Contribution to the lichen flora of Erzi Nature Reserve, Republic of Ingushetia, North Caucasus, Russia

Authors: Urbanavichus, Gennadii P., and Urbanavichene, Irina N.

Source: Willdenowia, 47(3) : 227-236

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.47.47306

Willdenowia
Annals of the Botanic Garden and Botanical Museum Berlin-Dahlem

GENNADII P. URBANAVICHUS[1*] & IRINA N. URBANAVICHENE[2]

Contribution to the lichen flora of Erzi Nature Reserve, Republic of Ingushetia, North Caucasus, Russia

Version of record first published online on 9 November 2017 ahead of inclusion in December 2017 issue.

Abstract: As a result of lichenological exploration of the Erzi Nature Reserve in the Republic of Ingushetia, North Caucasus, Russia, we report 266 species of lichenized fungi, 13 of lichenicolous fungi and seven of non-lichenized saprophytic fungi, representing 115 genera. Twenty-three species are recorded for the first time for North Caucasus, of which 16 are new for the Caucasus and ten are new for Russia (*Arthonia protoparmeliopseos*, *Aspicilia viridescens*, *Buellia abstracta*, *Lecidella viridans*, *Micarea soralifera*, *Rinodina straussii*, *R. tunicata*, *R. zwackhiana*, *Schizoxylon alboatrum* and *Verrucaria fuscoatroides*). Of the 16 species new for the Caucasus, seven are recorded for the first time for Asia (*Buellia abstracta*, *Micarea nigella*, *M. soralifera*, *Ramonia chrysophaea*, *Rinodina tunicata*, *Schizoxylon alboatrum* and *Verrucaria elevata*). In addition, two taxa listed in the Red Data Book of Russia are recorded: *Leptogium burnetiae* and *Usnea florida*.

Key words: Caucasus, checklist, conservation, diversity, Erzi Nature Reserve, lichens, new records, Republic of Ingushetia, Russia

Article history: Received 31 May 2017; peer-review completed 9 October 2017; received in revised form 15 October 2017; accepted for publication 19 October 2017.

Citation: Urbanavichus G. P. & Urbanavichene I. N. 2017: Contribution to the lichen flora of Erzi Nature Reserve, Republic of Ingushetia, North Caucasus, Russia. – Willdenowia 47: 227–236. doi: https://doi.org/10.3372/wi.47.47306

Introduction

The Caucasus is one of the world's biodiversity hotspots (Krever & al. 2001) and one of the most diverse regions of Russia (Geltman & al. 1998). In contrast to the relatively well-studied lichen flora of the W Caucasus, its C and E parts (including the Republic of Ingushetia) are still poorly explored. In North Caucasus, seven Nature Reserves include the most important natural ecosystems with great biological diversity and natural features of exceptional scientific interest. The lichen flora of six of these has been studied (Urbanavichus & Urbanavichene 2004, 2015, 2017; Urbanavichus & al. 2010); only the Erzi Nature Reserve remains to be studied. The present study aims at improving our knowledge of the Reserve's lichen flora and, together with other recent contributions on Caucasian lichens, to serve as an official documentation of newly discovered/reported species for the region and for Russia.

Research area

The Erzi Nature Reserve (Kotiev & al. 2015) covers an area of 35,292 ha and is located on the N slope of the Greater Caucasus in the Sunhza and Dzheirakh districts of the Republic of Ingushetia, c. 35 km S of Magas city (Fig. 1). In Russia the Reserve is bordered by the Republic of Northern Ossetia (Severnaya Osetiya) and the Republic of Chechnya along the main Caucasian

1 Institute of the North Industrial Ecology Problems, Kola Science Centre, Russian Academy of Sciences, Akademgorodok 14, 184209 Apatity, Murmansk Region, Russia; *e-mail: g.urban@mail.ru (author for correspondence).
2 Komarov Botanical Institute, Professor Popov Str. 2, St. Petersburg 197376, Russia; e-mail: urbanavichene@gmail.com

ridge, with the Republic of Georgia to the south. The altitude ranges from 850 to 3031 m (the highest peak Mt Khakhalgi). The landscape features mountain range spurs over deep river valleys, steep S slopes and gently sloping N slopes. Rivers in the Reserve include the Assa and Armkhi, which feed into the Terek river. The outcropping rocks are predominantly of shales and sandstones of Miocene age; Jurassic calcareous rock formations are rare. About one-third of the Reserve is forested, mostly on the lower N slopes. The forests are mostly oak (*Quercus petraea* (Matt.) Liebl.) and birch-pine (*Betula pendula* Roth., *Pinus kochiana* Klotzsch ex K. Koch) communities. Underbrush at the mid-level includes sea buckthorn (*Hippophae rhamnoides* L.), willow (*Salix caprea* L.), grey alder (*Alnus incana* (L.) Moench) and in some places extensive hazel (*Corylus avellana* L.). Approaching the sub-alpine zone the brush features Caucasian rhododendron (*Rhododendron caucasicum* Pall.). Above 2000 m, but below the alpine zone at 2500 m, is a belt of mountain forest-steppe: wheatgrass-wormwood-cereal xerophytic steppes on shallow meadow soils. Although the Reserve is rather small, it supports about 18 % (c. 1100 species) of the Caucasian flora. The climate of Erzi is characterised by long, cold winters, and short, cool summers. The average number of days of precipitation per year is 113. The average temperature is −1.4°C in January and 26.4°C in July. The average annual precipitation ranges from 350–400 mm below 1200 m altitude to 500–600 mm above 2000 m. Over 160 historical and cultural sites (martial towers, temples, necropolis tracts, sacred groves, and structures from ancient, medieval and later periods) are also protected by the Reserve.

Fig. 1. Geographic location of Erzi Nature Reserve in North Caucasus.

Material and methods

The lichen specimens were collected in the following seven localities:

1 Right-hand bank of Tetritskali river, 42°49'53"N, 44°55'19"E, 1280–1290 m, *Pinus kochiana* forest, 29 June 2016.
2 Targim tower complex on right-hand bank of Assa river, 42°50'00"N, 44°56'29"E, 1080 m, floodplain forest with *Alnus incana*, *Hippophae rhamnoides* and *Salix caprea*, 30 June 2016.
3 Between Leymi and Egikhal tower complexes, 42°50'02–07"N, 44°54'28–44"E, 1340–1450 m, *Pinus kochiana* forest and stony SE slope, 30 June 2016.
4 Right-hand bank of a nameless stream (right tributary of Tetritskali river), 42°49'43"N, 44°54'14"E, 1350–1360 m, *Alnus incana* and *Salix caprea* forest, 1 July 2016.
5 Around Ozdig tower complex, 42°49'30"N, 44°54'52"E, 1500–1600 m, *Pinus kochiana* and *Betula pendula* forest with *Populus tremula*, *Pyrus* sp. and *Tilia cordata* Mill. on N slope, 1 & 5 July 2016.
6 Left-hand bank of Assa river, 42°49'55"N, 44°56'18"E, 1090–1100 m, steppe meadow and grassland with calcareous and sandstones boulders, 2 & 6 July 2016.
7 Vovnushki tower complex on right-hand bank of Guloykhi river, 42°48'01"N, 44°59'41"E, shale cliffs and single trees of *Alnus incana* with bushes of *Juniperus communis* L., 1220–1250 m, 4 July 2016.

Our results are based on investigations from the field trips made between 29 June and 6 July 2016. Air-dried samples were examined using a stereo microscope, a light microscope and the usual spot tests with standard identification methods for lichenized and lichenicolous fungi; thin layer chromatography (TLC) was undertaken where necessary (Orange & al. 2001). A bullet "●" marks the analysed specimens. Remarkable species and species difficult to identify in the field were collected. Common macrolichens and some crustose lichens were not collected in the field, only registered in each locality.

