

## *Interesting Lichenized Fungi (Ascomycota) from Struma River Valley and Belasitsa Mts.*

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**Abstract.** New data on 10 interesting or rare lichenized fungi in Bulgaria (*Anaptychia ciliaris*, *Cetraria islandica*, *Cladonia ramulosa*, *Dermatocarpon miniatum*, *Graphis scripta*, *Hypogymnia tubulosa*, *Lobaria pulmonaria*, *Physconia enteroxantha*, *Pyrenula nitida* and *Rinodina pyrina*) are revealed. Most of them are documented with digital photographs. *Lobaria pulmonaria* is detected in several localities on old beech and chestnut bark, while *Cetraria islandica* is recorded on soil in Mt Belasitsa at high altitudes. Site description and information on the distribution of each species so far known in Bulgaria are presented.

**Key words:** biodiversity, lichenized fungi, Struma River valley, Belasitsa, Bulgaria.

### **Introduction**

The very first data on the lichenized fungi of Belasitsa Mts. can be found in the work of CRETZOIU (1936). Published information, including thorough and more detailed data about the distribution of lichenized fungi from the Struma River valley (including "Prepetscheno" locality) and "Belasitsa", could be obtained from several basic works (POPNIKOLOV, 1937; ZHELEZOVA 1962, 1963; POPNIKOLOV & ZHELEZOVA, 1964) and in the recent published monograph on foliose genera of *Physciaceae* family (ATANASSOVA & MAYRHOFER, 2012). The first monographic study on the morphologically diverse genus *Usnea* Dill. ex Adans. from the mountain regions of the country, comprising Belasitsa Mts., was compiled by MOTYKA & ZHELEZOVA (1962).

During routine field studies in the vicinities of Petrich town (southern part of Strouma Valley and several regions, situated around the lower parts near the villages of Belasitsa Mts., supplied by records from high mountain zone), new data about 10 lichenized fungi of special interest has been revealed. They represent mainly epiphytic, epilithic and epigeous species.

### **Material and Methods**

Field and laboratory studies were held during 2013 using techniques and methods, accepted and described in DOBSON (2011). The studied specimens were documented macroscopically with the help of digital camera Canon PowerShot A460 in the field or under Boeco B-3500 binocular microscope. Semipermanent microscope squash mounts, made from the cross

sections of the lichen thalli, were prepared in distilled water and observed under the LM Boeco T-SP-180. Data about the localities of the specimens (longitude, latitude and elevation parameters) are received with the help of GPS receiver Garmin Etrex 10. Information on plant substrata and other features of the samples is collected in the field. The identification of the specimens is justified by NIMIS *et al.* (2009), DOBSON (2011) and ELIX (2011).

Data about the distribution of the taxa in the country follows MAYRHOFER *et al.* (2005). The specimens of the lichenized fungi are housed at the Mycological Collection, Institute of Biodiversity and Ecosystem Research, Sofia (SOMF).

### Results and Discussion

Within the examined lichenized fungi from Belasitsa Mts. and Strouma Valley 10 species are presented here in. Six of them are new records for the studied areas, which is pointed out with an asterisk in the text (\*). Below the list of determined species is provided short note on their known distribution in Bulgaria, or important data are discussed briefly. Information on comparison with other closest species, if present, is given too.

#### *Anaptychia ciliaris* (L.) Körb.

*Specimen examined:* Bulgaria, Valley of Strouma River (southern): Blagoevgrad distr., vicinity of Petrich Town, above Ruzhdak Village, 41°23'28.4''N, 023°15'10.8''E, 346 m a.s.l., 23 May 2013, D. Stoykov, SOMF 28682, on bark of *Quercus pubescens* WILLD., along with *Physconia distorta* (With.) J.R. Laundon; Belasitsa Mts.: above the town of Petrich, far from Paprenitsa border point, along with *Hypogymnia tubulosa* (Schaer.) Hav., *Usnea hirta* (L.) Weber ex F.H. Wigg., *Evernia prunastri* (L.) Ach. and *Physconia distorta* (With.) J.R. Laundon, 41°19'34.3''N, 023°13'1.9''E, 1350 m a.s.l., 25 May 2013, D. Stoykov, SOMF 28740, on bark of old *Salix* sp.; *ibid.*, below the mountain road, 41°19'21.6''N, 023°11'28.5'' E, 1681 m a.s.l., 25 May 2013, D. Stoykov, SOMF 28747, on

bark of *Fagus sylvatica* L., adjacent to *Sorbus borbasii* Javorka trees. Epiphyte (**Fig. 1**).

*Known distribution:* Black Sea coast, Northeast Bulgaria, Forebalkan, Balkan Range, Sofia and Vitosha regions, Valley of Strouma River, Pirin and Rila Mts., Rhodopes Mts., Toundzha Hilly Country and Strandzha Mts. (see MAYRHOFER *et al.*, 2005).

