Diploschistes* (Thor 1985, Lumbsch 1989).

As a result of recent studies on mediterranean lichens, which included the investigation of many specimens of *Lobothallia* and *Aspicilia*, a further species of *Lichenostigma* was recognized, which subsequently proved to be widely distributed and overlooked. This new species is described below.

### Material and Methods

For this study air dried herbarium specimens of the species cited below have been used. External morphology was studied with a dissecting microscope (WILD M3, 6.4x-40x), and anatomical studies of the thallus and the ascomata were carried out using a light microscope (REICHERT POLYVAR, 40x-1000x). Sectioning was performed with a freezing microtome (LEITZ, Schnittdicke 12-15 µm) but squash preparations were also used especially for observations of the asci. Preparations were mounted in water. Where necessary, staining was performed by pretreatment with lactic acid-cotton blue (MERCK 13741). Sections and squash preparations were not pretreated with KOH. Measurements refer to dimensions in ordinary water.

Besides the specimens (paratypes) of *Lichenostigma elongata* cited below the following specimens have been used for comparision.

*Lichenostigma maureri*. - **Austria:** Steiermark, Grazer Bergland, auf Fichten an der Nordseite des Schöckels, 1400 m, on *Usnea* spec., 24.XI.1974, leg. W. Maurer (GZU, holotype). - **Georgia:** Caucasus Magnus, regio montis ignivomi Elbrus, in valle torrentis Adylsu prope pagum Elbrus, loco Dzan-Tugan dicto, 1800-2000 m, on *Usnea* spec., 23.VI.1980, leg. A. Vezda, Lich. sel. exs. 1949 (BCC-lich, GZU).

*Lichenostigma rugosa*. - **Spain:** Cataluña, prov. de Girona, Alt Empordà, el Port de la Selva: els Pins, carretera de Cadaqués, U.T.M. 31TEG1784-1785, 100 m, on *Diploschistes diacapsis*, 8.III.1992, leg. A. Gómez-Bolea, X. Llimona, P. Navarro-Rosinés & C. Roux (BCC-lich). - Murcia, Alhama: Sierra de Carrascoy, Rambla de Roy, U.T.M. 30SXG5189, 900 m, on *Diploschistes actinostomus* var. *farinosus*, leg. J. M. Egea, D. Le Coeur, P. Navarro-Rosinés & C. Roux, 30.IX.1992 (BCC-lich). - **Libya:** Cyrenaica, 25 km SSE of Al Abyar, 62 km SSW of Al Marj, open desert plane with scattered *Retama raetam* shrubs, on *Diploschistes steppicus*, 26.III.1983, leg. G. Thor no. 3458 (Hafellner, isotype).

*Lichenothelia scopularia*. - **Austria:** Steiermark, Stubalpe, südseitige Schrofen am Ostrücken des Speikkogel, um 1750 m, 2.VI.1974, leg. J. Poelt no. 12781, confirm. D. Hawksworth (GZU). - **Czechia:** Bohemia centr., in rupe schistosa prope pag. Píkovice ad fluv. Ságava, ca. 200 m, leg. J. Suza, Lich. Bohemoslovakiae 278 sub *Microthelia aterrima* (BCC-lich). - Bohemia occid., Trebic, ad fluv. Jihlavka prope pag. Dalesice in rupe granulitica, ca. 320 m, leg. J. Suza, Lich. Bohemoslovakiae 241 sub *Microthelia aterrima* (BCC- lich).

## Results

### *Lichenostigma elongata* Nav.-Ros. et Haf. sp. nov.

Fungus lichenicolus. Pseudothecia superficialia, elongata, ad filamenta composita superficialia connecta, dispersa vel aggregata, nigra, minuta, ad 40-70-(100)  $\mu\text{m}$  crassa, stromatoidea, cellulis subglobosis composita. Filamenta interascalia nulla. Asci subglobosi demum saccati, bitunicati, pariete endoascali apicaliter incrassato, octospori, iodo non reagentes. Ascosporae 10-13 x 6-8.5  $\mu\text{m}$ , uniseptatae, primum hyalinae halonataeque, mox fuscae, verriculosae. Omnes partes iodo non reagentes.

Differt a *Lichenostigma maureri* et a *L. rugosa* pseudothecia elongata, praesentia filamentis compositis superficialibus et sporis latioribus.

**Typus.**- Hispania, Catalonia, Prov. Tarragona, Ribera d'Ebre, Móra d'Ebre: loco dicto els Xarcums, U.T.M. 31TBF9454, 300 m, ad saxa calcarea supra thallum *Lobothalliae radiosae* crescens, 14.XI.1987, leg. M. Giralt et P. Navarro-Rosinés (BCC- lich, holotype; GZU, IMI, M, MARSSJ, UPS, isotypes).

**Etymology:** The epitheton elongata refers to the shape of the ascomata. The female sex is used because the second part of the generic name is derived from the greek -stigme, f. meaning point, dot (Brown 1956: 513).

#### Description:

Vegetative hyphae: partly superficial, forming black strands on the surface of the host (Figs. 1-2), simple or with few ramifications, about 200-500  $\mu\text{m}$  long and of rather variable thickness (8-20  $\mu\text{m}$ ), additional vegetative hyphae penetrating into the host, hyaline, frequently such hyphae attach the stromatic ascomata to the cortical layer of the host (Fig. 5B).

Ascomata black, superficial, elongate, recognizable as intercalar thickenings of hyphal strands (Figs. 1-2), somewhat convex, 50-200  $\mu\text{m}$  long and 30-60  $\mu\text{m}$  wide; internal structure paraplectenchymatic, stromatic, hyphal cells almost spherical, 4-5  $\mu\text{m}$  in diam., external cells with dark brown walls, wall pigment granular, internal cells hyaline, vertical thickness about 40-70(-100)  $\mu\text{m}$  (Figs. 3, 5 A-D).

