

# ECOLOGIA BALKANICA

2020, Vol. 12, Issue 2

December 2020

pp. 111-119

## *Lichenized Fungi (Ascomycota) from the Tisata Reserve (Bulgaria)*

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**Abstract.** Forty species of lichens are reported from the nature reserve area as a result of field and laboratory work in 2014. Thirteen species, *Amandinea punctata*, *Caloplaca subpallida* s.l., *Cladonia coniocraea*, *C. fimbriata*, *Evernia prunastri*, *Lecanora carpinea*, *Lecidea confluens*, *Lecidella elaeochroma*, *Opegrapha atra*, *Parmelina quercina*, *Pertusaria albescens*, *Rinodina confragosa*, and *Sarcogyne privigna*, are reported for the first time from the valley of Struma River. *Opegrapha atra* is less known in Bulgaria. Brief notes and information on their distribution, locations and substrata are included.

**Key words:** biodiversity, lichen mycota, protected area, Tisata.

### **Introduction**

The Tisata Reserve was founded on 5 December 1949. Afterwards its name became 'Tisova Barchina', and it occupied an area of 19 ha. The nature reserve is situated near the villages of Gorna Breznitsa and Kresna (Southern Struma River Valley). Its constant area and borders were finally adopted in 1991, with a total of 574.5 ha. This nature reserve has been created with the purpose to protect one of the most abundant, biggest and the only natural locality of *Juniperus excelsa* M. Bieb. (the Greek juniper).

Biodiversity of the lichenized fungi in the Tisata Reserve is poorly studied. Prior to the present work only twelve species were known – *Candelariella reflexa*, *Physcia biziana*, *P. dimidiata*, *P. dubia*, *Rinodina oleae*, *R. sophodes*, *Lepra amara*, *Lepraria nylanderiana*, *Melanelixia glabratula*, *M. subargentifera*, *Physconia enteroxantha*, and *Porpidia macrocarpa* (Atanassova & Mayrhofer, 2012; Mayrhofer et al., 2020).

This study aimed to contribute to the knowledge on lichen mycota of the Tisata Reserve area.

### **Material and Methods**

Field and laboratory studies were carried out by the author on 15 March 2014, at the side of Maleshevska Mt, near Curkvishte locality, and 10 May 2014, on the opposite side of Kresna Village, at the side of the Pirin Mts, at altitudes 230-260 m. Locality data on the collection sites were taken with the help of Garmin Etrex 10 GPS receiver. Field work was performed following the linear transect method. The host plant species and substrata were identified in the field. Semi-permanent microscope slides for studying lichen morphology were prepared in tap-water, and observed under Boeco BM-180/T/SP LM. Chemical spot tests with 10% KOH (K), calcium hypochloride (C), iodine reactions, and UV tests were checked in the laboratory. The studied materials were

documented *ex situ* with the aid of Canon PS A460 digital camera under Boeco B-3500 binocular stereomicroscope. Colour macrophotographs of thalli of 16 species, made under Boeco microscope, are composed in 16 figures. Collected specimens were identified by the keys in Hodgetts (1992), Nimis (1992), Wirth (1995), Giordani et al. (2002), Smith et al. (2009), Dobson (2011), Atanassova & Mayrhofer (2012), Szczepańska & Kossowska (2014). The nomenclature generally follows Mayrhofer et al. (2005), and Smith et al. (2009). Diagnostic characters are given for some taxa. The size of apothecia, asci and ascospores are presented with their minimum-maximum values, or in the form: (min-) mean±standard deviation (-max), *n*, where 'n' - denotes the number of measurements. Most of the examined materials were housed at the Mycological Collection of the Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, Sofia (SOMF). New records for the valley of Struma River are designated in the text with an asterisk (\*).

## Results

As a result of the present work 40 lichen species (including 1 subspecies) are recorded in the Tisata Reserve. Thirteen species, *Amandinea punctata*, *Caloplaca subpallida* s.l. (= *Rufoplaca subpallida*), *Cladonia coniocraea*, *C. fimbriata*, *Evernia prunastri*, *Lecanora carpinea*, *Lecidea confluens*, *Lecidella elaeochroma*, *Opegrapha atra*, *Parmelina quercina*, *Pertusaria albescens* (= *Lepora albescens*), *Rinodina confragosa* and *Sarcogyne privigna*, are reported for the first time from the valley of Struma River. *Opegrapha atra* is less known lichen in Bulgaria.

