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THE GENUS *SCUTELLINIA* (PEZIZALES, ASCOMYCOTINA) IN CROATIA, II.: *SCUTELLINIA* *BARLAE* AND *S. MINOR*

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The present research on Discomycetes in the Kvarner region has produced the first Croatian record of *S. barlae*, the first record of the genus *Scutellinia* in the Croatian North Adriatic. This European species is relatively poorly known as it has been so far recorded in only ten localities situated mostly in the Mediterranean area. Collections of the species were examined in detail through a proposed standardised procedure and compared with other collections outside Croatia as well as with the similar species *S. minor*. Although *S. barlae* and *S. minor* inhabit quite different bioclimatic areas, their closest localities in Croatia, are only 45 km distant. The January mean air temperature isotherm of 0 °C clearly separates all so far known localities of these two species.

Key words: Ascomycotina, Pezizales, *Scutellinia*, *S. barlae*, *S. minor*. – Chorology, morphology, mycofloristics, standardised microscopical research. Croatia.

Matočec, N.: Rod *Scutellinia* (Pezizales, Ascomycotina) u Hrvatskoj, II.: *Scutellinia barlae* i *S. minor*, Nat. Croat., Vol. 7, No 2., 91–105, 1998, Zagreb

Novo istraživanje diskomiceta, provedeno na Kvarneru, rezultiralo je pronalaskom nove vrste iz roda *Scutellinia* za Hrvatsku mikofloru: *S. barlae*. To je ujedno i prvi nalaz toga roda na sjevernom Jadranu u Hrvatskoj. Ta europska vrsta je razmjerno slabo poznata, jer je utvrđena samo na deset, pretežno mediteranskih nalazišta. Zbog toga su naši nalazi te vrste detaljno opisani i uspoređeni s ostalim nalazima izvan Hrvatske, kao i sa sličnom vrstom *S. minor*, koristeći predloženi standardizirani postupak. Iako nastanjuju posve različit bioklimatski prostor, najbliži dosad poznati lokaliteti vrsta *S. barlae* i *S. minor* nalaze se u Hrvatskoj, udaljeni tek 45 km zračne linije. Izoterma prosječne siječanjske temperature zraka od 0 °C potpuno razdvaja sva dosad poznata nalazišta tih dviju vrsta.

Ključne riječi: Ascomycotina, Pezizales, *Scutellinia*, *S. barlae*, *S. minor*. – korologija, mikofloristika, morfologija, standardizirano mikroskopijsko istraživanje, Hrvatska.

INTRODUCTION

Discomycete research in the Kvarner area carried out in spring 1996 produced the first Croatian record of the species *Scutellinia barlae* (Boud.) Maire, the first record of the genus *Scutellinia* (Cooke) Lambotte in the Croatian North Adriatic, extending the known distribution of the genus into the Croatian Mediterranean area. It is not surprising that this particular species has been found in this area in view of its warm temperate European distribution. Because of the great morphological similarities, this species was compared with the species *S. minor* (Velen.) Svrček, which has also recently been found in Croatia (MATOČEC *et al.* 1995).

MATERIAL AND METHODS

The geographical range of the present research includes the Vinodol area, part of the Velebit coast and the following Kvarner islands: Krk, Prvić, Sv. Grgur, Goli, Rab, the northern part of Pag and some of the smaller islets (Plate 1).

During research on the Mediterranean area, special attention was given to those habitats previously presumed capable of being settled by pezizalean fungi. They are: (a) coastal springs, (b) coastal wet caves or niches, (c) running water banks or intermittent brooks, (d) forest path fringes and humid trenches and (e) forest terraces and slopes (see also MATOČEC *et al.* 1995). The sampled collections and their habitats were photographed with 24 × 36 mm colour slides. Apothecia were maintained in the living state in order to provide macroscopical descriptions, spore prints and microscopical analysis of their natural living structures (cf. BARAL 1992).

Maps of the Military Geographic Institute 1 : 25 000 were used to determine the collection points precisely. As sources of supplementary data for ecological relations, we used the Climatic Atlas of FRY (for the period 1931–1960) and the Climatic Map of Europe (DE AGOSTINI 1992).

The material was firstly examined by optical microscope (lenses 40 × and 90 × with oil immersion) in the living state in tap water medium (cf. HUHTINEN 1990a and BARAL 1992) and after that in *statu emortuo* in cotton blue medium. Both species identification and determination of the variation range of qualitative and quantitative characters in our collections were based on apothecial anatomy and hymenial elements. Ascospore ornamentation was measured and described using the cotton blue stain dissolved in lactophenol. Preparation, procedure and purpose were elaborated earlier (ERB & MATHEIS 1983, MATOČEC *et al.* 1995). All the ascospore characters were based on samples of 100 fully matured ascospores prepared from apothecial spore prints. Both samples of fresh ascospores in tap water medium and those stained in cotton blue, taken from the same spore print, were measured and compared. Statistical samples of the most valuable differential characters (ascospore shape and diameter and ascospore ornamentation height and diameter) were used in order to compare our collections of both species *S. barlae* (Boud.) Maire and *S. minor* (Velen.) Svrček. The results of this procedure were cal-

culated and graphically presented by Statsoft's program STATISTICA 4.3. for Windows. Qualitative and quantitative characters of marginal hairs, based on 50 measurements, were also used for the same purpose.