The specimens are kept in the herbarium of the Komarov Botanical Institute, St. Petersburg (LE), and in the private herbarium of G. Urbanavichus ("herb. Urbanav."). All taxa listed here were collected by the authors. For nomenclatural aspects, mainly Hafellner & Türk (2016) and Lawrey & Diederich (2016) were followed, except for some of the *Teloschistaceae* taxa.

Results

Checklist of taxa

Symbols used before a species name are as follows: # = lichenicolous fungi; + = non-lichenized fungi; * = new for Russia; † = new for the Caucasus; ‡ = new for North Caucasus (i.e. not new for the whole Caucasus); **!** = new for Asia; and after species name "●" = analysed specimens (see Material and methods).

Species names are cited with their authorship. They are followed by locality numbers (loc. 1–7, see Material and methods) and, in parentheses under each locality, collection numbers (e.g. *IU ER-16/1-009*) and the herbarium (LE or herb. Urbanav.). Collection numbers of the first author are preceded by *GU* and those of the second author by *IU*.

Substrates are indicated, with abbreviations as follows: *Ai* = *Alnus incana*, *Bp* = *Betula pendula*, *Cb* = *Carpinus betulus* L., *Ca* = *Corylus avellana*, *Jc* = *Juniperus communis*, *Pk* = *Pinus kochiana*, *Pt* = *Populus tremula*, *Pr* = *Prunus* sp., *Py* = *Pyrus* sp., *Qp* = *Quercus petraea*, *Sa* = *Sorbus aucuparia* L., *Sc* = *Salix caprea*, *Sn* = *Sambucus nigra* L., *Tc* = *Tilia cordata*.

For certain species, additional comments are provided.

#*Abrothallus microspermus* Tul. – loc. 1 (*IU ER-16/1-009*, LE); on thallus of *Flavoparmelia caperata* on *Pk*.

Absconditella lignicola Vězda & Pišut – loc. 1 (*IU ER-16/1-010*, LE), 3 (*GU ER-16/3-127*, herb. Urbanav.), 5 (*GU ER-16/5-257*, LE); on wood of pine log, stump.

Acarospora badiofusca (Nyl.) Th. Fr. – loc. 7 (*GU ER-16/7-445*, herb. Urbanav.); on shale.

Acarospora cervina A. Massal. – loc. 3, 6 (in sample *GU ER-16/6-379*, herb. Urbanav.); on calcareous rocks.

Acarospora veronensis A. Massal. – loc. 7 (*GU ER-16/7-446*, herb. Urbanav.); on shale.

Acarospora versicolor Bagl. & Carestia – loc. 6 (*GU ER-16/6-366*, herb. Urbanav.); on sandstones.

Acrocordia gemmata (Ach.) A. Massal. – loc. 2 (*GU ER-16/2-048*, herb. Urbanav.); on *Ai*.

Agonimia opuntiella (Buschardt & Poelt) Vězda – loc. 6, 7 (*GU ER-16/7-447*, herb. Urbanav.); on plant debris.

Agonimia tristicula (Nyl.) Zahlbr. – loc. 3, 6 (*GU ER-16/6-368*, herb. Urbanav.); on plant debris.

Alyxoria varia (Pers.) Ertz & Tehler – loc. 2 (*GU ER-16/2-091*, herb. Urbanav.); on *Ai*.

Amandinea punctata (Hoffm.) Coppins & Scheid. – loc. 1 (*IU ER-16/1-011*, LE), 5, 7 (in sample *GU ER-16/7-511*, herb. Urbanav.); on *Jc*, pine log, and rocks.

Anaptychia ciliaris (L.) Körb. – loc. 2, 4, 5; on *Ai*, *Pt*, *Py*.

Anema tumidulum Henssen ex P. M. Jørg. & al. – loc. 3 (*GU ER-16/3-130*, herb. Urbanav.); on calcareous rocks.

Arthonia atra (Pers.) A. Schneid. – loc. 4 (*IU ER-16/4-236*, LE); on Sc.

#*Arthonia epiphyscia* Nyl. – loc. 2 (*GU ER-16/2-050*, herb. Urbanav.); on thallus of *Physcia aipolia* on *Ai*.

Arthonia fusca (A. Massal.) Hepp – loc. 3 (*GU ER-16/3-131*, herb. Urbanav.), 6 (*GU ER-16/6-369*, herb. Urbanav.); on calcareous rocks.

#*Arthonia phaeophysciae* Grube & Matzer – loc. 2 (*GU ER-16/2-051*, herb. Urbanav.); on thalli of *Phaeophyscia hirsuta* and *Phaeophyscia orbicularis* on *Ai*.

*†#*Arthonia protoparmeliopseos* Etayo & Diederich – loc. 6 (*GU ER-16/6-370*, LE); on apothecia of *Protoparmeliopsis muralis* on calcareous rocks. Described from Luxembourg and Spain (Etayo & Diederich 2009) and recently reported from Turkey (Yazici & Etayo 2014) and North America (Kocourková & Knudsen 2015).

Arthonia punctiformis Ach. – loc. 5 (*GU ER-16/5-260*, herb. Urbanav.); on *Tc*.

Arthonia radiata (Pers.) Ach. – loc. 2, 4 (*IU ER-16/4-212*, LE); on *Ai*.

Arthopyrenia analepta (Ach.) A. Massal. – loc. 5 (*GU ER*-16/5-261, herb. Urbanav.); on *Tc*.

Arthrosporum populorum A. Massal. – loc. 2 (*GU ER-16/2-053*, herb. Urbanav.); on *Ai*.

Aspicilia cf. *desertorum* (Kremp.) Mereschk. nom. illeg. – loc. 6 (*GU ER-16/6-372*, herb. Urbanav.), 7; on calcareous sandstones.

*‡*Aspicilia viridescens* (A. Massal.) Hue – loc. 7 (*GU ER-16/7-450*, herb. Urbanav.); on shale. Also recorded from Armenia in Transcaucasia (Harutyunyan & al. 2011).

Athallia pyracea (Ach.) Arup & al. – loc. 2; on *Ai*.

Bacidia pycnidiata Czarnota & Coppins – loc. 1, 4 (*IU ER-16/4-213*, LE); on mosses *Sc* and pine log.

Bacidia rubella (Hoffm.) A. Massal. – loc. 4 (*IU ER-16/4-214*, LE), 5; on *Ai*, *Pt*, *Sc*.

‡Bacidina arnoldiana (Körb.) V. Wirth & Vězda – loc. 3 (*GU ER-16/3-132*, herb. Urbanav.); on calcareous rocks. Recently reported from Armenia in Transcaucasia (Gasparyan & al. 2015).

Bagliettoa calciseda (DC.) Gueidan & Cl. Roux – loc. 6 (*GU ER-16/6-373*, herb. Urbanav.); on calcareous rocks.

Blastenia hungarica (H. Magn.) Arup & al. – loc. 1 (*IU ER-16/1-016*, LE), 3; on *Jc*, *Pk*.

Blennothallia crispa (Huds.) Otálora & al. – loc. 7; on soil.

Bryoria capillaris (Ach.) Brodo & D. Hawksw. – loc. 5 (*IU ER-16/5-263*, LE); on *Pk*.

Bryoria fuscescens (Gyeln.) Brodo & D. Hawksw. – loc. 5 (*IU ER-16/5-264*, LE); on *Pk*, *Tc*.

*†**!***Buellia abstracta* (Nyl.) H. Olivier – loc. 6 (*GU ER-16/6-374*, LE); on sandstones. Also known from Europe and North and South America (Giralt & al. 2011; Knudsen & Kocourková 2012). Our specimens lack visible thallus; the spores are 4.5–5 × 10–12 µm.

Buellia disciformis (Fr.) Mudd – loc. 4 (*IU ER-16/4-215*, LE); on *Ai*.

Buellia erubescens Arnold – loc. 2 (*GU ER-16/2-054*, herb. Urbanav.); on *Ai*.

Buellia griseovirens (Turner & Borrer ex Sm.) Almb. – log. 1, 3; on *Jc*, *Pk*.