### List of taxa

\**Amandinea punctata* (Hoffm.) Coppins & Scheid., s.l. on bark of *Carpinus orientalis* Mill., N41°46'04", E023°08'58", alt. ca 234±3 m, 15.03.2014; on bark of *Fraxinus*, Curkvishte locality, N41°45'59", E023°09'05", alt. 228±3 m, 15.03.2014, SOMF

30360, spot test C(-); on bark of old tree, N41°46'02", E023°08'57", alt. 235±3 m, 15.03.2014; on bark of Greek juniper, N41°46'02", E023°08'57", alt. 232±3 m, 15.03.2014 (Fig. 7). - Notes: apothecia superficial, small, black, less than 0.5 mm in diam. Asci (35-)45-70(-80) × (11-)13-15(-17) μm, *n*=15. Ascospores (11-)13-15 × (5-)5.5-7.5 μm, 1-septate, brown; on *Fraxinus*: asci 40-50 × 11-13 μm, *n*=6, ascospores darker brown, 1-septate, slightly constricted at septum, (10-) 11±0.6 (-12) × (4.5-) 5.1±0.4 (-6) μm, *n*=15 (SOMF 30360). Recently reported from West Frontier Mts (Mayrhofer et al., 2020).

*Aspicilia cinerea* (L.) Körb., s.l., on siliceous rocks, 41°46'03", E023°08'59", 234±3 m alt., 15.03.2014, SOMF 30359. - Note: spot test K+(red).

*Aspicilia caesiocinerea* (Nyl. ex Malbr.) Arnold, s.l. [= *Circinaria caesiocinerea* (Nyl.) A. Nordin, Savić & Tibell], on rock, Curkvishte locality, N41°45'59", E023°09'05", alt. 225±3 m, 15.03.2014, SOMF 30354, on rock, N41°46'02", E023°08'59", alt. 228±3 m, 15.03.2014. - Note: spot test K(-).

\**Caloplaca subpallida* H. Magn., s.l. [= *Rufoplaca subpallida* (H. Magn.) Arup, Søchting & Frödén], on siliceous rock in the open sunny place, Curkvishte locality, N41°45'59", E023°09'05", alt. 223±3 m, 15.03.2014, SOMF 30358 (Fig. 6).

Apothecial disc orange red, (0.2-) 0.5±0.1 (-0.8) mm in diam, *n*=30, apothecia developed directly on the substrate surface, often in groups, round or angular in shape, spot test: K(+) intense red; disc margin proper, 30-40(-45) μm wide, bright orange red, C(-). Amphitecium with numerous green algal cells. Epihymenium with crystals turning dark red with K. Hymenium hyaline, 90-100(-125) μm. Paraphyses simple, about 3 μm wide, rarely branched near the apex; apical cells not or slightly thickened (up to 4-4.5 μm wide). Asci 8-spored, about 40-50 × 13.5-15 μm, with polarilocular thin-walled, hyaline spores. Ascospores narrowly ellipsoid, 12.5-16(-18) × (4-) 4.5-6.5 μm [12.5-16 × (4.5-)5-6.5 μm, *n*<sub>1</sub>=20; (13-) 14.5±1.2 (-18) × (4-) 5.5±0.7 (-6.5), *n*<sub>2</sub>=30; (12.5-) 14.5±1.3 (-

18) × (4-) 5.3±0.6 (-6.5) μm,  $n_3=35$ ], septum 2-3(-3.5) μm. Conidia not seen. - Note: according to Smith et al. (2009) *Caloplaca subpallida* differs from *C. arenaria* in having paler apothecia. The group of '*C. ferruginea*' is taxonomically difficult and therefore is in urgent need of a thorough revision worldwide (Szczeptańska et al., 2013).

*Candelariella vitellina* (Hoffm.) Müll. Arg., on large rock, N41°46'03", E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30376; on rock, N41°45'59", E023°09'05", alt. 223±3 m, 15.03.2014, SOMF 30365 (Fig. 9) - mixed with *Polysporina simplex*. - Notes: Apothecia 0.3-1 mm. Asci 50-65 × (15-)18-23 μm,  $n=8$ , 24-32 spored. Ascospores hyaline, (9-) 10.5±0.8 (-12) × (3-) 4.6±0.7 (-5.5) μm, in aqueous lactophenol,  $n=15$ . *Candelariella reflexa* (Nyl.) Lettau has squamulose thallus, 8-spored asci and somewhat broader ascospores.