Interascal filaments lacking, interascal space filled with spherical cells.

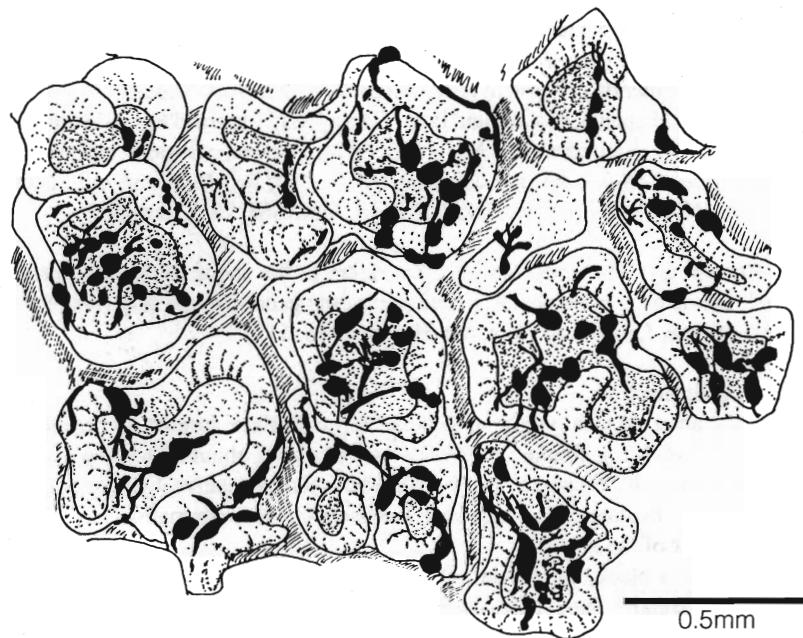
Asci: few (1-5) per section, developing close to the upper surface, fissitunicate, subglobose to broadly ovate, 20-25 x 15-18  $\mu\text{m}$ , 8-spored (Fig. 4 F).

Ascospores: one-septate, broadly obovate, uncoloured and provided with distinct gelatinous perispore when young, becoming brown at maturity, with finely granular surface at this stage, slightly constricted at the septum, (9)-10-13 x 6-8,5  $\mu\text{m}$  (Figs. 4 A-E, 5 E-F ).

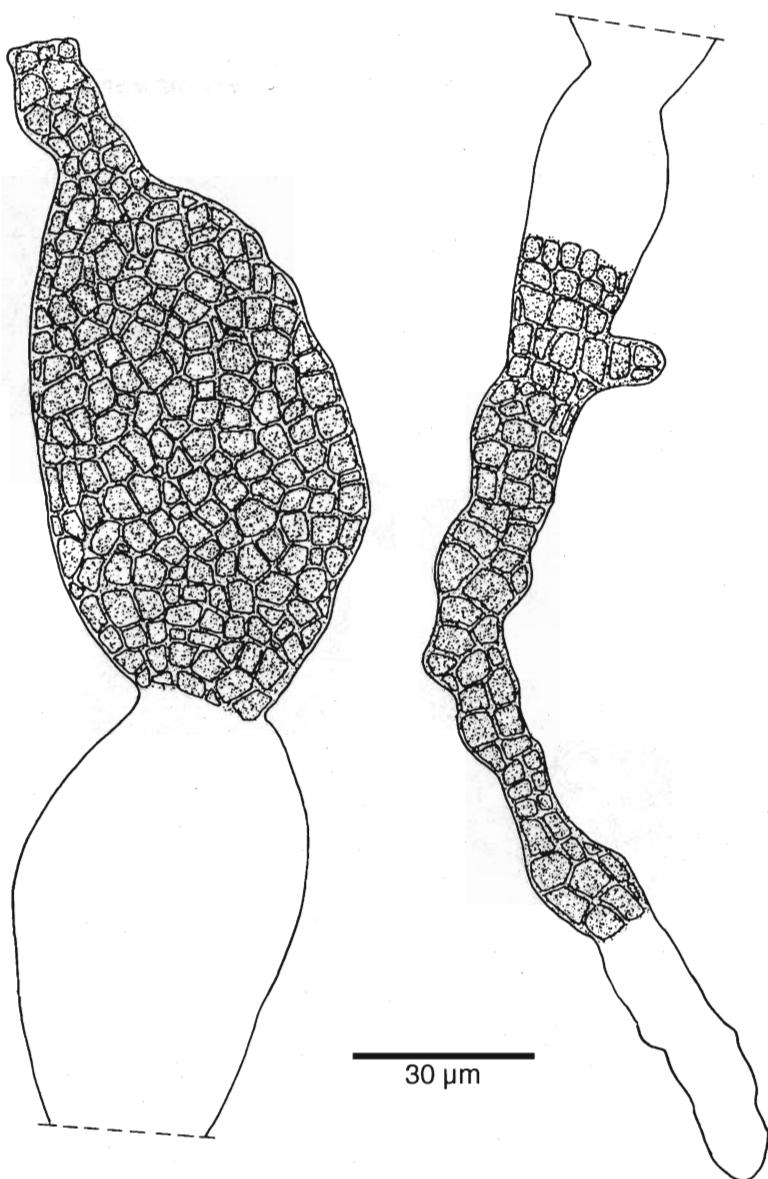
Chemical reactions: Centrum J(Lugol) negative, KJ(Lugol) negative. Ascus wall J(Lugol) negative, KJ(Lugol) negative, no fine structures visible in Methyleneblue. Spore wall and perispore J(Lugol) negative, Methyleneblue negative, brown condensed perispore becoming decolorized in C and reforming the hyaline perispore.

Life form: lichenicolous, slightly parasitic. The parasitic behaviour is most obvious when the fungus grows on the apothecia of the host, where it eventually causes the formation of deep cracks.