Calicium glaucellum Ach. – loc. 5 (*IU ER-16/5-265*, LE); on *Pk*.

Calicium lucidum (Th. Fr.) M. Prieto & Wedin – loc. 1, 3 (*IU ER-16/3-154*, LE); on *Pk*.

Calicium trabinellum (Ach.) Ach. – log. 3, 5; on *Pk*.

Callome multipartita (Sm.) Otálora & al. – loc. 3, 6 (*GU ER-16/6-396*, herb. Urbanav.); on calcareous rocks.

Calogaya biatorina (A. Massal.) Arup & al. – log. 3, 6, 7; on shale, calcareous rocks.

Calogaya pusilla (A. Massal.) Arup & al. – loc. 7 (*GU ER-16/7-454*, herb. Urbanav.); on shale.

Calogaya saxicola (Hoffm.) Vondrák – loc. 2, 7 (*GU ER-16/7-455*, herb. Urbanav.); on calcareous sandstones, shale.

Caloplaca asserigena (J. Lahm) Della Torre & Sarnth. – loc. 1, 5 (*IU ER-16/5-267*, LE); on *Pk*.

Caloplaca cerina (Hedw.) Th. Fr. – loc. 2, 5, 6, 7; on *Ai*, *Jc*, *Qp*.

Caloplaca conversa (Kremp.) Jatta – loc. 6; on calcareous rocks.

Caloplaca inconnexa (Nyl.) Zahlbr. – loc. 6 (*GU ER-16/6-379*, herb. Urbanav.); on thallus of *Acarospora cervina* on calcareous rocks.

Caloplaca obscurella (J. Lahm ex Körb.) Th. Fr. – loc. 4 (*IU ER-16/4-216*, LE); on *Ai*.

Caloplaca raesaenenii Bredkina – loc. 6 (*GU ER-16/6-386*, herb. Urbanav.); on plant debris.

Caloplaca stillicidiorum (Vahl) Lynge – loc. 6; on plant debris.

Candelaria concolor (Dicks.) Stein – loc. 2, 5, 7; on *Ai*, *Py*, shale.

Candelariella aurella (Hoffm.) Zahlbr. – loc. 3, 6, 7; on *Jc*, calcareous rocks, shale.

Candelariella efflorescens R. C. Harris & W. R. Buck – loc. 1 (*IU ER-16/1-017*, LE, dubl. in ALTB), 2, 4, 5, 6; on *Ai*, *Jc*, *Pk*, *Tc*.

Candelariella lutella (Vain.) Räsänen – loc. 4, 5; on *Ai*.

Candelariella oleaginescens Rondon – loc. 6; on calcareous rocks.

Candelariella rhodax Poelt & Vězda – loc. 3, 6 (*GU ER-16/6-392*, herb. Urbanav.), 7; on calcareous rocks, shale.

Candelariella vitellina (Hoffm.) Müll. Arg. – loc. 7; on shale.

Catillaria nigroclavata (Nyl.) Schuler – loc. 2 (*GU ER-16/2-062*, herb. Urbanav.); on *Ai*.

†*#Cercidospora epicarphinea* (Nyl.) Grube & Hafellner – loc. 6 (*GU ER-16/6-393*, herb. Urbanav.); on apothecia of *Pyrenodesmia variabilis* on calcareous rocks. Already reported from NW Russia (Alstrup & al. 2005) and S Ural mountains (Merkulova & Urbanavichus 2006).

Cetrelia cetrarioides (Delise & Duby) W. L. Culb. & C. F. Culb. ● – loc. 4 (*IU ER-16/4-219*, LE), 5; on *Ai*, *Tc*. (TLC – perlatolic acid).

Cetrelia olivetorum (Nyl.) W. L. Culb. & C. F. Culb. ● – loc. 2 (*GU ER-16/2-063*, herb. Urbanav.), 5; on *Ai*, *Tc*. (TLC – olivetoric acid).

Chaenotheca chrysocephala (Turner ex Ach.) Th. Fr. – loc. 1, 5; on *Pk*.

Chaenotheca furfuracea (L.) Tibell – loc. 5; on the roots of *Bp*.

Chaenotheca trichialis (Ach.) Th. Fr. – loc. 5; on pine wood.

Chaenotheca xyloxena Nádv. – loc. 5 (*IU ER-16/5-278*, LE); on pine wood.

+*Chaenothecopsis pusiola* (Ach.) Vain. – loc. 5 (*IU ER-16/5-279*, LE); on pine wood.

+*Chaenothecopsis savonica* (Räsänen) Tibell – loc. 5 (*IU ER-16/5-280*, LE); on pine wood.

+*Chaenothecopsis viridireagens* (Nádv.) A. F. W. Schmidt – loc. 5 (*IU ER-16/5-281*, LE); on pine wood.

Chrysothrix candelaris (L.) J. R. Laundon – loc. 4, 5; on *Sc*, *Tc*.

Circinaria calcarea (L.) A. Nordin & al. – loc. 6; on calcareous rocks.

Cladonia coniocraea (Flörke) Spreng. – loc. 1, 5; on *Pk*.

Cladonia foliacea (Huds.) Willd. – loc. 2, 3, 6, 7; on soil.

Cladonia fimbriata (L.) Fr. – loc. 1, 3, 5; on *Pk*.

Cladonia macilenta Hoffm. – loc. 3; on pine log.

Cladonia symphycarpa (Flörke) Fr. – loc. 3; on soil.

Coenogonium pineti (Ach.) Lücking & Lumbsch – loc. 5; on *Tc*.

Collema flaccidum (Ach.) Ach. – loc. 5; on *Pt*, *Tc*.

Collema furfuraceum (Arnold) Du Rietz – loc. 7; on plant debris on shale.

Collema subflaccidum Degel. – loc. 7; on plant debris on shale.

Cryptodiscus foveolaris (Rehm) Rehm – loc. 5 (*IU ER-16/5-287*, LE); on pine wood.

Dermatocarpon miniatum (L.) W. Mann – loc. 1, 2, 3, 5, 6, 7; on shale, calcareous rocks.

Dimelaena oreina (Ach.) Norman – loc. 2, 6, 7 (*GU ER-16/7-470*, herb. Urbanav.); on shale, small granite stones.

Diploschistes muscorum (Scop.) R. Sant. – loc. 7; on soil.

Diplotomma hedinii (H. Magn.) P. Clerc & Cl. Roux – loc. 6 (*GU ER-16/6-401*, herb. Urbanav.); on calcareous rocks.

‡*Diplotomma lutosum* A. Massal. – loc. 7 (*GU ER-16/7-472*, herb. Urbanav.); on shale. Also recorded from Georgia in Transcaucasia (Barkhalov 1983).

Enchylium polycarpon (Hoffm.) Otálora & al. – loc. 6, 7; on calcareous rocks.

Enchylium tenax (Sw.) Gray – loc. 3, 7; on calcareous soil.

Endocarpon pallidum Ach. – loc. 3 (*GU ER-16/3-156*, herb. Urbanav.); on calcareous rocks.

Endocarpon pusillum Hedw. – loc. 7 (*GU ER-16/7-473*, herb. Urbanav.); on soil.

#*Endococcus pseudocarpus* Nyl. – loc. 6 (*GU ER-16/6-402*, herb. Urbanav.); on thallus of *Callome multipartita* on calcareous rocks.

Evernia divaricata (L.) Ach. – loc. 5; on *Pr*.

Evernia prunastri (L.) Ach. – loc. 1, 3, 5; on *Bp*, *Pk*, *Pr*, *Py*, *Tc*, snag.

Flavoparmelia caperata (L.) Hale – loc. 1 (in sample *IU ER-16/1-009*, LE), 2, 3, 4, 5, 6, 7; on *Ai*, *Cb*, *Jc*, *Pk*, *Pr*, *Py*, *Sc*, *Tc*.