*Anaptychia ciliaris* resembles morphologically *A. crinalis* (Schleich.) Vězda, but differs mainly in different colour of the upper thalline surface and the wider lobes of the thallus (usually over 1 mm wide).

\**Cetraria islandica* (L.) Ach. - new record for Belasitsa Mts.

*Specimens examined:* Bulgaria, Belasitsa Mts.: above the town of Petrich, below Kongur Peak, near the high mountain road, 41°19'16.3''N, 023°11'05.9''E, 1730 m a.s.l., 25 May 2013, D. Stoykov, SOMF 28677, SOMF 28720, on soil, along with *Bruckenthalia spiculifolia* (Salisb.) Reichenb.; on southern slope of Radomir Peak, sine datum, 20 June 2013, coll. S. Stoyanov, SOMF 28741, 28743, 28744; above Samouilovo Village, Lopovo border point region, nearby the high mountain road in both directions – down the southern slope of Radomir Peak, along with *Umbilicaria cylindrica* (L.) Delise ex Duby on surrounding rocks, 41°19'49.9''N, 023°02'33.2''E, 1752 m a.s.l., 24 May 2013, D. Stoykov, SOMF 28731, on soil among grasses; above the village of Kljuch, along the mountain road, 41°19'53.2''N, 023°01'18.1''E, 1752 m alt., *ibid.*, SOMF 28711, on soil, together with *Vaccinium myrtillus* L.; along the mountain road above Kljuch Village in direction Toubata Peak, 24 May 2013, 41°19'09''N, 023°06'16''E, 1725 m alt., D. Stoykov, SOMF 28715, on soil; above the mountain road following Demirkapiya Pass in direction of Kljuch Village, together with *Cetaria aculeata* (Schreb.) Fr., 41°19'34.9''N, 023°03'43.0''E, 1766 m a.s.l., 24 May 2013, SOMF 28734, on sandy soil, in communities of *Viola stojanovii* W. Becker. Epigeous species (**Fig. 6**).

*Known distribution:* Balkan Range, Vitosha region, West Frontier Mts.,

Slavyanka Mts., Pirin and Rila Mts., Rhodopes Mts. (MAYRHOFER *et al.*, 2005).

*Cetraria islandica* has a fruticose, small to medium brown thallus, developed loosely or attached in the soil; it is usually tufted, many lobed and irregularly branched. Species is of conservation value in Great Britain, where it is included in the category Least Concerned (LC), WOODS & COPPINS (2012), while in the Red List of the lichenized fungi of Wales is designated as Near Threatened (NT), WOODS (2010). Recently it was confirmed in Bulgaria from Balkan Range (Shipchenska Mts.), from the regions of Malusha Peak (1312 m a.s.l.) in grassy communities, along with *Thamnolia vermicularis* (Sw.) Schaer. var. *vermicularis* and from the mountain zone of Bedek Peak in grassy communities (1488 m a.s.l.) and on soil among mosses in beech forest along the track to Gorski Dom 'Balgarka'.

\**Cladonia ramulosa* (With.) J.R. Laundon - new country record from Belasitsa Mts.

*Specimen examined*: Bulgaria, Belasitsa Mts.: between Kolarovo and Samouillovo Villages, near the old cherry orchard, 7 April 2013, 41°21'57.5''N, 023°05'38.4''E, 376 m a.s.l., D. Stoykov, SOMF 28742, on bark of old dead trunk from broadleaved tree. Epixylous species (Fig. 2).

Probably this species is more frequent in Bulgaria, but seems to be overlooked because of the similarity with another closest species - *Cladonia parasitica* (Hoffm.) Hoffm., which bears squamulose thallus and often inhabits bark of old trees.

*Dermatocarpon miniatum* (L.) W. Mann var. *miniatum*

*Specimen examined*: Bulgaria, Belasitsa Mts.: above Skrat Village, along the track to Dubitsata Waterfall, 41°21'25.3''N, 23°00'01.6''E, 616 m a.s.l., 6 April 2013, D. Stoykov, SOMF 28736, on the surface of big rounded rock, in the vicinity of the settlement. Epilithic lichen.

*Known distribution*: Widespread throughout Bulgaria. Not known in Sofia region, West Frontier Mts., Valley of Strouma River, valley of Mesta River,

Sredna Gora Mts. and Tounzdha Hilly Country (after MAYRHOFER *et al.*, 2005).

Confirmed for the first time with dry specimen from Belasitsa Mts. Several recent collections of the closest species *Dermatocarpon luridum* (With.) J.R. Laundon from Rila Mts. (Kostenski Waterfall) and of *D. miniatum* var. *miniatum* in Northeast Bulgaria (Shoumensko Plato Natural Park), made during a period of 2004-2007 years were presented by SHIVAROV & STOYKOV (2010).