*Chrysothrix candelaris* (L.) J.R. Laundon, on bark of *Fraxinus*, near N41°45'58", E23°09'05", alt. 228 m, 15.03.2014.

\**Cladonia coniocraea* (Flörke) Spreng, s.l., on bark of old tree, Curkvishte locality, alt. ca 229 m, 15.03.2014, SOMF 30367. - Note: *C. coniocraea* was reported in the Central Rilski Reserve near the base of old conifer trees (Stoykov, 2020).

\**Cladonia fimbriata* (L.) Fr., on soil, among moss, and near the rock base, N41°46'02", E023°08'59", alt. 213±3 m, 15.03.2014, SOMF 30366.

*Cladonia foliacea* (Huds.) Willd., on soil among moss, above Struma River, N41°45'50", E23°08'58", alt. 223±3 m, 15.03.2014, SOMF 30378; on soil, N41°43'51", E23°10'33", alt. 250 m, 10.05.2014.

*Cladonia rangiformis* Hoffm., on soil among moss, N41°46'03", E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30370. - Note: spot test K(+) yellow.

*Diploschistes scruposus* (Schreb.) Norman, on rocks, N41°46'03", E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30380; on rocks, N41°43'51.3", E023°10'37", alt. 273 m, 10.05.2014 (Fig. 8). - Notes: Apothecia 1-1.3 mm, ascospores 21-30 × 11-16(-17.5) μm,  $n=10$ ; on siliceous rocks, Curkvishte locality,

along with *R. geographicum*, 15.03.2014, SOMF 30356, on light gray areolate thallus, exciple K(+) red, asci 8-spored, ascospores 16.5-27(-32.5) × 9.5-15(-17.5) μm,  $n=10$ , hyaline, rarely brownish, muriform. *Diploschistes scruposus* was reported on mica schists from Slavyanka Mt (Mayrhofer et al., 2020).

\**Evernia prunastri* (L.) Ach., on bark of Greek juniper, N41°46'02", E023°08'58", alt. 234±3 m, 15.03.2014, SOMF 30375, accompanied by *P. tiliacea*.

\**Lecanora carpinea* (L.) Vain., on bark of *Carpinus orientalis* Mill., N41°46'04", E023°08'58", alt. ca 229±3 m, 15.03.2014, SOMF 30353. - Notes: thallus C (-), K(+) yellow, asci up to 55-60 × 18-20 μm. Ascospores hyaline, 9.5-13.5 × 6-8 μm,  $n=15$  ( $n$  - number of spores measured in tap water), hymenium about 55-60 μm, I(+) blue. New record for the valley of Struma river (Fig. 11).

*Lecanora gangaleoides* Nyl., s.l., on big rocks, N41°46'03", E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30352 (Fig. 10). - Notes: apothecia (0.7-)1-1.4(-1.7) μm, hymenium up to 120 μm, I(+) in iodine. Asci 50-55 × 14-16 μm. Ascospores ellipsoid to ovoid, simple, 9.5-13.5 × 4.5-8 μm,  $n=15$ . Spot tests C(-), K(+) yellowish, CK(-).

\**Lecidea confluens* (Weber) Ach., on siliceous rock, N41°46'03", E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30368. - Notes: spot tests C(-), epithecium K(+) floating, medulla I+(blue), ascospores 7-10 × 4-5.5 μm.

\**Lecidella elaeochroma* (Ach.) M. Choisy, s.l., on bark of *Fraxinus*, N41°45'58", E023°09'05", alt. 228±3 m 15.03.2014 (Fig. 16).

*Lepraria incana* (L.) Ach., s.l., on moss on the ground, N41°46'03", E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30372, spot tests: K, C (-), UV (-); on bark of old Greek juniper, N41°46'02", E023°08'57", alt. 220±3 m, 15.03.2014; on moss on the ground, N41°46'02", E023°08'59", alt. ca 231±3 m, spot tests: K, C (-); on soil, near the base of a tree, Curkvishte locality, N41°46'02", E023°08'57", alt. ca 220 m; on soil, near the trunk of *Carpinus orientalis* Mill., among moss, N41°43'49", E023°10'36", alt. 253±3 m, 10.05.2014.