Flavoplaca coronata (Kremp. ex Körb.) Arup & al. – loc. 1, 2, 3, 5, 6, 7; on calcareous rocks.

Flavoplaca flavocitrina (Nyl.) Arup & al. – loc. 3, 6 (*GU ER-16/6-382*, herb. Urbanav.); on calcareous sandstones, calcareous rocks.

Flavoplaca oasis (A. Massal.) Arup & al. – loc. 6 (in sample *GU ER-16/6-373*, herb. Urbanav.); on thallus of *Bagliettoa calciseda* on calcareous rocks.

Flavopunctelia flaventior (Stirt.) Hale – loc. 1, 2, 3, 4, 5, 6, 7; on *Ai*, *Jc*, *Pk*, shale.

Flavopunctelia soredica (Nyl.) Hale – loc. 1, 2, 3, 4, 5, 6, 7; on *Ai*, *Jc*, *Pk*, *Tc*, shale.

Graphis scripta (L.) Ach. – loc. 2, 4, 5; on *Ai*, *Bp*, *Tc*.

†*Gyalideopsis helvetica* van den Boom & Vězda – loc. 5 (*GU ER-16/5-295*, LE); on wood of pine log. Also recently reported from S Siberia (Urbanavichene 2015).

Gyalolechia flavorubescens (Huds.) Søchting & al. – loc. 2; on *Ai*.

Gyalolechia flavovirescens (Wulfen) Søchting & al. – loc. 3, 6 (in sample *GU ER-16/6-370*, LE); on calcareous sandstones, sandstones.

Heterodermia speciosa (Wulfen) Trevis. – loc. 4; on *Ai*.

Heteroplacidium compactum (A. Massal.) Gueidan & Cl. Roux – loc. 6 (*GU ER-16/6-406*, herb. Urbanav.); on calcareous rocks.

Hyperphyscia adglutinata (Flörke) H. Mayrhofer & Poelt – loc. 2, 7; on *Ai*, *Jc*, shale.

†*Hyperphyscia granulata* (Poelt) Moberg – loc. 7 (*GU ER-16/7-478*, herb. Urbanav.); on shale. Also reported from S Siberia (Urbanavichus & Urbanavichene 2007).

Hypocenomyce scalaris (Ach.) M. Choisy – loc. 3; on *Pk*.

Hypogymnia physodes (L.) Nyl. – loc. 1, 3, 4, 5; on *Pk*, *Sc*.

Hypogymnia tubulosa (Schaer.) Hav. – loc. 1, 3, 5; on *Pk*.

Lathagrium auriforme (With.) Otálora & al. – loc. 7; on mossy calcareous rocks.

Lathagrium cristatum (L.) Otálora & al. – loc. 2, 3, 6, 7; on calcareous rocks, calcareous sandstones.

Lathagrium fuscovirens (With.) Otálora & al. – loc. 3, 7; on calcareous rocks, shale.

Lathagrium undulatum (Flot.) Otálora & al. – loc. 6; on calcareous rocks.

Lecania croatica (Zahlbr.) Kotlov – loc. 4 (*IU ER-16/4-227*, LE), 5; on *Ai*, *Sc*.

Lecania naegelii (Hepp) Diederich & van den Boom – loc. 2 (in sample *GU ER-16/2-051*, herb. Urbanav.), 4; on *Ai*.

Lecanora albella (Pers.) Ach. – loc. 1, 5 (*IU ER-16/1-029*, LE, *GU ER-16/5-299*, herb. Urbanav.); on *Pk*, *Tc*.

Lecanora albellula (Nyl.) Th. Fr. – loc. 3; on pine wood.

Lecanora allophana Nyl. – loc. 2, 5; on *Ai*, *Tc*.

Lecanora argopholis (Ach.) Ach. – loc. 7 (*GU ER-16/7-479*, herb. Urbanav.); on shale.

Lecanora chlarotera Nyl. – loc. 2; on *Ai*.

Lecanora intumescens (Rebent.) Rabenh. – loc. 5 (*IU ER-16/5-301*, LE); on *Pr*, *Pt*, *Tc*.

Lecanora meridionalis H. Magn. – loc. 2 (*GU ER-16/2-077*, herb. Urbanav.); on *Ai*.

Lecanora populicola (DC.) Duby – loc. 5; on *Pt*.

‡*Lecanora reagens* Norman – loc. 7 (*GU ER-16/7-482*, herb. Urbanav.); on shale. Previously recorded from Georgia in Transcaucasia (Barkhalov 1983).

Lecanora subcarpinea Szatala – loc. 2 (*GU ER-16/2-081*, herb. Urbanav.); on *Ai*.

Lecanora symmicta (Ach.) Ach. – loc. 2, 3; on *Ai*, *Pk*.

Lecanora thysanophora R. C. Harris ● – loc. 4 (*IU ER-16/4-229*, LE), 5; on *Ai*, *Tc*.

‡*Lecidea nylanderi* (Anzi) Th. Fr. – loc. 3 (*GU ER-16/3-170*, herb. Urbanav.); on *Pk*. Previously recorded from Azerbaijan in Transcaucasia (Barkhalov 1983).

Lecidella achristotera (Nyl.) Hertel & Leuckert – loc. 2 (*GU ER-16/2-083*, herb. Urbanav.); on *Ai*.

Lecidella flavosorediata (Vězda) Hertel & Leuckert – loc. 2 (*GU ER-16/2-084*, herb. Urbanav.), 3 (*GU ER-16/3-171*, herb. Urbanav.), 5; on *Ai*, *Pk*.

Lecidella patavina (A. Massal.) Knoph & Leuckert – loc. 6 (*GU ER-16/6-410*, herb. Urbanav.), 7; on calcareous rocks and shale.

Lecidella stigmatea (Ach.) Hertel & Leuckert – loc. 3, 6 (*GU ER-16/6-411*, herb. Urbanav.); on calcareous rocks.

*†*Lecidella viridans* (Flot.) Körb. – loc. 7 (*GU ER-16/7-485*, herb. Urbanav.); on shale. Also known from many regions of Europe, and North and South America (Knoph & Leuckert 2004).

Lepraria finkii (B. de Lesd.) R. C. Harris ● – loc. 5 (*IU ER-16/5-307*, LE); on *Tc*.

Leptogium burnetiae C. W. Dodge – loc. 4 (*IU ER-16/4-230*, LE), 5, 7 (*GU ER-16/7-486*, herb. Urbanav.); on *Sc*, *Tc*, mossy shale.

Leptogium cyanescens (Rabenh.) Körb. – loc. 5 (*IU ER-16/5-309*, LE); on *Tc*.

Leptogium saturninum (Dicks.) Nyl. – loc. 4, 5, 7; on *Ai*, *Sn*, *Tc*, mossy shale.

#Lichenochora obscuroides (Linds.) Triebel & Rambold – loc. 2 (in sample *GU ER-16/2-051*, herb. Urbanav.); on thalli of *Phaeophyscia orbicularis* and *Phaeophyscia pusilloides* on *Ai*.

#Lichenostigma cosmopolites Hafellner & Calat. – loc. 7 (*GU ER-16/7-488*, herb. Urbanav.); on thallus of *Xanthoparmelia stenophylla* on shale.

#Lichenothelia renobalesiana D. Hawksw. & V. Atienza – loc. 6 (in sample *GU ER-16/6-373*, herb. Urbanav.); on thallus of *Bagliettoa calciseda* on calcareous rocks.

†*Lichinella stipatula* Nyl. – loc. 3, 6 (*GU ER-16/6-413*, herb. Urbanav.); on calcareous rocks. Also known from S Ural mountains and S Siberia (Urbanavichus 2010).

Lobothallia alphoplaca (Wahlenb.) Hafellner – loc. 2; on sandstones.

Lobothallia radiosa (Hoffm.) Hafellner – loc. 2, 3, 6; on calcareous rocks and sandstones.

Melanelixia albertana (Ahti) O. Blanco & al. – loc. 4 (*IU ER-16/4-232*, LE), 5; on *Ai*, *Pr*.