Exiccata, spore prints, colour slides, collection drawings and textual data as well, are deposited in the Matočec personal fungarium.

Abbreviations

2/ = Matočec personal fungarium, Gajnice 13, Zagreb; CB = cotton blue; CB+ = cyanophillic structures; CB- = non-cyanophillic structures; H₂O = tap water; SEM = Scanning Electron Microscope. In abbreviations of authors of fungal names I follow P. M. KIRK & A. E. ANSELL (1992).

The level of observation and the presentation

In the species concept, organism delimitation, fructification definition, anatomical terminology, taxonomy and nomenclature I follow an earlier paper (MATOČEC *et al.* 1995). In biogeographical terminology I follow SCHUMACHER (1990, 1993).

MATERIAL STUDIED

Scutellinia barlae (Boud.) Maire

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Illustrations: Plate 2, 3

Apothecia shallowly cupulate to plane, sessile, 4.0–6.5 mm in diam. Hymenium reddish orange to scarlet red. Apothecial margin densely beset with short, almost not protruding ochraceous brown to blackish brown hairs. Excipular surface greyish orange clothed with relatively sparse, short and inconspicuous, greyish ochraceous hairs.

Marginal hairs flexuous, predominantly obtuse to tapering, exceptionally pointed at the top, generally spindle-shaped but sometimes broadest at the basal half, uniformly coloured, (1) 2–6 celled, 126–352 × 13.5–27.0 μm, always with simple, unbranched base; walls ochraceous yellow to rusty brown, 2.9–6.7 μm thick. Excipular hairs completely homogenous as regards to the marginal hairs, flexuous, predominantly pointed at the apex, generally spindle-shaped, uniformly coloured, (2) 3–8 celled, 146–378 × 12.3–19.5 μm, with simple, unbranched base; walls ochraceous yellow to brownish, 2.5–4.6 μm thick. Marginal part of the excipulum composed of prismatic to isodiametric angular cell rows oriented to the excipular surface at a low angle; cells 7.5–25.5 μm in diam., hyaline to subhyaline, CB+. Ectal excipulum 160–185 μm thick, pseudoparenchymatic, composed of isodiametric angular to slightly elongated cells, 14.5–75 × 14.5–50.0 μm, walls CB+, 0.4–1.0 μm thick. Medullary excipulum 370–430 μm thick, composed of textura porrecta-intricata; cells cylindrical, run parallel to the excipular surface, 3.6–12.0 μm in diam., walls

CB-. Subhymenium distinct, 60–80 μm thick, composed of densely packed angular to shortly elongated cells with CB- or locally with weak CB+ walls. Asci cylindrical, pleurorhynchous, uniseriate and 8-spored, operculate, hyaline, 274–316 \times 23.3–28.2 μm . Paraphyses cylindrical, simple, mostly clavate enlarged, rarely with paddle-shaped or fusiformly enlarged apical part; apical cell 30–66 μm long and 6.0–11.0 μm in diam., filled with yellowish orange to orange red granuliform to vermiform pigment, normally septate. Mature ascospore in the living state in H₂O perfectly globose, hyaline, 18.1–21.2 μm in diam., filled with numerous, refractive, granular lipid bodies. Mature ascospores stained in CB, globose, 16.5–19.3 μm in diam. Ascospore ornamentation CB+, composed of isolated roller-shaped, aculeolate warts, 0.6–1.8 μm in diam. and 0.6–1.7 μm in height. The outer wall layer not loosening when heated in CB. Premature, not ejected ascospores often subglobose to broadly ellipsoid.

Two collections originated from separate fructifications found on very wet ground of the edge of a path situated in low forest. The first fructification was composed of 10 separated, mostly mature apothecia. The substrate was forest ground without litter and partly beset with mosses. The second fructification was composed of 35 mostly separated, fully mature apothecia. The substrate was also forest ground, but without litter or mosses. Therefore, these two fructifications were designated humus saprotrophs. The distance of these fructifications was 4.5 m and they showed total space discontinuity.