*Leptogium gelatinosum* (With.) J.R. Laundon, on rocky slope, on soil, N41°43'49", E023°10'36", alt. 253±3 m, 10.05.2014.

*Melanelixia fuliginosa* (Fr. ex Duby) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch subsp. *glabratula* (Lamy) J.R. Laundon [= *Melanelixia glabratula* (Lamy) Sandler & Arup], on bark of *Fraxinus*, near Curkvishte locality, N41°45'58.5", E23°09'05", alt. 228±3 m, 15.03.2014. - Note: spot tests C(+), K(+) reddish. Reported in Tisata Reserve on *Juniperus* (Mayrhofer et al., 2020).

*Melanohalea elegantula* (Zahlbr.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch, on *Quercus*, Curkvishte locality, N41°46'03", E023°08'59", alt. 231±3, 15.03.2014; on *Fraxinus*, N41°46'02", E023°08'57", alt. 229±3 m, 15.03.2014, SOMF 30369 - mixed with *Parmelina tiliacea*. - Note: spot test of thalline sections C(-).

\**Opegrapha atra* Pers., on bark of *Fraxinus*, near Curkvishte locality, after N41°45'58.5", E023°09'05", alt. 228±3 m, 15.03.2014 (Fig. 4). - Note: Ascospores observed under LM were hyaline, 3-septate, straight, sometimes slightly thinner only near the one end, 13-18 × 4-5.5 μm, n=16. The species is rarely recorded in Bulgaria.

\**Parmelina quercina* (Willd.) Hale, s.l., on twigs of broadleaf tree, above Curkvishte, N41°46'02", E023°08'59", alt. 229±3 m, 15.03.2014 (Fig. 5).

*Parmelina tiliacea* (Hoffm.) Hale, s.l., on old *Fraxinus*, above Curkvishte, N41°46'02", E023°08'59", alt. 229±3 m, 15.03.2014, upper part isidiate, spot reactions: thallus C(+) carmine red, K(-), KC(+) carmine red, idem., N41°46'02", E023°08'59", alt. 235±3 m, 15.03.2014; on rocks under *Fraxinus*, idem., 15.03.2014, SOMF 30364, fertile, with small apothecia, isidia coralloid, with brown tips, under surface black, brownish near the margins only, spot tests K(-), C(-), KC(+) reddish, CK(-); on bark of old Greek juniper, along with *Evernia prunastri*, N41°46'02", E023°08'57", alt. 231±3 m, 15.03.2014; on bark

of old *Fraxinus*, Curkvishte locality, N41°46'02", E023°08'58", alt. 234±3 m, 15.03.2014, SOMF 30369; on piece of bark from *Quercus*, idem., N41°45'60", E023°09'00" alt. 232±3 m, 15.03.2014, spot tests C(+) red, K(+) red, KC(+) red. - Notes: different hemotypes examined, upper surface gray, thalli up to 2-2.5 cm in diam, lobes about 3 mm (SOMF 30369), isidia short, dark, apothecia not present, spot test reactions of thalline sections: C(+), K(-), CK(+) red, KC(+) red.

\**Pertusaria albescens* (Huds.) M. Choisy & Werner [= *Lepra albescens* (Huds.) Hafellner], on bark of old *Fraxinus*, N41°46'02", E023°08'57", alt. 235±3 m, 15.03.2014, SOMF 30361, UV(-) (Fig. 12).

*Pertusaria amara* (Ach.) Nyl. [= *Lepra amara* (Ach.) Hafellner], on big rock, N41°46'03", E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30357. - Note: thallus with white soralia, slightly bitter if tasted, UV(-). Reported from the Tisata Reserve on rock (Mayrhofer et al., 2020).

*Phyiscia adscendens* H. Olivier, on bark of *Fraxinus*, N41°45'58.5", E023°09'05", alt. 228±3 m, 15.03.2014, SOMF 30362. - Note: Upper thalline surface whitish, cilia white, long, up to 1-1.7 mm; spot test of the upper cortex K(+) yellow. Also found on bark of old Greek juniper, above Curkvishte, alt ca. 231±3 m, 15.03.2014, spot test of the upper cortex K(+) yellow.

*Phyiscia biziana* (A. Massal.) Zahlbr., on bark of old Greek juniper, N41°46'02", E023°08'57", alt. 220±3 m, 15.03.2014, SOMF 30373. - Note: spot reaction of the upper cortex K(+) yellow. Published from the Tisata Reserve also on Greek juniper by Atanassova & Mayrhofer (2012).