Melanelixia fuliginosa (Fr. ex Duby) O. Blanco & al. – loc. 1, 2 (*GU ER-16/2-088*, herb. Urbanav.); on *Ai*, *Jc*.

Melanelixia glabra (Schaer.) O. Blanco & al. sensu lato – loc. 2, 4, 5; on *Ai*, *Pt*, *Tc*. The recently resurrected taxon *M. epilosa* (J. Steiner) A. Crespo & al. (Leavitt & al. 2016) and the species *M. glabra* are not morphologically distinguishable. Probably our Ingushetian specimens refer to *M. epilosa*, but it is not certain without molecular sequence data. We treat our specimens in a broad sense as *M. glabra* sensu lato.

Melanelixia glabratula (Lamy) Sandler & Arup – loc. 5; on *Bp*, *Tc*.

Melanelixia subargentifera (Nyl.) O. Blanco & al. – loc. 4, 7; on *Ai*, shale.

Melanelixia subaurifera (Nyl.) O. Blanco & al. – loc. 1, 3, 4, 5; on *Ai*, *Sc*, *Tc*, pine wood.

Melanohalea exasperata (De Not.) O. Blanco & al. – loc. 5; on *Ai*, *Bp*, *Qp*.

Melanohalea exasperatula (Nyl.) O. Blanco & al. – loc. 2, 5; on *Ai*, *Bp*, *Pk*, *Pr*, *Qp*, *Tc*.

†**!***Micarea nigella* Coppins ● – loc. 5 (*IU ER-16/5-317*, LE); on pine wood. Also known from NW Russia (Urbanavichus 2010).

*†**!***Micarea soralifera* B. Guzow-Krzemińska & al. ● – loc. 5 (*IU ER-16/5-318*, LE); on pine wood. A recently described species from the Czech Republic and Poland (Guzow-Krzemińska & al. 2016).

Montanelia tominii (Oxner) Divakar & al. – loc. 7; on shale.

#Muellerella lichenicola (Sommerf. ex Fr.) D. Hawksw. – loc. 3 (*GU ER-16/3-176*, herb. Urbanav.), 6 (in sample *GU ER-16/6-370*, LE); on thallus of *Lecidella stigmatea*, and apothecia of *Gyalolechia flavovirescens* and *Xanthocarpia crenulatella* on calcareous rocks.

+*Mycocalicium subtile* (Pers.) Szatala – loc. 5; on wood.

Myriolecis crenulata (Hook.) Śliwa & al. – loc. 2, 6, 7; on calcareous sandstones, shale.

Myriolecis dispersa (Pers.) Śliwa & al. – loc. 3; on calcareous rocks.

Myriolecis persimilis (Th. Fr.) Śliwa & al. – loc. 2, 5; on *Ai*, *Tc*.

Myriolecis pruinosa (Chaub.) Śliwa & al. – loc. 3; on calcareous rocks.

Myriolecis semipallida (H. Magn.) Śliwa & al. – loc. 2, 3, 6, 7; on calcareous sandstones, shale.

Neocatapyrenium rhizinosum (Müll. Arg.) Breuss – loc. 3 (*GU ER-16/3-177*, herb. Urbanav.); on calcareous soil.

Neofuscelia pulla (Ach.) Essl. – loc. 7; on shale.

Nephroma parile (Ach.) Ach. – loc. 5; on *Sc*, *Tc*.

#Nesolechia oxyspora (Tul.) A. Massal. – loc. 7 (*GU ER-16/7-497*, herb. Urbanav.); on thallus of *Xanthoparmelia stenophylla* on shale.

Ochrolechia arborea (Kreyer) Almb. – loc. 1, 3, 5; on *Jc*, *Pk*.

Opegrapha vulgata (Ach.) Ach. – loc. 5 (*IU ER-16/5-322*, LE); on *Tc*.

Parmelia barrenoae Divakar & al. – loc. 5 (*GU ER-16/5-323*, herb. Urbanav.); on *Tc*.

Parmelia sulcata Taylor – loc. 1, 2, 3, 4, 5, 6, 7; on *Ai*, *Bp*, *Pk*, *Pr*, *Py*, *Sa*, *Sc*, *Tc*.

Parmelina pastillifera (Harm.) Hale – loc. 5 (*IU ER-16/5-325*, LE); on *Bp*, *Tc*.

Parmelina tiliacea (Hoffm.) Hale – loc. 1, 5 (*IU ER-16/5-326*, LE); on *Bp*, *Pk*, *Pr*, *Tc*.

Parmotrema perlatum (Huds.) M. Choisy ● – loc. 2, 4 (*IU ER-16/4-239*, LE); on *Ai*. (TLC – stictic acid).

Parmotrema stuppeum (Taylor) Hale ● – loc. 5 (*IU ER-16/5-327*, LE); on *Tc*. (TLC – salazinic acid).

Peltigera canina (L.) Willd. – loc. 5; on soil.

Peltigera didactyla (With.) J. R. Laundon – loc. 7; on mossy rocks.

Peltigera elisabethae Gyeln. – loc. 5; on mossy log.

Peltigera lepidophora (Nyl. ex Vain.) Bitter – loc. 7; on soil above shale.

Peltigera praetextata (Flörke ex Sommerf.) Zopf – loc. 5; on *Pt*, *Tc*, log.

Peltigera rufescens (Weiss) Humb. – loc. 3; on soil.

Peltula bolanderi (Tuck.) Wetmore – loc. 3, 7 (*GU ER-16/7-495*, herb. Urbanav.); on calcareous sandstones and shale.

Peltula euploca (Ach.) Poelt – loc. 6, 7 (*GU ER-16/7-496*, herb. Urbanav.); on shale.

+*Peridiothelia fuliguncta* (Norman) D. Hawksw. – loc. 5 (*GU ER-16/5-331*, herb. Urbanav.); on *Tc*.

Phaeophyscia cernohorskyi (Nádv.) Essl. – loc. 6, 7 (*GU ER-16/7-498*, herb. Urbanav.); on plant debris above calcareous sandstones and shale.

Phaeophyscia ciliata (Hoffm.) Moberg – loc. 2, 5; on *Ai*, *Sn*.

Phaeophyscia endophoenicea (Harm.) Moberg – loc. 2, 5; on *Ai*, *Sn*.