Both collections, which originate from a SW slope, were situated in the lower spring area of the Vela rika gorge on the island of Krk, Plate 1. The locality is situated in a relatively wet flysch area inside the karst region, in Sub-Mediterranean low forest composed of *Quercus pubescens* Willd. and *Ostrya carpinifolia* Scop. According to the Climatic Atlas of FRY (for the period of 1931–1960), the monthly mean air temperature in January is +4 °C, while the monthly mean air temperature in the fructification month (April) is +12 °C. The monthly mean precipitation in April is 80 mm. Woody species in the areas of the collection points (20 m in diameter per each collection point) were listed according to their quantity: *Quercus pubescens* Willd., *Ostrya carpinifolia* Scop., *Acer monspessulanum* L. and *Coronilla emeroides* Boiss. & Spr.

Specimens examined: Collections 2/3008 and 2/3009, Vela rika gorge near Sv. Juraj on the island of Krk, UTM 33T VK 87, altitude 250 m above sea level, 6 April 1996., leg. N. Matočec & M. Samardžić.

DISCUSSION

Chorology

The present collections of *S. barlae* represent a new species for Croatian mycology. There are now 15 recognised species of this genus in Croatia. This warm temperate species, restricted probably to the European continent is, however, rela-

tively poorly known and has been found with certainty in only ten localities. Those localities are situated mostly in the Mediterranean area (7 localities) and also on the warm Atlantic (3 localities), Plate 1A. Our collections of *S. barlae* are treated here in detail and compared with material collected outside Croatia as well as with records of the morphologically most similar species – *S. minor*.

Collections of *S. barlae* made on the island of Krk also fall in the ecological range of the fructification period for the genus *Scutellinia* determined for the Croatian inland (range of monthly mean air temperature 10–21 °C and precipitation above 70 mm). This confirmed the validity of the »Time-space fructification probability model« even on the Croatian North Adriatic with a Sub-Mediterranean climate (cf. MATOČEC *et al.* 1995).

The distance between the known localities of *S. barlae* and *S. minor* is the shorter in Croatia than in any other country. Only 45 km separate the locality of *S. barlae* on the island of Krk and locality of *S. minor* on subalpine »island«, sink-hole Viljska ponikva in the national park »Risnjak«.

Although the so far known localities of both *S. barlae* and *S. minor* are insufficient to define their ranges, it is obvious that these two species inhabit quite different bioclimatic areas. Therefore it is quite possible that these two species are naturally isolated. *S. minor* is distributed only in subalpine, alpine and arcto-boreal regions of Europe. All so far known localities are situated in the area with a monthly mean air temperature in January below 0 °C (DE AGOSTINI 1992, Plate 1). On the other hand, *S. barlae* is a warm temperate species and distributed only in European Mediterranean region and in the warm Atlantic. All so far known localities belong to the area with a monthly mean air temperature in January above 0 °C (DE AGOSTINI 1992, Plate 1).

Morphological characters and standardised microscopical research

The most valuable quantitative morphological characters at the species level in the genus *Scutellinia* (ascospore and marginal hair characters) show considerable deviations. Tables 1 and 2 represent these deviations in species *Scutellinia barlae* and *S. minor*. On the other hand, qualitative characters are more or less stable, and therefore can be successfully used distinguishing the species *S. barlae* and *S. minor*. *S. barlae* has perfectly globose mature ascospores and simple, unforked marginal and excipular hair base, while *S. minor* always has subglobose mature ascospores at least in a large part of the sample as well as marginal hairs forked at the bases, with 2–3 branches (Plate 3). However, ascospore diameter may also play an important role in distinguishing these two species. The variation ranges of the ascospore diameter given in the literature vary considerably (Tabs.1, 2), often resulting in an unclear delimitation of these two species according to this single characteristic. This could be connected with different authors having different and not standardised research methods. Therefore the entire variability of this characteristic should not be assigned to the natural variation range of these species. It could be caused (besides measurement inaccuracy, micrometer calibration inaccuracy and unrepresentative sampling) by:

(a) different ways of taking samples of the ascospores for measurement. The most reliable results can be obtained from the apothecial spore print, because it represents the only sample with fully mature ascospores, ejected from the living asci. Ascospore measurements taken from a preparation of apothecial sections, or what is even worse, from a squash preparation, give a considerable amount of low values due to the significant presence of young, premature ascospores, mechanically forced out from the premature asci. The measurements of ascospores inside the asci may result in totally unexpected (and quite unreal) values because of light diffraction in the ascus cytoplasm and premature ascospores.

(b) different procedures and media in which ascospores are measured. Living ascospores in tap water medium show higher dimension values than those obtained from rehydrated ascospores or especially those stained with cotton blue (Tabs. 1–3), as noticed earlier (BARAL 1992). These differences in both *S. barlae* and *S. minor* were found on the basis of measurements made from samples of the same apothecial spore print and mounted in both water and cotton blue media, Table 3.