*Phyiscia dubia* (Hoffm.) Lettau, on pebble, N41°46' 02", E023°08'59", alt. 231±3 m, 15.03.2014. - Note: published from the Tisata Reserve by Atanassova & Mayrhofer (2012).

*Polysporina simplex* (Davies) Vežda, on rock, N41°45'59", E023°09'05", alt. 223±3 m, 15.03.2014, SOMF 30365 (Fig. 1). - Note: hymenium 90-120 μm in cross section, I(+); paraphyses up to 1.8-2 μm; asci polyspored,

62.5-67.5(-75) × 17.5-22.5(-25) μm, I(-); ascospores hyaline, bacilliform, 3-4(-5) × 1-1.5 μm, n=10.

*Porpidia crustulata* (Ach.) Hertel & Knoph, on siliceous rock, Curkvishte locality, N41°45'49", E023°08'58", alt. 229±3 m, 15.03.2014, SOMF 30363. - Note: thallus inconspicuous, pale grey, apothecia in groups, about 1 mm in diam, numerous, black; hymenium ca 80 μm, I(+) blue.

*Protoparmeliopsis muralis* (Schreb.) M. Choisy, on rock, Curkvishte locality, N41°45'59", E023°09'05", alt. 225±3 m, 15.03.2014, SOMF 30371, accompanied by *Xanthoparmelia pulla*, idem., SOMF 30355 - mixed with *Rinodina confragosa*.

*Ramalina farinacea* (L.) Ach., on bark of trees, above Curkvishte locality, near N41°45'59", E023°09'05", alt. 228±3 m 15.03.2014.

*Rhizocarpon geographicum* (L.) DC., on rocks, N41°45'59", E023°09'05", alt. 228±3 m, 15.03.2014, SOMF 30356 (mixed with *Diploschistes scruposus*); on big rock, N41°46'02", E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30374. - Note: ascospores in tap water (35-)40-43 × 13-17(-19) μm, n=10, muriform, medulla I+ (blue).

\**Rinodina confragosa* (Ach.) Körb., on rock, accompanied by *Protoparmeliopsis muralis*, 15.03.2014, SOMF 30355. - Notes: thallus thin, pale grey, apothecia black, less than 0.5 mm in diam, ascospores 16.5-23 × 9-13 μm, n=17, brownish, with angular locules. The species was known from the Black Sea coast, Vitosha and Belasitsa Mts (Mayrhofer et al., 2005).

*Rinodina sophodes* (Ach.) A. Massal., on bark of *Fraxinus*, N41°46'02", E023°08'57", alt. 231±3 m, 15.03.2014 (Fig. 2). - Note: reported from the Tisata Reserve on *Paliurus spina-christi* (Mayrhofer et al., 2020).

\**Sarcogyne privigna* (Ach.) A. Massal., on siliceous rocks, N41°43'51", E023°10'33", alt. 250±3 m, 10.05.2014; N41°44'42", E023°09'34", alt. 259 m, 10.05.2014. (Fig. 3). - Notes: ascospores hyaline, 3.5-5 × 1.4-1.8 μm, n=10. Known from the Rhodopi Mts (Mayrhofer et al., 2005).

*Xanthoparmelia conspersa* (Ach.) Hale, on rocks, N41°43'51", E023°10'33", alt. 250±3 m 10.05.2014 (Fig. 15).

*Xanthoparmelia pulla* (Ach.) O. Blanco, A. Crespo, Elix, D. Hawksw. & Lumbsch, on rocks, Curkvishte locality, N41°45'59", E023°09'05", alt. 225±3 m, 15.03.2014, spot tests K, C, KC(-), along with *Protoparmeliopsis muralis*; on rock accompanied by *Diploschistes scruposus*, N41°46'03, E023°08'59", alt. 231±3 m, 15.03.2014, SOMF 30379 (Fig. 14), spot tests C, CK(-), KC(+) floating pinkish red. - Notes: it was recorded from the open pasture, and on big rocks exposed in the sun. Known from the valley of Struma River (Mayrhofer et al., 2020).