Phaeophyscia hirsuta (Mereschk.) Essl. – loc. 2, 5; on *Ai*, *Jc*, *Sc*.
Phaeophyscia insignis (Mereschk.) Moberg – loc. 7 (*GU ER-16/7-499herb*. Urbanav.); on shale.
Phaeophyscia kairamoi (Vain.) Moberg – loc. 2, 4, 5; on *Ai*, *Pt*, *Sc*, *Sn*.
Phaeophyscia nigricans (Flörke) Moberg – loc. 2, 7; on *Ai*, branches of shrubs.
Phaeophyscia orbicularis (Neck.) Moberg – loc. 2, 5; on *Ai*.
Phaeophyscia pusilloides (Zahlbr.) Essl. – loc. 2, 4, 5; on *Ai*, *Sc*, *Tc*.
Phaeophyscia sciastra (Ach.) Moberg – loc. 1, 2, 3, 5, 6, 7; on calcareous rocks, sandstones, shale.
Phlyctis argena (Ach.) Flot. – loc. 1; on *Jc*.
Physcia adscendens (Fr.) H. Olivier – loc. 1, 2, 3, 4, 5, 6; on all plant and rock substrates.
Physcia aipolia (Ehrh. ex Humb.) Fürnr. – loc. 2 (in sample *GU ER-16/2-050*, herb. Urbanav.), 4, 5; on *Ai*, *Pr*, *Pt*.
Physcia caesia (Hoffm.) Fürnr. – loc. 2, 3, 5, 6, 7; on calcareous rocks, sandstones.
Physcia dimidiata (Arnold) Nyl. – loc. 6, 7; on shale, sandstones.
Physcia dubia (Hoffm.) Lettau – loc. 7; on shale.
Physcia stellaris (L.) Nyl. – loc. 2, 5, 6; on *Ai*, *Bp*, *Jc*, *Qp*.
Physcia subalbinea Nyl. – loc. 7; on shale.
Physcia tenella (Scop.) DC. – loc. 4, 5; on *Ai*, *Pk*.
Physcia tribacia (Ach.) Nyl. – loc. 2 (*GU ER-16/2-106*, herb. Urbanav.); on *Ai*.
Physcia vitii Nádv. – loc. 1, 2, 4, 5; on *Ai*, *Jc*, *Pr*, *Sn*.
Physciella chloantha (Ach.) Essl. – loc. 2, 4, 5, 6, 7; on *Ai*, *Bp*, *Sn*, and all rock substrates.
Physconia distorta (With.) J. R. Laundon – loc. 2, 4, 5, 6; on *Ai*, *Pr*.
Physconia grisea (Lam.) Poelt – loc. 7; on plant debris, shale.
Physconia muscigena (Ach.) Poelt – loc. 7; on soil, plant debris above shale.
Physconia petraea (Poelt) Vězda & Poelt – loc. 7; on rocks.
Physconia rossica G. Urban. – loc. 3, 7 (*GU ER-16/7-510*, herb. Urbanav.); on plant debris above shale.
Placidium rufescens (Ach.) A. Massal. – loc. 6 (*GU ER-16/6-426*, herb. Urbanav.); on calcareous rocks.
Placocarpus schaereri (Fr.) Breuss – loc. 3, 6; on calcareous rocks.
Placynthiella dasaea (Stirt.) Tønsberg – loc. 1, 3; on wood of pine log.
Placynthium nigrum (Huds.) Gray – loc. 3, 6; on calcareous rocks.
Placynthium posterulum (Nyl.) Henssen – loc. 6 (*GU ER-16/6-429*, herb. Urbanav.); on calcareous rocks.
†*#Polycoccum clauzadei* Nav.-Ros. & Cl. Roux – loc. 7 (*GU ER-16/7-511*, herb. Urbanav.); on thallus of *Rusavskia* sp. on rocks. Previously known only from the Republic of Buryatia, S Siberia (Urbanavichene & Urbanavichus 2009).
Protoparmeliopsis muralis (Schreb.) M. Choisy – loc. 1, 2, 3, 5, 6, 7; on all rock substrates.
Pseudevernia furfuracea (L.) Zopf – loc. 1, 3, 5; on *Jc*, *Pk*.
Pseudoschismatomma rufescens (Pers.) Ertz & Tehler – loc. 4 (*IU ER-16/4-237*, LE); on *Ai*.
Psora decipiens (Hedw.) Hoffm. – loc. 3; on calcareous soil.
Punctelia borreri (Sm.) Krog – loc. 4, 7; on *Ai*, shale.
Punctelia jeckeri (Roum.) Kalb – loc. 1, 2, 3, 4, 5; on *Ai*, *Jc*, *Pk*, *Pr*, shale.
Punctelia subrudecta (Nyl.) Krog – loc. 5, 7; on *Tc*, shale.
Pycnora praestabilis (Nyl.) Hafellner – loc. 3; on *Pk*.
Pyrenodesmia chalybaea (Fr.) A. Massal. – loc. 6; on calcareous rocks.
Pyrenodesmia variabilis (Pers.) A. Massal. – loc. 3, 6; on calcareous rocks.
Ramalina asahinana Zahlbr. – loc. 2, 4, 5; on *Ai*, *Pt*, *Pr*.
Ramalina farinacea (L.) Ach. – loc. 2, 4; on *Ai*, *Sc*.
Ramalina pollinaria (Westr.) Ach. – loc. 2, 4, 5; on *Ai*, *Sc*, *Tc*.
Ramalina sinensis Jatta – loc. 2, 5; on *Ai*, *Pr*.
Ramalina subgeniculata Nyl. – loc. 4; on *Ai*.
†!*Ramonia chrysophaea* (Pers.) Vězda – loc. 5 (*IU ER-16/5-353*, LE); on *Sn*. Previously reported from the S Ural mountains (Urbanavichene & al. 2013). A very rare or overlooked species, not reported outside of Europe.
Rhizocarpon disporum (Nägeli ex Hepp) Müll. Arg. – loc. 7 (*GU ER-16/7-514*, herb. Urbanav.); on shale.
Rhizoplaca chrysoleuca (Sm.) Zopf – loc. 6, 7; on shale, small granite stones.
Rinodina bischoffii (Hepp) A. Massal. – loc. 6 (*GU ER-16/6-431*, herb. Urbanav.); on calcareous rocks.
Rinodina exigua (Ach.) Gray – loc. 2 (*GU ER-16/2-115*, herb. Urbanav.); on *Ai*.
Rinodina oleae Bagl. – loc. 2 (*GU ER-16/2-116*, herb. Urbanav.); on *Ai*.
Rinodina septentrionalis Malme – loc. 1 (*IU ER-16/1-043*, LE); on *Pk*.
Rinodina sophodes (Ach.) A. Massal. – loc. 2 (*GU ER-16/2-117*, herb. Urbanav.); on *Ai*.
*†*Rinodina straussii* J. Steiner – loc. 7 (*GU ER-16/7-516*, LE); on shale. Also known from S Asia, the European Alps and North America (Sheard 2010).
*†!*Rinodina tunicata* H. Mayrhofer & Poelt – loc. 6 (*GU ER-16/6-517*, herb. Urbanav.); on calcareous rocks. A mainly Mediterranean species occurring on calcareous rocks at middle altitudes in the mountains of S Europe and N Africa (Giralt & Llimona 1997).
*†*Rinodina zwackhiana* (Kremp.) Körb. – loc. 7 (*GU ER-16/7-518*, LE); on shale. Also known from S Europe, Asia (China) and North America (Sheard 2010).
Rusavskia papillifera (Vain.) S. Y. Kondr. & Kärnefelt – loc. 2, 3, 6, 7; on calcareous rocks.

Sarcogyne privigna (Ach.) A. Massal. – loc. 7 (*GU ER-16/7-519*, herb. Urbanav.); on shale.

Sarcogyne regularis Körb. – loc. 3 (*GU ER-16/3-193*, herb. Urbanav.); on calcareous rocks.

*†**!**+*Schizoxylon alboatrum* Rehm – loc. 5 (*GU ER-16/5-354*, LE); on *Tc*. A relatively rare species in only a few European countries and North America (Sherwood 1977).

Spilonema revertens Nyl. – loc. 7 (*GU ER-16/7-520*, herb. Urbanav.); on shale.

Staurothele frustulenta Vain. – loc. 7 (*GU ER-16/7-521*, herb. Urbanav.); on shale.

+*Stenocybe pullatula* (Ach.) Stein – loc. 2, 4, 5; on *Ai*.

Synalissa ramulosa (Hoffm. ex Bernh.) Fr. – loc. 3; on calcareous rocks.

Thallinocarpon nigritellum (Lettau) P. M. Jørg. – loc. 3, 6; on calcareous rocks and sandstones.

‡*Thermutis velutina* (Ach.) Flot. – loc. 6 (*GU ER-16/6-433*, herb. Urbanav.); on thallus of *Toninia cinereovirens* on calcareous rocks. Recently reported from Armenia in Transcaucasia (Gasparyan & al. 2015).

Thyrea confusa Henssen – loc. 6; on calcareous rocks.

Toninia candida (Weber) Th. Fr. – loc. 3; on calcareous rocks.

Toninia cinereovirens (Schaer.) A. Massal. – loc. 3, 5, 6; on calcareous rocks.

Toninia toniniana (A. Massal.) Zahlbr. – loc. 3; on calcareous rocks.

Trapeliopsis flexuosa (Fr.) Coppins & P. James – loc. 1, 3; on *Pk*, log.