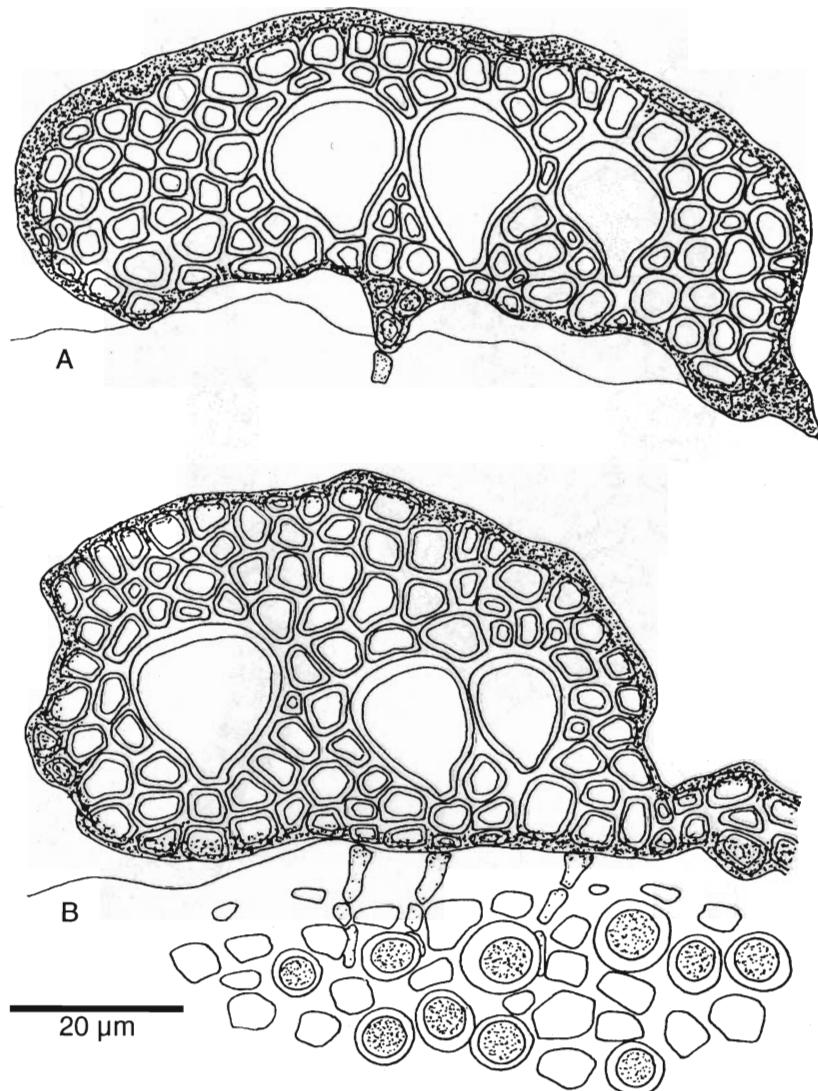
Anamorph: unknown.



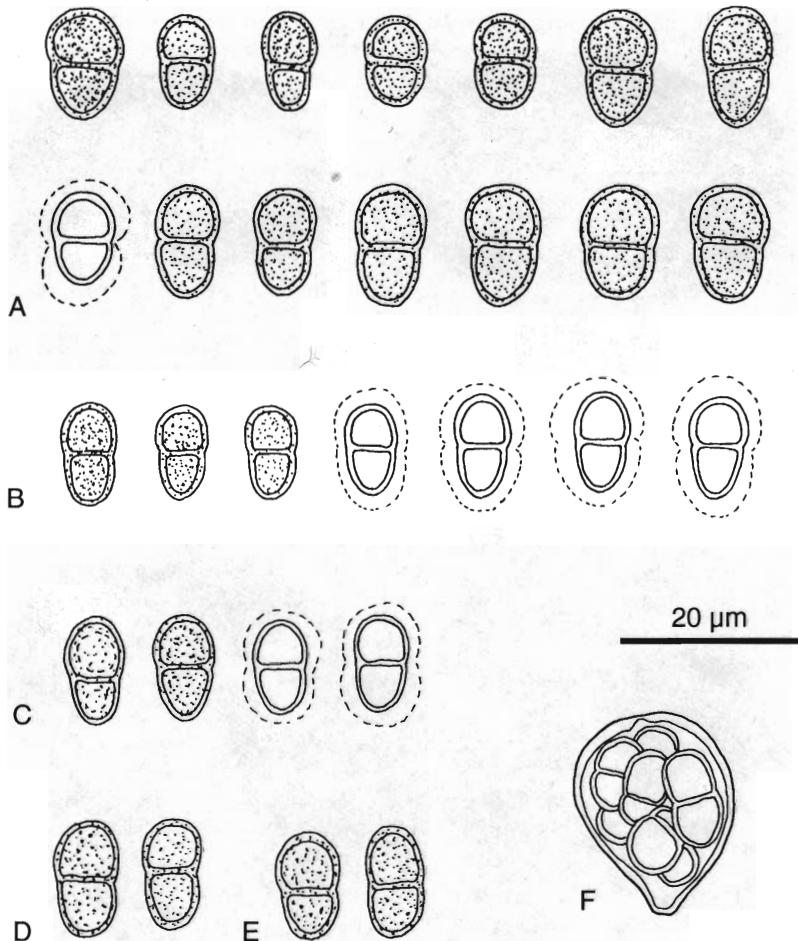
**Fig. 1.-** *Lichenostigma elongata* on *Lobothallia radiosoides*. Habitus on thallus and apothecia (type).



**Fig. 2.-** *Lichenostigma elongata* on *Aspicilia calcarea*. Surface view of ascocarps and hyphal strands, cellular structure only partly indicated (Tivissa, Ermita de St. Blai, Spain).