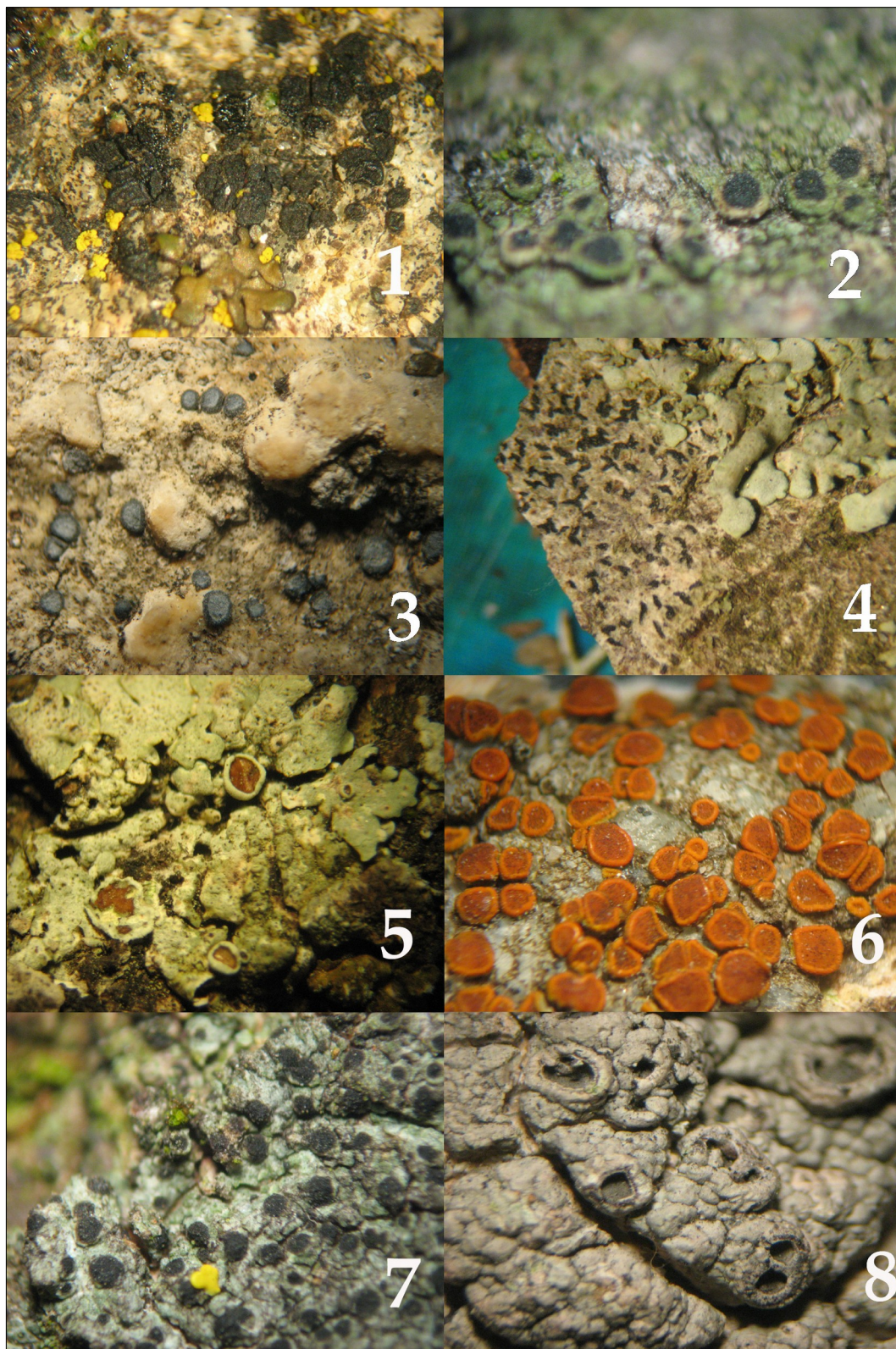
*Xanthoparmelia stenophylla* (Gyeln.) Hale, on rocks, N41°46'02", E023°08'59", alt. 229±3 m, 15.03.2014, on rocks, N41°46'02", E023°08'57", alt. 231±3 m, SOMF 30381 (Fig. 13). - Notes: spot tests C(-), CK(+) yellow-orange. Known from the West Frontier Mts and valley of Struma River (Mayrhofer et al., 2020). *Xanthoparmelia conspersa* and *X. pulla* have black lower thalline surfaces, while *X. stenophylla* has brownish lower part (Hale, 1990, Giordani et al., 2002; Szczepańska & Kossowska, 2014; Tsurykau et al., 2018). These three species of the genus *Xanthoparmelia* could be distinguished also on the base of ascospore characters, thalline chemical compounds (by spot tests and thin-layer chromatography).