Umbilicaria cylindrica (L.) Delise ex Duby – loc. 7; on shale.

Umbilicaria hirsuta (Sw. ex Westr.) Hoffm. – loc. 7; on shale.

Usnea cavernosa Tuck. – loc. 5; on *Pk*.

Usnea dasopoga (Ach.) Nyl. – loc. 5; on *Pk*.

Usnea florida (L.) F. H. Wigg. – loc. 1 (*IU ER-16/1-045*, LE), 2 (*GU ER-16/2-119*, herb. Urbanav.), 3, 4, 5, 6, 7; on *Jc*, *Pk*, *Pr*, *Py*, *Qp*, *Tc*.

Usnea hirta (L.) F. H. Wigg. – loc. 1, 3, 5; on *Jc*, *Pk*, snag.

Usnea lapponica Vain. – loc. 5 (*GU ER-16/5-361*, herb. Urbanav.); on *Tc*.

Usnea wasmuthii Räsänen – loc. 5 (*IU ER-16/5-362*, LE); on *Tc*.

Variospora aurantia (Pers.) Arup & al. – loc. 3, 6; on calcareous rocks.

Variospora velana (A. Massal.) Arup & al. – loc. 3; on calcareous rocks.

†**!***Verrucaria elevata* (Nyl.) Zschacke – loc. 6 (*GU ER-16/6-437*, herb. Urbanav.); on calcareous rocks. Recently reported from the Leningrad region (Pykälä & al. 2012).

Verrucaria furfuracea (B. de Lesd.) Breuss – loc. 6; on calcareous rocks.

*‡*Verrucaria fuscoatroides* Servít – loc. 3 (*GU ER-16/3-202*, herb. Urbanav.); on calcareous rocks. Recently reported from Abkhazia in Transcaucasia (Urbanavichus & Urbanavichene 2012). An apparently rather widespread but still poorly known species described from Germany; also reported from a few other European countries and North America (Breuss 2007; Breuss & Berger 2010). In her excellent revision of *Verrucaria* in Poland, Krzewicka (2012) suggested that *V. fuscoatroides* may be a synonym of *V. nigroumbrina* (A. Massal.) Servít.

Verrucaria macrostoma Dufour ex DC. – loc. 2 (*GU ER-16/2-120*, herb. Urbanav.); on calcareous sandstones.

Verrucaria nigrescens Pers. – loc. 7 (*GU ER-16/7-525*, herb. Urbanav.); on shale.

Verrucaria sphaerospora Anzi – loc. 3, 6 (*GU ER-16/6-439*, herb. Urbanav.); on calcareous rocks.

Verrucaria tristis (A. Massal.) Kremp. – loc. 3 (*GU ER-16/3-204*, herb. Urbanav.); on calcareous rocks.

Xanthocarpia crenulatella (Nyl.) Frödén & al. – loc. 3, 6; on calcareous rocks.

Xanthoparmelia camtschadalis (Ach.) Hale – loc. 2, 3, 6; on soil.

Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale – loc. 7; on shale.

Xanthoparmelia stenophylla (Ach.) Ahti & D. Hawksw. – loc. 2, 7; on shale.

Xanthomendoza fallax Søchting & al. – loc. 3, 7; on calcareous rocks, shale.

Xanthomendoza fulva (Hoffm.) Søchting & al. – loc. 6; on calcareous rocks.

Xanthomendoza ulophyllodes (Räsänen) Søchting & al. – loc. 2; on *Ai*.

Xanthoria aureola (Ach.) Erichsen – loc. 3, 7; on calcareous rocks, shale, mossy rocks.

Xanthoria calcicola Oxner – loc. 2, 6, 7; on sandstones, shale.

Xanthoria parietina (L.) Th. Fr. – loc. 1, 2, 3, 4, 5, 6, 7; on *Ai*, *Cb*, *Jc*, *Pk*, *Pr*, *Py*, *Qp*, *Sc*, *Tc*.

Xylographa parallela (Ach.) Fr. – loc. 3, 5; on pine wood.

#Zwackhiomyces coepulonus (Norman) Grube & R. Sant. – loc. 7 (*GU ER-16/7-532*, herb. Urbanav.); on thallus of *Calogaya biatorina* on shale.

Conclusions

The inventory of lichenized and lichenicolous fungi taxa in Erzi Nature Reserve is essential for protecting the Caucasian lichen flora, and for future floristic, taxonomic, systematic and ecological studies, as well as for the monitoring of future changes in the composition of the flora. We currently recognize 286 species as occurring in the Erzi Nature Reserve (266 species of lichenized fungi, 13 of lichenicolous fungi and seven of non-lichenized saprophytic fungi), representing 115 genera. Twenty-three species are recorded for the first time for North Caucasus, of which 16 are new for the Caucasus and

ten are new for Russia (*Arthonia protoparmeliopseos*, *Aspicilia viridescens*, *Buellia abstracta*, *Lecidella viridans*, *Micarea soralifera*, *Rinodina straussii*, *R. tunicata*, *R. zwackhiana*, *Schizoxylon alboatrum* and *Verrucaria fuscoatroides*). Of the 16 species new for the Caucasus, seven are recorded for the first time for Asia (*Buellia abstracta*, *Micarea nigella*, *M. soralifera*, *Ramonia chrysophaea*, *Rinodina tunicata*, *Schizoxylon alboatrum* and *Verrucaria elevata*). In addition, two of the 42 taxa listed in the Red Data Book of Russia (Trutnev & al. 2008) are recorded, namely *Leptogium burnetiae* (Near Threatened category) and *Usnea florida* (Vulnerable category).

Acknowledgements

This work was supported by a grant of the Russian Foundation for Basic Research, No. 15-29-02396 "North Caucasian Lichen Flora: taxonomic structure, diversity, specificity, systematics of individual taxa and contribution to the diversity of the lichen flora of Russia". We are grateful to Liza Khaykharoeva and staff of the Erzi Nature Reserve for supporting our research and to Prof. Mark Seaward who kindly corrected the English. We also thank Dr. Harrie J. M. Sipman (Botanic Garden and Botanical Museum Berlin) and an anonymous reviewer for their comments on an earlier version of this paper. Special thanks are also due to Igor Lavrinenko (Komarov Botanical Institute, St. Petersburg) for technical assistance with the map (Fig. 1).

References

Alstrup V., Zavarzin A. A., Kocourková J., Kravchenko A. V., Fadeeva M. A. & Shiefelbein U. 2005: Lichens and lichenicolous fungi found in northern Ladoga lake area (Republic of Karelia) during the international fieldtrip in August 2004, prior to the Fifth IAL Congress. – Trudy Karel'skogo Nauchnogo Tsentra RAN **7:** 3–16. [In Russian].

Barkhalov S. O. 1983: Flora lishaynikov Kavkaza [The lichen flora of the Caucasus]. – Baku: El'm Press. [In Russian].

Breuss O. 2007: *Verrucaria*. – Pp. 335–377 in: Nash T. H. III, Gries C. & Bungartz F. (ed.), Lichen flora of the Greater Sonoran Desert region **3.** – Tempe: Lichens Unlimited.

Breuss O. & Berger F. 2010: Die *Verrucaria*-Arten mit braunem Lager in den österreichischen Kalkalpen. Eine vorläufige Übersicht mit Bestimmungsschlüssel. – Biblioth. Lichenol. **104:** 77–116.

Etayo J. & Diederich P. 2009: *Arthonia protoparmeliopseos*, a new lichenicolous fungus on *Protoparmeliopsis muralis* from Spain and Luxembourg. – Bull. Soc. Naturalistes Luxemb. **110:** 93–96.

Gasparyan A., Aptroot A., Burgaz A. R., Otte V., Zakeri Z., Rico V. J., Araujo E., Crespo A., Divakar P. K. & Lumbsch H. T. 2015: First inventory of lichens and lichenicolous fungi in the Khosrov Forest State Reserve, Armenia. – Fl. Medit. **25:** 105–114.