\**Graphis scripta* (L.) Ach. - recorded for the first time in Belasitsa Mts.

*Specimens examined*: Bulgaria, Belasitsa Mts.: above Skrat Village, along the track to Dubitsata Waterfall, 41°21'25.3''N, 023°00'01.6''E, 625 m a.s.l., 6 April 2013, D. Stoykov, SOMF 28735, on bark of *Corylus avellana* L.; between Kolarovo and Samouillovo Villages, 41°21'57.5''N, 023°05'38.4''E, 380 m a.s.l., 7 April 2013, D. Stoykov, SOMF 28737, on bark of broadleaved tree. Epiphyte (Fig. 7).

*Known distribution*: Black Sea Coast, Northeast Bulgaria, Forebalkan, Balkan Range, Vitosha Region, Rila Mts., Rhodopes Mts.

Characteristic species, often with apothecia in the form of thin curved black lines, more rarely resembling an irregular three line aster on thalline surface, which similarity is used to attach its specific species epithet. Distinguished macroscopically from the closest *Graphis elegans* (Borrer ex Sm.) Ach., which possesses apothecia with raised carbonaceous margin, in the form of small cracks, ± meeting in the centre. Recently *G. scripta* is recorded on old mature beech in the area above 1200 m in Balkan Range (Shipchenska and Trevnenska Mts) in Bulgaria. *Graphis scripta* is known as intermediately pollution tolerant species (BEAVEN, 2008). In Great Britain this lichen, along with *Arthonia radiata* (Pers.) Ach. and *Arthonia cinnabarina* (DC.) Wallr., is common on young smoothbarked trees (ROSE, 1993). RAVERA *et al.* (2010) reported *G. scripta* as an important component of epiphytic climax lichen communities, inhabiting old forests and especially old trees of *Fagus sylvatica* L.

\**Hypogymnia tubulosa* (Schaer.) Hav. – new record in Belasitsa Mts.

*Specimen examined:* Bulgaria, Belasitsa Mts.: above Petrich Town, far from Paprenitsa border point, 41°19'34.3''N, 023°13'1.9''E, 1350 m a.s.l. along with *Anaptychia ciliaris* (L.) Körb., *Pseudevernia furfuracea* (L.) Zopf and *Usnea hirta* (L.) Weber ex F.H. Wigg., 25 May 2013, D. Stoykov, SOMF 28739, on bark of old tree of *Salix* sp. Epiphyte (Fig. 8).

*Known distribution:* Balkan Range, Vitosha Region, Pirin and Rila Mts., Rhodopes Mts.

*H. tubulosa* is similar in appearance to *Hypogymnia physodes* (L.) Nyl., but bears more erect, tubular and fingerlike thalline lobes and has slightly different colour in the upper part. It is thought to be less resistant species to air pollution than *H. physodes*.

*Lobaria pulmonaria* (L.) Hoffm.

*Specimens examined:* Bulgaria, Belasitsa Mts.: above Paprenitsa border point, 41°43'45.5''N, 023°34'20.6''E, 1310 m a.s.l., 25 May 2013, S. Stoyanov, SOMF 28748, on bark of old beech tree; above Petrich town, far from Paprenitsa border point, abundant on large number (6-7) of very old, mature *Fagus sylvatica* L. trees in the area between 41°19'43.4''N, 023°12'35.5''E, at about 1410 m alt. until 41°19'22.4''N, 023°11' 47.7''E, 1640 m a.s.l., 25 May 2013, D. Stoykov, SOMF 28746, on bark of *Fagus sylvatica* L.; above Samouilovo Village, below mountain road after Lopovo border point, in direction to Demirkapiya mount pass, 41°19'12.2''N, 023°05'16.2''E, 1706 m alt., 24 May 2013, D. Stoykov, SOMF 28732, along with *Pertusaria pertusa* (WEIGEL) TUCK., on bark of old *Fagus sylvatica* L. - single tree; above the village of Belasitsa, 41°21'33''N, 023°09'30''E, 880 m a.s.l., 26 May 2013, D. Stoykov, SOMF 28733, on bark of very old *Castanea sativa* MILL. - single tree; above the village of Kolarovo, 41°35'18.8''N, 023°13'3.4''E, 780 m alt., 25 April 2013, coll. S. Stoyanov, SOMF 28743, on bark of old *Fagus sylvatica* L. - single tree. Epiphyte.

*Known distribution:* Black Sea Coast, Northeast Bulgaria, Forebalkan, Balkan

Range, Znepole Region, Vitosha Region, Belasitsa Mts., Pirin and Rila Mts., Sredna Gora Mts., Rhodopes Mts., Strandzha Mts. (after MAYRHOFER *et al.*, 2005).