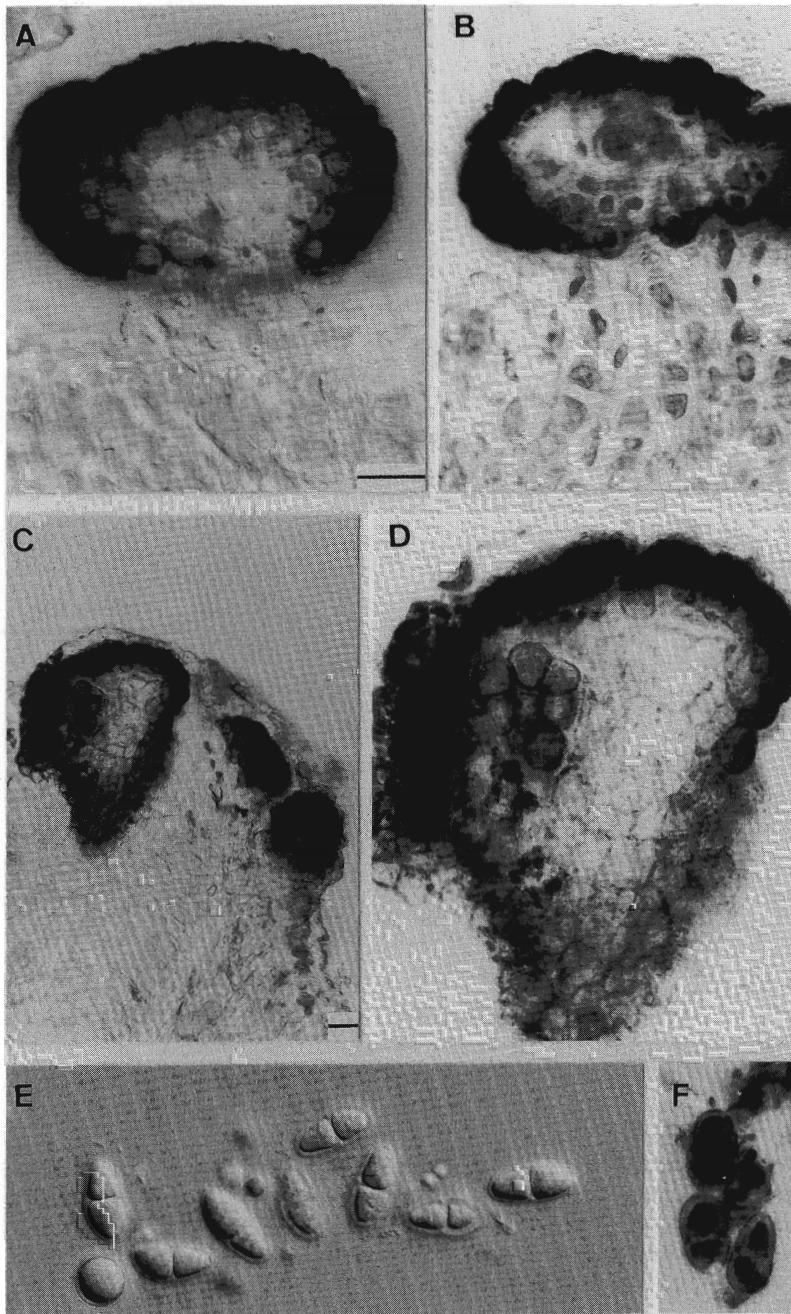


**Fig. 3.-** *Lichenostigma elongata*. Sections of ascomata. A- on *Lobothallia radiososa*, Dobrogea (Romania). B- on *Aspicilia calcarea*, Tivissa, Ermita de St. Blai (Spain).



**Fig. 4.-** *Lichenostigma elongata*. A-E.- ascospores, A- Truel (Gard, France), B- Móra d'Ebre (type), C- Hans-sur-Lesse (Namur, Belgium), D- Krakowsko-Czestochowska (Polonia), E- (Rochers de Chooz (Ardennes, France). F.- ascus (type).

**Fig. 5.-** *Lichenostigma elongata*. A- section of young ascocarp (interference contrast). B- section of ascocarp (lactic acid - cotton blue). C,D- section of mature ascocarp developing in pycnidium of the host. E- young ascospores (interference contrast). F- mature ascospores (lactic acid - cotton blue). (All figures from type, scale = 10 µm, for Fig. A, B, D, E, F on A). →



**Hosts:** *Lobothallia radiosa* (1) (host of type), *L. praeradiosa* (2), ?*L. alphoplaca* (Gerber 1931, see below), *Aspicilia calcarea* (3), *A. cernohorskiana* (4), *A. cheresina* (5), *A. contorta* subsp. *contorta* (6), *A. c.* subsp. *hoffmanniana* (7), ?*A. gibbosa* (Faurel & Schotter 1958, see below), *Aspicilia* spec. (8). It is also reported on *A. caesiocinerea* by van den Boom & al. (1994).

**Affinities:** *L. elongata* differs from other species of the genus in the elongate shape of the ascocarps, the presence of superficial hyphal strands and somewhat broader ascospores. The internal structure of the ascomata of all known *Lichenostigma* species is very similar and it is mainly characterized by the bitunicate asci separated by globular stromatic cells, i.e. interascal filaments are not differentiated. In this respect they are similar to some species included originally in *Lichenothelia* (Henssen 1987). It is possible that the *Lichenothelia* species with a pseudoparenchymatous hamathecium should be transferred to *Lichenostigma* subgen. *Lichenogramma* (see below<sup>1</sup>).

*Lichenostigma elongata* has been observed previously by Gerber (1931: 480-483, as "Epiphyt auf *Placodium alphoplacum*"), and Roux (1978: 184, as "Champignon stérile 1"), both describing the external morphology of the ascocarps and the hyphal strands and the texture of sterile ascocarps. The record of "*Stigonema minutissimum* f. *lichenicolum*" mentioned by Faurel & Schotter (1958: 73, 79) probably refers to the same species.