Table 1. Comparative table of character values observed from all available and possible references in *S. barlae*

Source <i>S. barlae</i>	Marginal hairs			Ascospores			Ascospore ornamentation		
	base	length /μm	diam. /μm	shape *	shape ‡	diam. /μm	shape	diam. /μm	height /μm
MATOČEC 1997 (H ₂ O) n=2	simple	126–352	13.5–27	glob.		* 18.1–21.2			
MATOČEC 1997 (CB) n=2	simple	126–352	13.5–27		glob.	‡ 16.5–19.3	acul.	0.6–1.8	0.6–1.7
ORTEGA & VISOZO, 1991 n=1	simple	100–400	15–25	–	glob.	‡ 20–22	acul.	–	–
SCHUMACHER 1990 n=6	simple	ca. 300	15–20	glob.	glob.	? 16.2–24.4	acul.	up to 1.8	0.6–1.4 (1.8)
DONADINI 1983 n=3	–	200–400	15–25	? glob.	? glob.	? 19–23	pust.	–	–
BOUDIER 1905–1910 n=?	simple except forked	280–305*	12.5–18*	glob.	–	* 17.0–17.5*	acul.	–	–
HIRSCH 1985, n=3 <i>S. barlae</i> ?	simple	ca. 250	15–25	? glob.	? glob.	? 17.6–19.8	tuber.	up to 1.5	up to 1.0 (1.3)

* character observed in the living state; ‡ character observed in rehydrated material and stained in CB; ? material state at time of microscopical research is unknown; * calculated values obtained by measuring the original microscopic drawings n= number of examined collections; **acul.** aculeolate ornamentation; **tuber.** tuberculate ornamentation; **pust.** pustulate ornamentation; **glob.** globose ascospores; **subgl.** subglobose ascospores

The collection marked »*S. barlae?*« (from HIRSCH /1985/, as *S. trechispora* (Berk. & Broome) Lambotte) clearly do not belong to *S. trechispora*. It may represent *S. minor* because it contains tuberculate ascospores, but on the other hand it may be conspecific with *S. barlae* according to its unforked hair bases. The present author did not examine this doubtful collection.

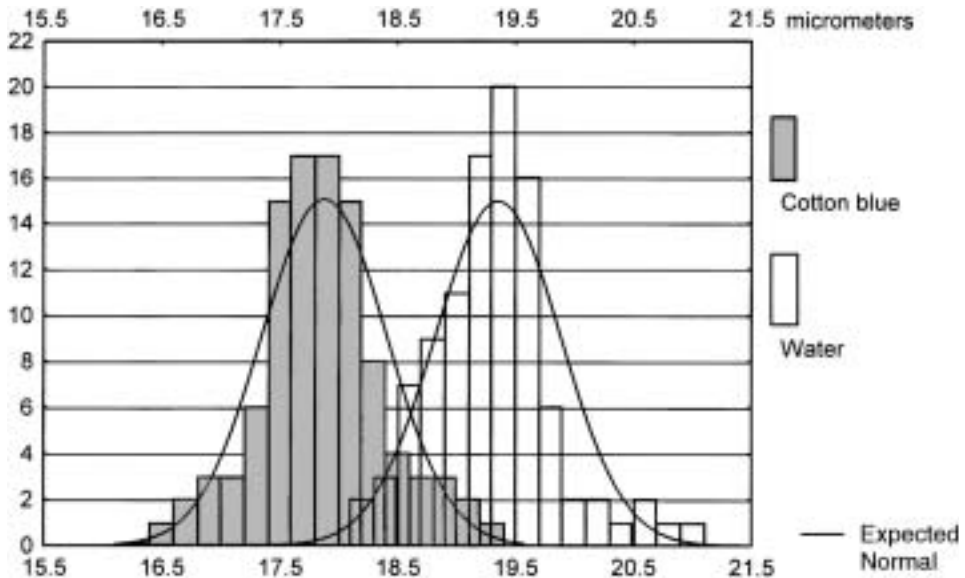
Table 2. Comparative table of *S. minor* character values observed from all available and possible references