Gel'tman D. V., Antonova N. N., Byalt V. V., Grabovskaya A. E., Dorofeev V. I., Zolkina L. A., Konechnaya G. Yu., Krasovskaya L. S., Krupkina L. I., Levichev I. G., Medvedeva N. A., Portenier N. N. & Sokolova I. V. 1998: Flora of the vascular plants of the Russian Federation. – Biol. Bull. (Moscow) **25(1):** 78– 82.

Giralt M., Bungartz F. & Elix J. A. 2011: The identity of *Buellia sequax*. – Mycol. Progr. **10:** 115–119.

Giralt M. & Llimona X. 1997: The saxicolous species of the genera *Rinodina* and *Rinodinella* lacking spot test reactions in the Iberian peninsula. – Mycotaxon **62:** 175–224.

Guzow-Krzemińska B., Czarnota P., Łubek A. & Kukwa M. 2016: *Micarea soralifera* sp. nov., a new sorediate species in the *M. prasina* group. – Lichenologist **48:** 161–169.

Hafellner J. & Türk R. 2016: Die lichenisierten Pilze Österreichs – eine neue Checkliste der bisher nachgewiesenen Taxa mit Angaben zu Verbreitung und Substratökologie [The lichenized fungi of Austria – a new checklist of the taxa so far recorded, with data to distribution and substrate ecology]. – Stapfia **104(1):** 1–216.

Harutyunyan S., Wiesmair B. & Mayrhofer H. 2011: Catalogue of the lichenized fungi in Armenia. – Herzogia **24:** 265–296.

Knoph J.-G. & Leuckert C. 2004: *Lecidella*. – Pp. 309–320 in: Nash T. H. III, Ryan B. D., Diederich P., Gries C. & Bungartz F. (ed.), Lichen flora of the Greater Sonoran Desert region **2.** – Tempe: Lichens Unlimited.

Knudsen K. & Kocourková J. 2012: *Buellia abstracta* in the Joshua Tree National Park (California, U.S.A.). – Published at http://fzp.czu.cz/vyzkum/maps/keko/koc-0005.pdf [accessed 27 May 2017].

Kocourková J. & Knudsen K. 2015: Notes on the California lichen flora 7: more new records. – Opusc. Philolichenum **14:** 118–120.

Kotiev M. M., Khaykharoeva L. A. & Barkinkhoeva M. M. 2015: Cadastral information about the State Nature Reserve "Erzi". – Published at http://www.erziri.ru/ [accessed 10 Oct 2017].

Krever V., Zazanashvili N., Jungius H., Williams L. & Petelin D. 2001: Biodiversity of the Caucasus: an analysis of biodiversity and current threats and initial investment portfolio. – Moscow: World Wide Fund for Nature.

Krzewicka B. 2012: A revision of *Verrucaria* s.l. (*Verrucariaceae*) in Poland. – Polish Bot. Stud. **27:** 3–142.

Lawrey J. D. & Diederich P. 2016: Lichenicolous fungi – worldwide checklist, including isolated cultures and sequences available. – Published at http://www.lichenicolous.net [accessed 1 Mar 2017].

Leavitt S. D., Esslinger T. L., Divakar P. K., Crespo A. & Lumbsch H. T. 2016: Hidden diversity before our eyes: delimiting and describing cryptic lichen-forming fungal species in camouflage lichens (*Parmeliaceae*, *Ascomycota*). – Fungal Biol. **120:** 1374–1391.

Merkulova O. S. & Urbanavichus G. P. 2006: Addition to the lichen flora of the Ural region. – Pp. 148–152 in: Andreev M. P., Himelbrant D. E., Golubkova N. S., Titov A. N. & Urbanavichus G. P. (ed.), Lichen flora of Russia: state and perspective of exploration. Proceedings of the international conference dedicated to the 120-th anniversary of V. P. Savicz. – St. Petersburg: LETI Press. [In Russian].

Orange A., James P. W. & White F. J. 2001: Microchemical methods for the identification of lichens. – London: British Lichen Society.

Pykälä J., Stepanchikova I. S., Himelbrant D. E., Kuznetsova E. S. & Alexeeva N. M. 2012: The lichen genera *Thelidium* and *Verrucaria* in the Leningrad region (Russia). – Folia Cryptog. Estonica **49:** 45–57.

Sheard J. W. 2010: The lichen genus *Rinodina* (Ach.) Gray (*Lecanoromycetidae*, *Physciaceae*) in North America, north of Mexico. – Ottawa: NRC Research Press.

Sherwood M. A. 1977: The Ostropalean fungi. – Mycotaxon **5:** 1–277.

Trutnev Yu. P., Gizatulin R. R., Mitvol O. L., Amirkhanov A. M., Kamelin R. V., Bardunov L. V. & Novikov V. S. (ed.) 2008: Red Data Book of the Russian Federation (Plant and Fungi). – Moscow: KMK Scientific Press Ltd.

Urbanavichene I. N. 2015: The first record of *Gyalideopsis helvetica* (*Graphidaceae*, lichenized *Ascomycota*) for Russia from the southern part of Lake Baikal region. – Novosti Sist. Nizsh. Rast. **49:** 282–288. [In Russian].

Urbanavichene I. N. & Urbanavichus G. P. 2009: To the lichen flora of Oka plateau (eastern Sayan, Republic of Buryatia). – Novosti Sist. Nizsh. Rast. **43:** 229–245. [In Russian].

Urbanavichene I., Urbanavichus G., Mežaka A. & Palice Z. 2013: New records of lichens and lichenicolous fungi from the southern Ural Mountains, Russia. II. – Folia Cryptog. Estonica **50:** 73–80.

Urbanavichus G. P. 2010: A checklist of the lichen flora of Russia. – St. Petersburg: Nauka.

Urbanavichus G. P., Gabibova A. R. & Ismailov A. B. 2010: First records about lichenflora of Daghestan Reserve. – Novosti Sist. Nizsh. Rast. **44:** 250–256. [In Russian].

Urbanavichus G. P. & Urbanavichene I. N. 2004: Lichens. – Pp. 5–235 in: Korneeva T. M., Afonina O. M., Golubkova N. S. & Blagovidov A. K. (ed.), The present-day state of biological diversity within protected areas in Russia. Issue **3.** Lichens and bryophytes. – Moscow: World Conservation Union; Ministry of Natural Resources of the Russian Federation; Commission on Biodiversity Conservation of the Russian Academy of Sciences.

Urbanavichus G. P. & Urbanavichene I. N. 2007: The distribution and ecology of genera *Hyperphyscia* and *Pyxine* (*Physciaceae*, lichenized *Ascomycota*) in Russia. – P. 154 in: Abstracts. XV Congress of European Mycologists. Saint Petersburg, Russia, September 16–21, 2007. – St. Petersburg: TREEART LLC.

Urbanavichus G. P. & Urbanavichene I. N. 2012: Addition to the lichen flora of Abkhazia and Caucasus. – Vestn. Tversk. Gosud. Univ., Ser. Biol. Ecol. **27(23):** 109–116. [In Russian].

Urbanavichus G. P. & Urbanavichene I. N. 2015: A contribution to the lichen flora of Utrish Nature Reserve. – Turczaninowia **18:** 86–95. [In Russian].

Urbanavichus G. P. & Urbanavichene I. N. 2017: New and noteworthy records of lichen-forming and lichenicolous fungi from Abrau peninsula (NW Caucasus, Russia). – Fl. Medit. **27:** 175–184.

Yazici K. & Etayo J. 2014: Lichenicolous fungi in Iğdır province, Turkey. – Acta Bot. Brasil. **28:** 1–7.

Willdenowia

Open-access online edition www.bioone.org/loi/will BioOne

Online ISSN 1868-6397 · Print ISSN 0511-9618 · Impact factor 0.680

Published by the Botanic Garden and Botanical Museum Berlin, Freie Universität Berlin