**Habitat:** *Lichenostigma elongata* is very frequent in epilithic communities of the Aspicilon calcareae alliance, mainly in the *Placocarpetum schaeferi* (=Dermatocarpetum monstrosi) and *Aspicilietum calcareae* associations, in which the fungus is regarded as a highly characteristic species (Roux 1978: 124, Tab. XXXV, 132, Tab. XLV, sub champignon stérile 1, p.p.). These communities occur on exposed calcareous rocks under microclimatrical conditions with marked fluctuations in temperature and moisture. *L. elongata* is also found in heminitrophytic and xerophytic communities on siliceous rocks, where one of the

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<sup>1</sup>As the species described above does not fit exactly the description of *Lichenostigma* a new subgenus is introduced.

***Lichenostigma* Haf. (1982) subgenus *Lichenogramma* Nav.-Ros. & Haf. subgen. nov.**

Differ a subgenere typico ascomatis elongatis et praesentia filamentorum compositorum superficialium.

Holotypus subgeneris: *Lichenostigma elongata* Nav.-Ros. & Haf.

Species of the subgenus *Lichenogramma* differ from those of subgen. *Lichenostigma* in the elongate shape of the ascocarps which are connected to superficial strands composed of several short-celled hyphae. The internal structure of the ascocarps is the same as in species of *Lichenostigma* subgen. *Lichenostigma*.

main hosts, *Lobothallia radiososa*, is a frequent species.

**Distribution:** Based on our present knowledge, in Europe *L. elongata* has a central european-mediterranean distribution linked with the principal distribution of the hosts. It is also found in the mediterranean and more or less arid parts of Africa, Asia and North America. Records outside of the Holarktis are rare. One record from Australia however shows that the overall distribution may be much wider.

**Specimens seen:**

The numbers in brackets before the date refer to the hosts listed above. Collections preserved under the host are indicated by an asterisk after the number which refers to the host. The names of the authors are abbreviated by their initials.

**Europe: Austria:** Burgenland: Südburgenland, Güssing, Burg Güssing, Innenhof, (1\*), 1.V.1979, leg. J. Poelt (GZU). - Ibid., am Fuß des Berges, SE-seitig, 221 m, (1\*), 18.VI.1978, leg. M. Friedl (GZU). - Südburgenland, Hannersdorf E von Großpetersdorf, am Fuß des kleinen Hügels S der Kirche, ca. 270 m, MTB 8764/3, niedere S-exponierte Schieferschrofen, (1), 7.I.1991, leg. J. H. no. 26482 & W. Maurer (GZU). - Niederösterreich: Thermenalpen, Frauenstein bei Mödling, S-seitige, flache Trockenhänge mit niederen Dolomitfelsen über der Klause, 300-320 m, (1\*), 14.IX.1984, leg. H. Mayrhofer no. 4332 & J. Poelt (GZU). - Bad Deutsch Altenburg, Pfaffenbergs SE des Ortes, SW-exponierte von Kalkfelsen durchsetzte Trockenrasen nahe dem Steinbruch, 200-250 m, (1\*), 23.VIII.1983, leg. H. Mayrhofer no. 3548 (GZU). - Tirol: Samnaun-Gruppe, Umgebung von Tösens im oberen Inntal, Hänge N vom Ort unweit der Kapelle St. Georg, ca. 1050-1100 m, MTB 8929, SE-exponierte Kalkschieferschrofen im lückigen Föhrenwald, (2), 6.IX.1991, leg. J. H. no. 30360 (Hafellner). - Osttirol, Virgental, Obermauern, S-Hänge der Burg, ca. 1400 m, MTB 8940/4, niedere Kieselkalkschrofen, (2), 1.IX.1988, leg. J. H. no. 23603 (GZU). - **Belgium:** Huccorgne, versant droit du Fond de Roua, près du châteaux de Famelette. Rochers calc. ensoleillés (dans le Xerobrometum), (1\*), 16.XI.1963, leg. J. Lambinon (LG). - Namur, Hans-sur-Lesse, Belvédère, 230 m, crête rocheuse calcaire, U.T.M. FR5555, (1\*), 24.IX.1982, leg. P. Malaise (LG) . - Olloy, au dessus du vieux chemin de Dourbes, bloc horizontal dans une pelouse, assoc. ± ornithocoproph., (1\*), 1.XII.1962, leg. J. Lambinon (LG). - **France:** Alpes-Maritimes, Gorges de Saorge au débouché de la Bendola, 360 m, petit muret en blocs de calcaire gréseux, (1\*), 24.V.1968, leg. J. Lambinon (LG). - Alpes-Maritimes, Peille, Route de l'Escarène, au SW et à env. 3 km du village, petit calcaire siliceux, presque au ras du sol, alt. 600 m, (1\*), 24.IV.1968, leg. J. Lambinon (LG). - Ardennes, Rochers d'Aviette (comm. Rancennes), rochers schisto-gréseux du Couvinien supér., ± éclairés, à exp. SW dans le haut de l'escarpement, (1\*), 30.V.1970, leg. J. Lambinon (LG). - Ardennes, Rochers de