Source <i>S. minor</i>	Marginal hairs			Ascospores			Ascospore ornamentation		
	base	length /µm	diam. /µm	shape *	shape ‡	diam. /µm	shape	diam. /µm	height /µm
MATOČEC 1995 (H ₂ O) n=1	mostly forked	220–488	17.2–30	glob.- subgl.		* 14.5–16.8			
MATOČEC 1995 (CB) n=1	mostly forked	220–488	17.2–30			‡ 13.6–16.2	acul.	1.2–2.1	0.8–2.2
SCHUMACHER 1990 n=26	simple to 2–3x forked	100–450 (650)	15–40	glob.- subgl.	glob.- subgl.	? 14.8–19.4	acul.	ca. 1.5	1.0–1.8
MORAVEC 1974 n=?	–	–	–	? glob.- subgl.	? glob.- subgl.	? 14.8–16.3	acul.	up to 1.5	1.0–2.0
SVRČEK & MORAVEC 1969 n=1	simple to forked	95–250	9.5–35	? subgl.	? subgl.	? 14.8–16.3	acul.	0.5–1.4	–
SCHÄRER-BIDER 1951 <i>S. minor?</i>	forked	245	–	? glob.	? glob.	? 19–22	–	–	–
Moravec 1969, n=1 <i>S. minor?</i>	mostly forked	80–300	9–19	–	glob.- subgl.	‡ 16–20	tuber.	0.4–1.4	–
LOH. & HÄFFN 1983, n=3 <i>S. minor?</i>	simple to forked	(80) 100–250 (300)	15–24	? glob.	? glob.	? 15–17	acul.- tuber.	up to 2.0	0.5–1.2 (1.5)
DONADINI 1983, n=1 <i>S. minor?</i>	simple to forked	160–320	25–30	? glob.	? glob.	? 16.5–18.0	acul.	–	0.8–2.0
IRLET 1984, n=4 <i>S. minor?</i>	forked	200–380	17–26	? glob.	? glob.	? 17–19	tuber.	–	0.5–1.0

* character observed in the living state; ‡ character observed in rehydrated material and stained in CB; ? material state at time of microscopical research is unknown; n= number of examined collections; **acul.** aculeolate ornamentation; **tuber.** tuberculate ornamentation; **pust.** pustulate ornamentation; **glob.** globose ascospores; **subgl.** subglobose ascospores

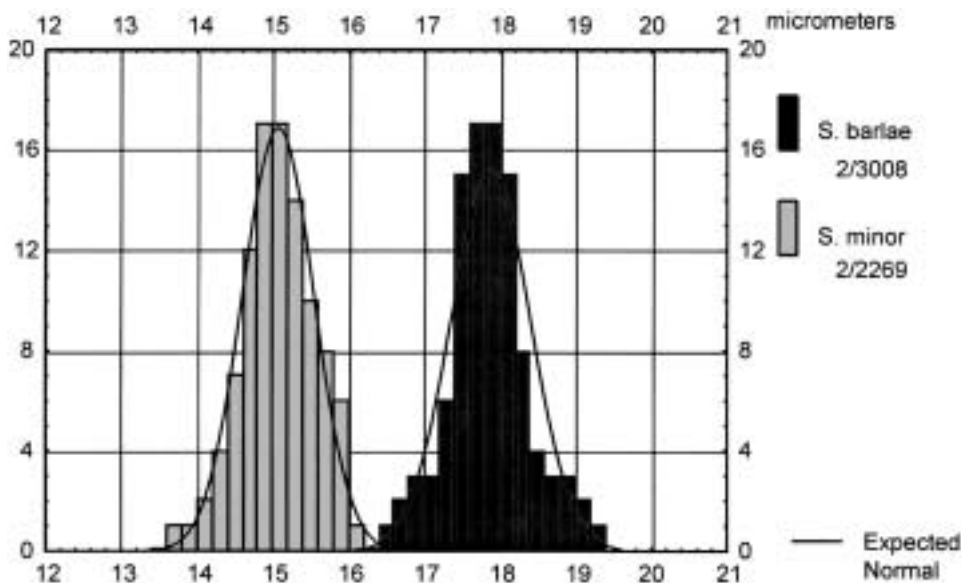
Collections marked with »*S. minor?*« represent material that clearly does not belong to *Scutellinia barlae* (Boud.) Maire, due to the presence of marginal hairs with forked bases and to the occurrence of either tuberculate ornamented or small ascospores (below 17 μm in diameter) noticed by the authors: SCHÄRER-BIDER 1951 as *Ciliaria barlae* Boud.; MORAVEC 1969 as *S. trechispora* (Berk. & Broome) Lambotte var. *barlae* (Boud.) J. Moravec; LOHMEYER & HÄFFNER 1983 and IRLET 1984 as *S. trechispora* (Berk. & Broome) Lambotte. All of the material cited above originates from alpine or boreo-temperate regions. Although species identity is not certain, they may represent *S. minor* (Velen.) Svrček, especially collections published by LOHMEYER & HÄFFNER (1983, ascospores below 17 μm in diameter) and by MORAVEC (1969, subglobose ascospores). The collection published by DONADINI (1983) as *S. trechisperma* f. *micropilifera* may also represent *S. minor*. The author did not examine any of these doubtful collections.