*Xanthoria parietina* (L.) Th. Fr., on twigs and bark of *Fraxinus*, N41°45'58", E023°09'05", alt. 228±3 m, 15.03.2014, SOMF 30377; idem., N41°46'02", E023°08'59", alt. 235±3 m, 15.03.2014.

## Discussion

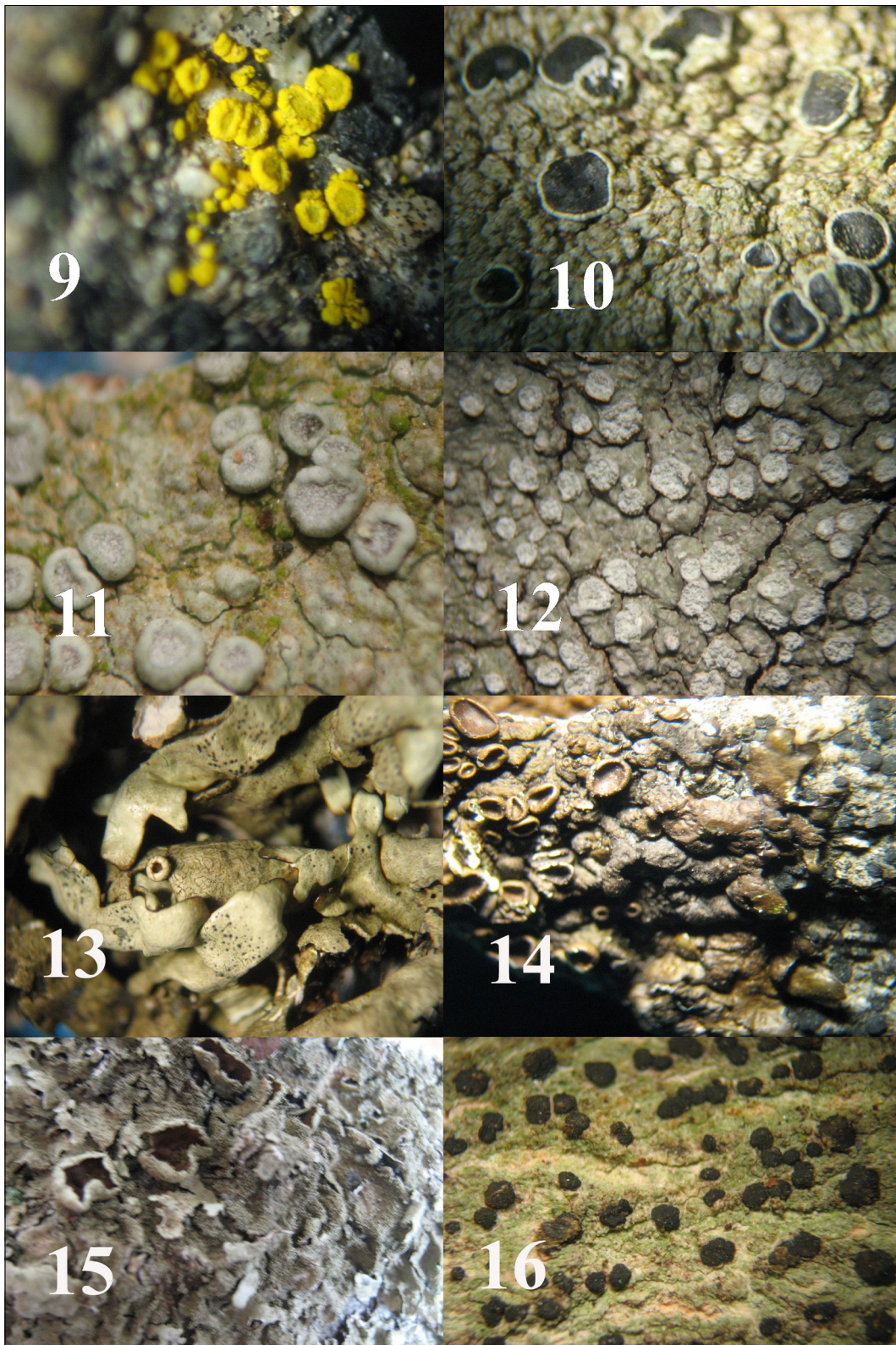
During this study, 40 species of lichenized fungi were reported. It is supposed, that due to the different habitats and climate conditions in both parts of the Tisata Reserve (at the side of Maleshevska Mt, and on the opposite side of Kresna Village, at the side of Pirin Mts) the number of lichenized fungi will increase.