Chooz, au-dessus du hameau de Petit-Chooz, rochers schisto-gréseux ± calcareux éodévoiens sur la crête ensoleillée, (1\*), 31.V.1970, leg. J. Lambinon (LG). - Basses Alpes, au NE de Thoard, à proximité du sommet du pic de Siron, 1650 m alt., calcaires liasiques exposés, presque au ras du sol, (3\*), 25.VI.1965, leg. G. Clauzade (MARSSJ). - Corse, Haute Corse, désert des Agriates, Meerestrond im Mündungsbereich des Flusses Ostriconi, 10 m, (1\*), VIII.1990, leg. M. Matzer no. 1243 (GZU). - Gard, au S. de Truel, (3), 29.I.1976, leg. C. Roux (MARSSJ). - Seine-et-Marme, Saint-Mammès, alt. 50-70 m, dans un talus calcaire exp. SSW, sur rocher calcaire, (1), 17.III.1991, leg. P. Diederich et C. Roux (Diederich). - Vaucluse, Gargas, 350 m, grès siliceux et ferrugineux ensoleillés, versant S de la colline du fort, près du sommet, (1\*), 23.IV.1965, leg. J. Lambinon (LG). - Vaucluse, Joucàs, (1\*, 3\*), 12.VIII.1969, leg. X. Llimona (BCC-lich). - Ibid., (3\*), 19.VIII.1969, leg. X. Llimona (BCC-lich. 178). - Vaucluse, Saignon, Plateau des Claparèdes, près de Colombier, 600 m alt., pierre calcaire (molasse burdigalienne) sur le sol en bordure d'un chemin, (3\*), 29.XI.1963, leg. G. Clauzade (MARSSJ). - Vaucluse, Saignon, Rochers de l'Oratoire, molasse burdigalienne, exposés W, (3\*), 12.VI.1949, leg. G. Clauzade (MARSSJ). - **Germany:** Thüringen, Kyffhäuser, Naturschutzgebiet Ochsenburg, Südabdachung des Kyffhäusers bei Bad Frankenhausen, 200-240 m, Gips, (2\*), 7.IX.1979, leg. R. Schubert & J. Poelt (GZU). - **Greece:** Insel Kreta: Prov. Chania, Straße nach Omalos etwa 500 m SW von Lacki, kleine, anstehende Felsgruppen aus weichen, schieferigen Gesteinen, NE-exponierter Hang, um 500 m, (1), 17.VIII.1976, leg. H. Mayrhofer (GZU). - Prov. Rethimnon, an der Straße zwischen den Orten Nithavris und Fourfouras, etwa 1 km S von Kouroutes, einzelne Felsen zwischen Äckern, 500 m, (1\*), 19.VIII.1976, leg. H. Mayrhofer (GZU). - **Italy:** Emilia-Romagna: Prov. Parma, nördlicher Apennin, an der Straße über den Pso. della Cisa, Mte. Prinzera am N Ortsende von Boschi di Bardone, ca. 650 m, Serpentinit, SW-exponierte Abbrüche, (1), 29.X.1978, leg. J. H. no. 23604 (Hafellner). - Ibid., leg. H. Mayrhofer (GZU). - Friuli-Venezia Giulia: Prov. Trieste, Carso Triestino, Val Rosandra SE von Triest, ca. 1 km E von Basovizza, ca. 300 m, auf Kalkblöcken am Rand der Hochfläche, (1), 30.VII.1993, leg. J. H. no. 23651 & P. L. Nimis (GZU). - Liguria: Prov. Savona, NW oberhalb Laigueglia, ca. 50 m, Flyschmergelblöcke, (1), 27.IV.1965, leg. M. Steiner (GZU). - Prov. Savona, Passo di S. Giacomo, bei Alassio, ca. 770 m, an mergeligem Gestein, (1\*), 3.V.1965, leg. M. Steiner (GZU). - Sicilia: Prov. Palermo, Le Madonie, Piano di Battaglia SE über Collesano, beweideter, von Kalkblöcken durchsetzter Hang, 1620-1640 m, (1\*), 31.V.1988, leg. J. Poelt (GZU). - W of Messina, Madonie, 18 km S of Cefalù, 3 km S of Isnello, Torre Montaspro, slope with steep limestone autcrops, coord. 14.00E-38.00N, alt. 1000 m, (1), 4.VIII.1990, leg. P. v. d. Boom no. 10481a (P. v. d. Boom). - Südtirol: Vinschgau, Laaser Leiten NW von Laas und Erys, ca. 900 m, S-exponierte Trockenrasen mit kleinen Silikatschrofen, (2), 5.IX.1992, leg. J. H. no. 30600 (Hafellner). - Vinschgau, am Eingang in das Schlandrauntal bei Schlanders, auf Gneis, (1\*), 15.VII.1966, leg. J. Poelt no. 3435