Table 3. Comparative graph of ascospore diameter distributions in the Croatian collection of *S. barlae* (2/3008) obtained from cotton blue and water media



It is obvious that the distribution of the ascospore diameter values in both the Croatian collections of *S. barlae* and *S. minor* are totally exclusive (i.e. non-overlapping) when treated with the standardised procedure on samples comprising 100 ascospores taken from spore prints and stained with cotton blue. Consequently, it is not necessary to provide significance tests (Table 4). We may assume that these two species, as well as some other pezizalean fungi, would be more successfully distinguished if standardised procedures were widely and constantly ap-

Table 4. Comparative graph of ascospore diameter distributions in Croatian collections of *S. barlae* and *S. minor*



plied. I chose a cotton blue medium in order to treat simultaneously all the quantitative ascospore characters including the cyanophilous ornamentation. Therefore I strongly recommend that:

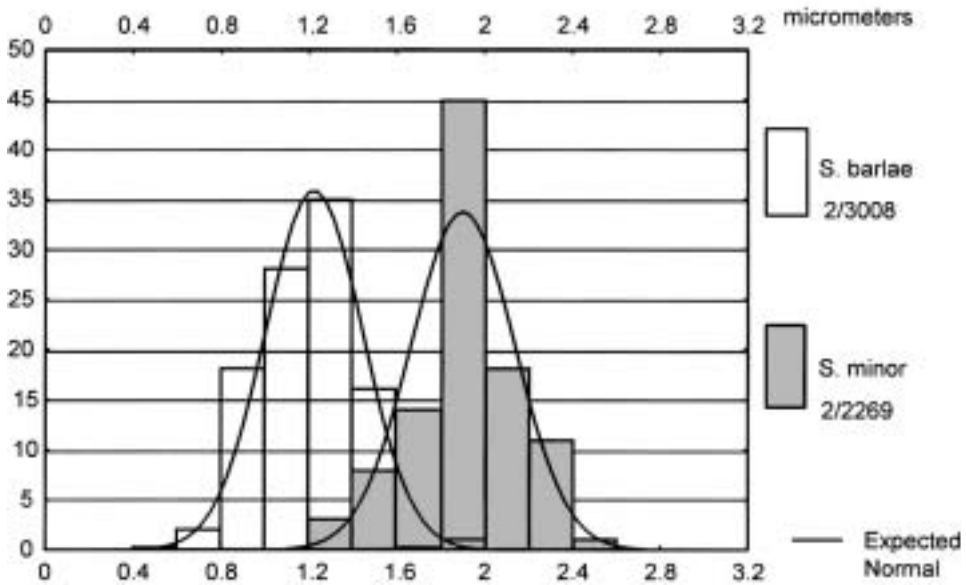
a) authors, when presenting the morphology of the examined apothecia, always indicate exactly which measurements (and variability range) were taken from living structures in water medium and which were obtained from rehydrated material,

b) authors apply cotton blue when rehydrated material is studied as both ascospore and ornamental dimensions can be measured at the same time from the every single ascospore, and

c) workers should obtain a spore print for ascospore analysis whenever possible because it is the only reliable source of fully mature ascospores and contains much more than enough for a single study (ca. 100 ascospores would be enough to make reliable variation range of the collection).

Ornamentation height, a characteristic that is one of the most valuable in species delimitation among critical species in the genus, has little importance in distinguishing the species *S. barlae* and *S. minor*. Although distributions of the ascospore ornamentation height in both Croatian collections of these species are highly overlapping, the collection of *S. minor* has comparatively higher values in ornamentation height than *S. barlae* when only maximal height values are selected per ascospore in the sample (Table 5).

Table 5. Comparative graph of ascospore ornamentation maximum heights distributions in Croatian collections of *S. barlae* and *S. minor*



Ornamentation diameter distributions showed almost total overlapping and therefore have no importance in distinguishing these two species.

Although ascospore ornamentation types in our collections have been determined only by light microscope (oil immersion objective, cotton blue), they are fully in agreement with those obtained by SEM microscope (SCHUMACHER 1990, Figs. 52–54).

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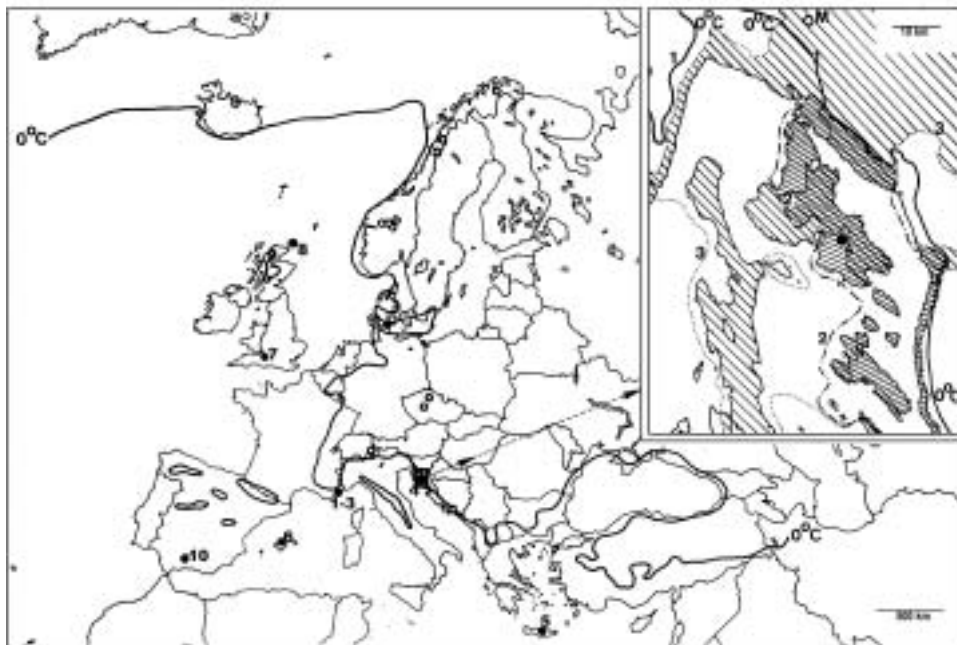
S a ž e t a k