**Fig. 1-8.** Thalli: 1. *Polysporina simplex*; 2. *Rinodina sophodes*; 3. *Sarcogyne privigna*; 4. *Opegrapha atra*; 5. *Parmelina quercina*; 6. *Caloplaca subpallida*; 7. *Amandinea punctata*; 8. *Diploschistes scruposus*.





**Fig. 9-16.** Thalli: 9. *Candelariella vitellina*; 10. *Lecanora gangaleoides*; 11. *L. carpinea*; 12. *Pertusaria albescens*; 13. *Xanthoparmelia stenophylla*; 14. *X. pulla*; 15. *X. conspersa* (in situ); 16. *Lecidea elaeochroma*.

*Amandinea punctata* was reported on bark of trees in the Tisata Reserve in the area of Curkvishte. It was known from the Black Sea coast, Northeast Bulgaria, Forebalkan, Stara Planina Mts, Sofia region, Vitosha region, West Frontier Mts and the Rhodopi Mts (Mayrhofer et al., 2005, 2020).

*Caloplaca subpallida* (= *Rufoplaca subpallida*) was recorded on basalt and trachyte rocks in Bulgaria from the Rhodopi Mts (Mayrhofer et al., 2020), while *C. arenaria* (Pers.) Müll. Arg. was keyed under *Caloplaca ferruginea* (Huds.) Th. Fr., as var. *lamprocheila* (DC.) H. Olivier, by Zhelezova & Popnikolov (1964) on siliceous rocks, with ascospores 13-15 × (5-)6-6.5 µm, and was known from the Black Sea coast, Vitosha and Rhodopi Mts (Mayrhofer et al., 2005; Vondrák & Slavíková-Bayerová, 2006). *Caloplaca subpallida* differs from *C. crenularia* (With.) J.R. Laundon by its smaller orange red apothecia, inconspicuous thallus, thinner ascospores with shorter septum. Nimis (1992), Wirth (1995) and Szczepańska et al. (2013) considered *Caloplaca subpallida* and *C. arenaria* different species.

*Lecidea confluens* was known from Stara Planina Mts, Vitosha region, Pirin, Rila and Rhodopi Mts, and the Thracian Lowland (Mayrhofer et al., 2005).

*Opegrapha atra* was known so far from the Black Sea coast only (Mayrhofer et al., 2005). The first report for the country appeared in Szatala (1929). The photograph of *O. atra* and its first description in Bulgarian was included in Popnikolov & Zhelezova (1964).

*Physcia adscendens* was previously known from the valley of Struma River in Rupite locality on sandstone tomb and oak (Atanassova & Mayrhofer, 2012).

*Pertusaria albescens* (= *Lepra albescens*) and *Lecidella elaeochroma* s.l., known from the present study on bark of ash trees, during 2008 have been recorded in the Central Balkan National Park on beech, and in the Strandzha Nature Park on oak trees (Spier et al., 2008). *Pertusaria albescens* (= *Lepra albescens*) and *Protoparmeliopsis muralis* have

been reported recently in the Central Rilski Reserve, Rila Mts (Stoykov, 2018).

*Pertusaria amara* (= *Lepra amara*) was known from the Black Sea coast, Stara Planina, the valley of Struma River, Belasitsa, Rila and Strandzha Mts on beech, oak trees and trachyte (Mayrhofer et al., 2005, 2020; Spier et al., 2008; Stoykov, 2020).

*Polysporina simplex* was known from Stara Planina Mts, the valley of Struma River, Pirin and Rhodopi Mts (Mayrhofer et al., 2005).

*Sarcogyne privigna* was known so far from the Rhodopi Mts (Mayrhofer et al., 2005). This report from the Tisata Reserve is the second find from Bulgaria.

### Acknowledgements

Field work was supported by the 'Management Plan of Tisata Reserve project (2014)'. This study is held within the framework of 'Phylogeny, distribution and sustainable use of fungi' project.

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Received: 02.08.2020

Accepted: 26.09.2020