(GZU). - **Polonia:** Wyzyna Krakowsko-Czestochowska, Jura poludniowa, Dolina Kluczwody okolo 300 m, Na skalach wapienia jurajs kiego, (1\*), 6.IV.1955, leg. J. Nowak (LG). - Kraków-Wielun Upland, Przeginia Duchowna, distr. Kraków, 280 m, on horizontal surfaces of sunny limestone outcrops above stream, (1\*), 30.VI.1970, leg. J. Nowak (GZU). - **Romania:** Dobrogea, Distr. Constanta, in valle rivi Tigrusor, inter vicos Gura Dobrogei et Tigrusor, alt. 50 m, ad saxa calcarea, (1\*), 10.VIII.1974, leg. A. Vězda (LG, sub A. Vězda: Lichenes selecti exsiccati 1637: *Aspicilia calcarea* var. *dobrogensis*). - Ibid., (3\*), (BCC-lich). - **Serbia:** an der Straße von Titovo Uzice nach Visegrad, 7 km NE von Mokra Gora, auf Serpentinit, (1\*), 14.VII.1974, leg. J. H. no. 1194 (GZU) . - Ibid., (1), leg. J. H. no. 23605 (GZU). - **Spain:** Andalucía: Prov. Almería, Sierra de los Filabres, Calar Alto, SW vom Observatorio Astronómico, N von Gérgal, 1900 m, S-exponierte Granatglimmerschieferblöcke, (1\*), 21.IX.1980, leg. J. H. no. 9638 (GZU). - Aragón: Prov. Zaragoza, Escatrón: Monte Mocatero, U.T.M. 30TYL27-YL37, 190 m, (3), 17.X.1991, leg. P. N.-R. (BCC-lich). - Prov. Zaragoza, am Nordufer des Embalse de Mequinenza N von Caspe, 200 m, Triften mit Kalksandsteinblöcken, (1\*), 25.V.1983, leg. H. Mayrhofer no. 3724 (GZU). - Cataluña: Prov. Barcelona, Baix Llobregat, Begues: Pla de Campgras, U.T.M. 31TDF0971, 530 m, (3), 22.VII.1990, leg. A. Canals (BCC-lich). - Prov. Barcelona, Baix Llobregat, Cervelló: urbanització Selva Negra, U.T.M. 31TDF18, arenisques del Buntsandstein, 100-200 m, (1), 13.XI.1971, leg. X. Llimona (BCC-lich). - Prov. Girona, Alt Empordà, Roses: Cap Norfeu, U.T.M. 31TEG2176, 100-150 m, (3), 8.III.1992, leg. A. Canals, X. Llimona, P. N.-R. & C. Roux (BCC-lich). - Prov. Lleida, Segarra, Sanaüja: prop del poble, U.T.M. 31TCG54-CG63, 500 m, (5\*, 7\*), 13.II.1983, leg. P. N.-R. (BCC-lich).- Ibid., (1), 29.XII.1982, leg. P. N.-R. (BCC-lich). - Ibid., (1), 28.II.1992, leg. P. N.-R. (BCC-lich). - Prov. Tarragona: Baix Camp, Colldejou: entre el Portell del Llam i la Mola, U.T.M. 31TCF2152, 700-900 m, (3), 9.XII.1988 leg. A. Canals, M. Giralt, A. Gómez-Bolea & P. N.-R. (BCC-lich). - Baix Ebre, Benifallet, camí de l'ermita de St. Onofre, prop del Balneari del Cardó (Serra del Cardó), U.T.M. 31TBF9636, 550 m, (3), 14.XI.1987, leg. M. Giralt & P. N.-R. (BCC-lich). - Baix Ebre, Benifallet, camí vell del Balneari del Cardó (Serra del Cardó), U.T.M. 31TBF9636, 450 m, (3), 6.XI.1988, leg. M. Giralt, A. Gómez-Bolea & P. N.-R. (BCC-lich). - Baix Ebre, Roquetes, Barranc del Lloret (Serra dels Ports), U.T.M. 31TBF7617, 300 - 400 m, (3), 5.VII.1987, leg. M. Boqueras, A. Gómez-Bolea & P. N.-R. (BCC-lich). - Baix Ebre, Tivenys, Barranc del Xato, U.T.M. 31TBF9130-9230, 100-150 m, (6, 7), 5.XI.1988, leg. M. Giralt, A. Gómez-Bolea & P. N.-R. (BCC-lich). - Sierra de Prades, NW-geneigte Hänge SW ober dem Monasterio de Poblet, an der Straße nach Prades, ca. 500 m, Quercetum ilicis mit Schieferblöcken, (1\*), 23.V.1983, leg. J. H. no. 17502 (GZU). - Montsianès, La Sénia, entre les Vallcaneres Altes i la Mola dels Conills (Serra dels Ports), U.T.M. 31TBF7015-7115, 1200 m, (3), 14.II.1987, leg. M. Boqueras, A. Gómez-Bolea & P. N.-R. (BCC-lich). - Priorat, La Torre de Fontaubella, Collet de la Plana d'en Cervera, U.T.M. 31TCF2154-

2253, 500-550 m, (1, 7), 13.XI.1987, leg. M. Giralt & P. N.-R., (BCC-lich). - Ribera d'Ebre, Móra d'Ebre, els Xarcums, U.T.M. 31TBF9454-9554, 300 m, (1, 3, 4), 14.XI.1987, leg. M. Giralt & P. N.-R. (BCC-lich). - Ribera d'Ebre, Rasquera, prop del poble, U.T.M. 31TBF9641, 200-300 m, (3, 7), 14.XI.1987 leg. M. Giralt & P. N.-R. (BCC-lich). - Ribera d'Ebre, Tivissa, Ermita de St. Blai, U.T.M. 31TCF0844-0845, 400 m, (1, 3, 7), 2.VI.1988, leg. M. Giralt, A. Gómez-Bolea & P. N.-R. (BCC-lich). - Ribera d'Ebre, Tivissa, Barranc del Montalt, prop de la Serra d'Almós, U.T.M. 31TCF1348-1448, 300-400 m, (3), 2.VI.1988, leg. M. Giralt, A. Gómez-Bolea & P. N.-R. (BCC-lich). - Murcia: Alhama, Sierra de Carrascoy, Rambla de Roy, U.T.M. 30SXG5189, 900 m, (1), 30.IX.1992, leg. J. M. Egea, D. Le Coeur, P. N.-R. & C. Roux, (BCC-lich). - Sierra de Almenara, Alto de Palomera, 400 m, (1\*), 28.XII.1976, leg. J. M. Egea (GZU).

**Africa: Tunisia:** Steinige Hänge am Djebel Goraa, an der Straße Thibar-Teboursouk, um 450 m, (8), 12.IV.1968, leg. J. Poelt (GZU).

**Asia: Cyprus:** Distr. Larnaca, Kloster Stavrovouni W Larnaca, ca. 600 m, Felsabbrüche unter dem Kloster, (1\*), 17.IV.1987, leg. M. & H. Mayrhofer no. 7194 (GZU). - **Jordania:** As Salt, Wadi Sháib, on calcareous rocks, (1\*), 24.IV.1983, leg. El-Oqlah (GZU). - **Mongolia:** Ömnögobi Aimak: Bajandalai Somon, Dsuramtai, (8), 30.VI.1988, leg. S. Huneck MVR 88-257 (GZU). - Dund-Saichan, 2600 m, (1), 27.VI.1988, leg. U. Cogt no. 6350 (GZU). - **Syria:** Nordsyrien, Quala'at, Sam'an, Zitadelle bei Bab el Hauwa, (3\*), 1989, leg. H. Pölzl (GZU).