Rod *Scutellinia* (Pezizales, Ascomycotina) u Hrvatskoj II.: *Scutellinia barlae* i *S. minor*

N. Matočec

Tijekom proljetnih istraživanja diskomiceta godine 1996. na području Kvarnera pronađena je nova, petnaesta vrsta iz roda *Scutellinia* za mikofloru Hrvatske: *Scutellinia barlae* (Boud.) Maire. To je ujedno i prvi nalaz tog roda na sjevernom Jadranu u Hrvatskoj. Nalazište je smješteno u relativno vlažnom, flišnom području klanca Vele rike u južnom dijelu otoka Krka, na području šume hrasta medunca s crnim grabom. *S. barlae* je mediteransko-atlantska vrsta pronađena zasad samo u Europi, razmjerno slabo poznata i utvrđena sa sigurnošću samo na 10 različitih lokaliteta u toplijim područjima, pretežno mediteranskim. Zbog toga, taj nalaz predstavlja važan prilog poznavanju njene varijacijske širine. Uvidom u podatke o njenim nalazištima ustanovljeno je da se svi nalaze na području sa prosječnom siječanjskom temperaturom zraka iznad 0 °C. U Hrvatskoj je vjerojatno ograničena samo na mediteranski prostor. Zbog svega toga nalaz je detaljno obrađen, uspoređen s drugim nalazima iste vrste izvan Hrvatske i uspoređen s nalazom, morfološki vrlo slične no ekološki posve različite vrste *S. minor* predloženim, standardiziranim postupkom. Vrsta *S. minor* također dosad poznata samo za Europu, a nastava subalpska, alpska i boreo-polarna područja, pronađena je u Hrvatskoj 1994. na tek 45 km zračne linije udaljenom nalazištu u subalpskom bioklimatskom »otoku« Gorskog kotara u području nacionalnog parka »Risnjak«. Tako su dosad poznata nalazišta tih dviju vrsta međusobno najbliža upravo u Hrvatskoj. U morfološkom pogledu jasno se razlikuju prema dva kvalitativna taksonomska obilježja: građi baze rubnih dlačica plodišta i obliku askospora. Promjer askospora, kao kvantitativno taksonomsko obilježje, također jasno razdvaja naše nalaze vrsta *S. barlae* i *S. minor*, ali samo pri standardiziranom postupku, na čemu bi se moglo temeljiti jasnije razlučivanje i drugih vrsta gljiva iz reda Pezizales. Premda su dosad poznata nalazišta obiju vrsta za oslikavanje njihovih areala nedostatna, već sada je vidljivo kako obje vrste nastavaju posve različit bioklimatski prostor, pa vjerojatno u prirodi ne može doći do njihova dodira. Izoterma prosječne siječanjske temperature zraka od 0 °C potpuno razdvaja sva dosad poznata nalazišta tih dviju vrsta.