In Bulgaria *L. pulmonaria* can be usually found on bark of broadleaved trees. Occasionally it is recorded from Balkan Range on mossy ground in beech forest (ZHELEZOVA, 1962). Recently was confirmed on bark of single beech tree in Shipchenska Mountain (Ouzana locality), at nearly 1200 m a.s.l. *L. pulmonaria* is an indicator of very old preserved forests. It is widespread, but regionally threatened foliose lichen. Species of conservation value in Great Britain with category Least Concerned (LC), WOODS & COPPINS (2012), while in Estonia nearly 20% of his localities are considered endangered, as their areas are affected by forest management activities (JÜRIADO & LIIRA, 2010). According to the latest known data, in the northern parts of Europe (incl. Great Britain) it is used as an indicator species for natural forest ecosystems and forest areas of long ecological continuity (ROSE, 1993). *L. pulmonaria* have been used also as a model species in ecological, ecophysiological and conservation biological research (SCHEIDEGGER & WERTH, 2009).

*Physconia enteroxantha* (Nyl.) Poelt

*Specimens examined:* Bulgaria, Belasitsa Mts.: near Petrich Town, after Mladezhki Dom complex, 41°23'24.8''N, 023°12'49.1''E, a.s.l. 295 m, 7 April 2013, D. Stoykov, SOMF 28745, on bark of old *Robinia pseudoacacia* L. tree; above Samouilovo village, along the track to Kamenishki Waterfall, 41°21'32.3''N, 023°04'54.7''E, 800 m a.s.l., 24 May 2013, D. Stoykov, SOMF 28665, along with *Physconia distorta* (With.) J.R. Laundon and *Parmelia saxatilis* (L.) Ach., on bark of old *Fraxinus* tree. Epiphyte (Fig. 4).

*Known distribution:* Balkan Range, Sofia Region, Belasitsa Mts., Rila Mts., Rhodopes Mts.

Recently reported from the vicinity of Belasitsa chalet on bark of *Quercus pubescens* Willd. (ATANASSOVA & MAYRHOFER, 2012).

\**Pyrenula nitida* (WEIGEL) ACH. – new record in Belasitsa Mts.





**Fig.1-8.**Thalli of: 1. *Anaptychia ciliaris* (SOMF 28682), 2. *Cladonia ramulosa* (SOMF 28742); 3. *Rinodina pyrina* (SOMF SOMF 28725); 4. *Physconia enteroxantha* (SOMF 28745); 5. *Pyrenula nitida* (SOMF 28738); 6. *Cetraria islandica* (SOMF 28731); 7. *Graphis scripta* (SOMF 287378); 8. *Hypogymnia tubulosa* (SOMF 28739).

*Specimen examined:* Bulgaria, Belasitsa Mts.: above Petrich town, far from Paprenitsa border point, along the road to Kongur Peak, 41°19'45.4''N, 023°12'44.0''E, 1386 m a.s.l., 25 May 2013, D. Stoykov, SOMF 28738, on bark of very old *Fagus sylvatica* L. Epiphyte (Fig. 5).

*Known distribution:* Northeast Bulgaria, Forebalkan, Balkan Range, Pirin and Rila Mts., Stranzdha Mts..

\* *Rinodina pyrina* (Ach.) Arnold – new species in Strouma River Valley.

*Specimen examined:* Bulgaria, Struma River Valley (southern): Petrich district, near Ruzhdak Village, above the dung-hill, 41°23'58.9''N, 023°15'20.9''E, 236 m a.s.l., 8 April 2013, D. Stoykov, SOMF 28725, on bark of young *Fraxinus* tree. Epiphyte (Fig. 3).

*Known distribution:* Black Sea Coast, Forebalkan, Balkan Range, Vitosha Region, Rhodopes Mts.

### Conclusions

Five new species for the regions of Belasitsa Mts. and one new lichenized fungus from Struma River Valley in Bulgaria are recorded for the first time during this study. One of the finds is epigeous (*Cetraria islandica*), while the others are epiphytic (*Anaptychia ciliaris*, *Cladonia ramulosa*, *Graphis scripta*, *Hypogymnia tubulosa*, *Pyrenula nitida* and *Rinodina pyrina*). *Cladonia ramulosa* is recorded for the first time on dead trunk in Bulgaria. *Rinodina pyrina* is revealed as new species to the Valley of Strouma River. *Lobaria pulmonaria*, an epiphytic species inhabiting very old beech and chestnut trees, is recorded in several localities in Belasitsa Mts. *Dermatocapon miniatum* (an epilithic species) and *Physconia enteroxantha* could serve as fresh specimens for future analysis.

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