**Australia:** New South Wales, Yass, road to Careys Cave, 1 km NNE of Wee Jasper, ca. 400 m, limestone, (1\*), 10.VIII.1988, leg. H. Mayrhofer no. 8018, J. A. Elix, J. Johnston & H. Streimann (GZU).

**North America: U.S.A.:** Arizona: Canyon De Chelly near Chinle, ca. 2000 m, (8), 1987, leg. H. Pölzl (GZU). - Maricopa Co., McDowell Mountains Regional Park, Ft. McDowell Quadrangle, 2200 ft., E-facing slope, upper Sonoran desert scrub, (8), 10.I.1976, leg. T. H. Nash & M. A. Lane no. 1899a (GZU). - Colorado, Rocky Mountains, Jefferson Co., sandstone outcrops of the Morrison Formation near mouth of Mt. Vernon Canyon, near the Interstate Hwy, 1950 m, (1), 4.IX.1977, leg. R. Anderson & J. Poelt (GZU).

## Discussion

Henssen (in Eriksson and Hawksworth 1986: 137) proposed the family Lichenotheliaceae which is regarded as belonging to Dothideales s. ampl. The family comprises the genera *Lichenothelia* D. Hawksw. and *Lichenostigma* Haf. Initially Hawksworth (1981) included in *Lichenothelia* only those species with

filiform interascal filaments. Henssen (loc. cit.) extended the concept of *Lichenothelia* to species with a pseudoparenchymatous hamathecium and she proposed to distinguish the two genera mainly on the arrangement of the asci. In *Lichenothelia* the asci are produced in a hymenium-like layer, in *Lichenostigma* asci are scattered within the pseudoparenchyma of the stromatic ascoma. However, *Lichenostigma* was not mentioned when Henssen (1987) described 18 new species of *Lichenothelia*, although similarities in ascoma construction between several of these newly described species and *Lichenostigma* are striking.

Besides the frequent occurrence of thallus-borne macroconidia, an amyloid centrum seems to be characteristic for *Lichenothelia* species. Their ascocarps are either applanate to pulvinate provided with a pseudoparenchymatous hamathecium or they are apothecoid with filamentous hamathecium. Among *Lichenothelia* species with apothecoid ascocarps an amyloid centrum is rare (or absent?), amyloidy is absent in at least the type species *Lichenothelia scopularia*, although an amyloid centrum is regarded as typical for the genus by Eriksson and Hawksworth (1988: 79).

In *Lichenostigma* the amyloidy of the centrum is so far unknown. *Phaeosporobolus* is probably the anamorph genus of *Lichenostigma* subgen. *Lichenostigma* (Hawksworth & Hafellner 1986: 528). No anamorph has been found in *Lichenostigma elongata* (subgen. *Lichenogramma*). As ascocarps are regularly formed, dispersal by fragmented hyphal strands or side branches seems unlikely but can not be excluded.

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### References

- Brown, R. W. (1956).- Composition of scientific words. Washington, Smithsonian Institution Press.
- Clauzade, G., P. Diederich et C. Roux (1989).- Nelikenigintaj fungoj likenlogaj. Ilustrita determinlibro.- *Bull. Soc. Linn. Provence*, Núm. spécial 1: 1-142.
- Eriksson, O. E. et D. L. Hawksworth (1986).- Notes on ascomycete systematics. Nos 1-224.- *Syst. Ascomycetum* 5(1): 113-174.
- Eriksson, O. E. et D. L. Hawksworth (1988).- Notes on ascomycete systematics -

- Nos 552-732.- *Syst. Ascomycetum* 7(1): 59-101.
- Faurel, L. et G. Schotter (1958).- Lichens. In: P. Quézel, Mission botanique au Tibesti, p. 67-79, tab. I. Algier.
- Gerber, K. (1931).- Die epiphytische Verbreitung von "Flechtenparasiten".- *Arch. Protistenk.* 74: 471-489.
- Hafellner, J. (1982).- Studien über lichenicole Pilze und Flechten II. *Lichenostigma maureri* gen. et sp. nov., ein in den Ostalpen häufiger lichenicoler Pilz (Ascomycetes, Arthoniales).- *Herzogia* 6: 299-308.
- Hawksworth, D. L. (1981).- *Lichenothelia* a new genus for the *Microthelia aterrima* group.- *Lichenologist* 13: 141-153.
- Hawksworth, D. L. et J. Hafellner (1986).- *Phaeosporobolus usneae*, a new and widespread lichenicolous deuteromycete.- *Nova Hedwigia* 43: 525-530.
- Henssen, A. (1987).- *Lichenothelia*, a genus of microfungi on rocks. In: Progress and Problems in Lichenology in the Eighties.- *Biblioth. Lichenol.* 25: 257-293.
- Lumbsch, H. T. (1989).- Die holarktischen Vertreter der Flechtengattung *Diploschistes* (Thelotremaeaceae).- *J. Hattori Bot. Lab.* 66: 133-196.
- Roux, C. (1978).- Complément à l'étude écologique et phytosociologique des peuplements lichéniques saxicoles-calcicoles du SE de la France.- *Bull. Mus. Hist. Nat. Marseille* 38: 65-186.
- Thor, G. (1985).- A new species of *Lichenostigma*, a lichenicolous ascomycete.- *Lichenologist* 17: 269-272.
- Van den Boom, P., M. Brand, P. Diederich, A. Aptroot et E. Sérusiaux (1994).- Report of a lichenological field meeting in Luxembourg.- *Bull. Soc. Nat. Luxemb.* 95: 145-176.