Plate 1. Known distribution of the *Scutellinia barlae* and *S. minor*

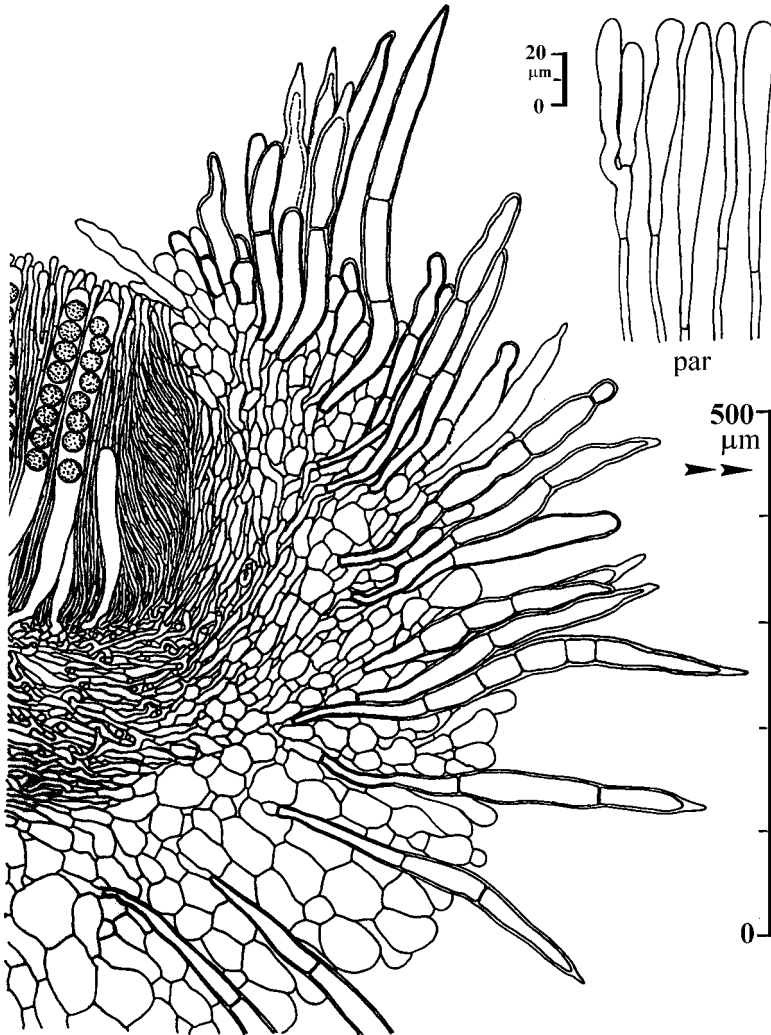


A - Larger map: Europe with depicted isotherm of 0 °C mean air temperature in January (after DE AGOSTINI 1992) with so far known localities of *S. barlae* (filled circle) and *S. minor* (empty circle)

B - Smaller map: Kvarner region and a part of the Gorski kotar region in Croatia

- (1) isotherm of 0 °C mean air temperature in January (according to Climatic Atlas of FRY)
- (2) researched area in the present field work
- (3) researched area in the previous field work
- (4) locality of the *Scutellinia barlae* (filled circle)
- M - locality of the *Scutellinia minor* (empty circle)

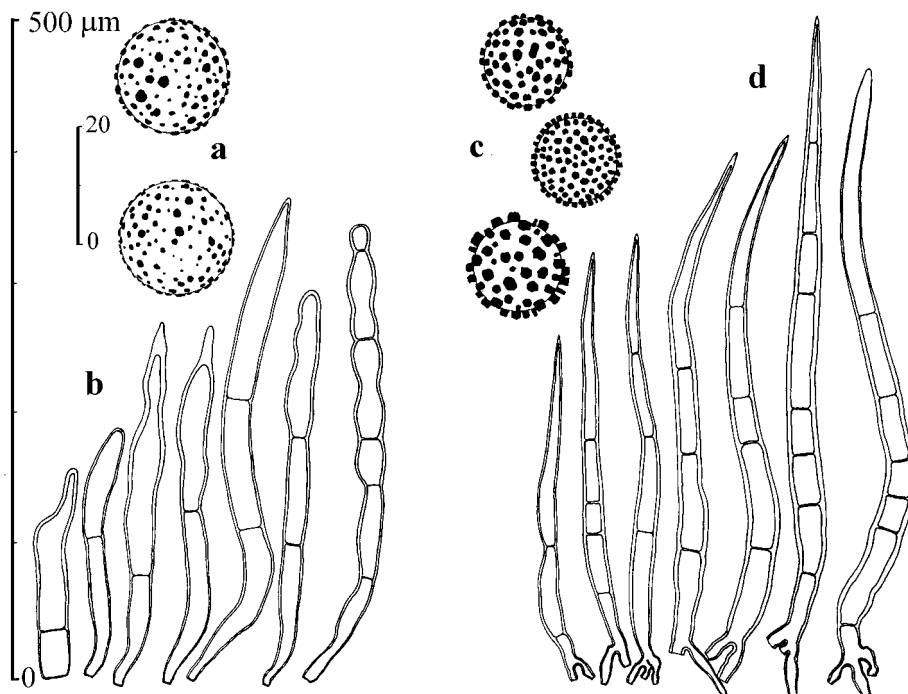
Plate 2. Section of the apothecial margin and paraphyses in *S. barlae*



exiccata no. 2/3008

Larger scale corresponds to apothecial margin and smaller to paraphyses (par)

Plate 3. Comparative morphology in *S. barlae* and *S. minor*



exiccata no. 2/3008

exiccata no. 2/2269
(from MATOČEC *et al.* 1995)

- a - ascospores of *S. barlae* stained with cotton blue (smaller scale)
- b - marginal hairs of *S. barlae* (larger scale)
- c - ascospores of *S. minor* stained with cotton blue (smaller scale)
- d - marginal hairs of *S. minor* (larger scale)