

New lichen records from Georgia

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Abstract: New records of the following 17 lichen taxa are reported from Georgia: *Aspicilia esculenta* (Pall.) Flagey, *Caloplaca lobulata* (Flörke) Hellb., *Cladonia caespiticia* (Pers.) Flörke, *Hypogymnia farinacea* Zopf, *H. subduplicata* (Rass.) Rass., *Lecidella stigmatea* (Ach.) Hertel & Leuckert, *Leptorhaphis lucida* Körb., *Parmelia saxatilis* (L.) Ach. var. *divaricata* Delise ex Nyl., *Parmotrema arnoldii* (Du Rietz) Hale, *Phaeophyscia hirsuta* Mereschk., *Physcia biziana* (A.Massal.) Zahlbr., *Physconia deterosa* (Nyl.) Poelt, *Ramalina obtusata* (Arnold) Bitter, *Squamarina gypsacea* (Sm.) Poelt, *Toninia sedifolia* (Scop.) Timdal, *Umbilicaria cylindrica* (L.) Delise ex Duby var. *tornata* (Ach.) Nyl., and *Xanthoparmelia tinctoria* (Maheu & A.Gillet) Hale. Four of the reported taxa were recorded in Vashlovani Protected Areas, East Georgia. The paper also presents a brief summary of lichen studies in Georgia since the beginning of the 19th century with all important literature sources cited.

Key words: Lichens, new records, Vashlovani Protected Areas, Georgia, Caucasus

Introduction

Investigation of Georgia's lichen flora started at the beginning of the 19th century. Lichen species collected in Georgia were first mentioned by Acharius (1810). Species from Georgia (mainly from the surroundings of Tbilisi) are mentioned by Belanger (1825-29), Buhse (1860), Rabenhorst (1871), and Vainio (1887, 1894). Later lichen collections from various regions of the country were thoroughly analysed by Vainio (1899), Jatta (1900), and Radde (1901). Lichenological studies conducted by Elenkin in the Caucasus (1901a, 1901b) were particularly significant. The studies were continued by Voronov

(1915, 1916, 1923), Voronikhin (Elenkin & Voronikhin, 1908; Voronikhin, 1919, 1927), and Steiner (1919), and further by Pakhunova (1926-27, 1933, 1952, 1956, 1959), who investigated the lichen flora of Gare Kakheta and Racha-Lechkhumi as well as the distribution of species of the genera *Parmelia* and *Cetraria* in Georgia. Lichen flora of the river Aragvi gorge, the floristic regions of Abkhazeti, Adjara, Svaneti, Trialeti, Djavakheti, Imereti, and several protected areas, and lichens of Nikortsminda cathedral in West Georgia were studied by Inashvili (1963a, 1963b, 1964, 1968, 1969, 1970, 1974, 1978, 1980, 2005, 2006a, 2006b). The lichen flora of dry

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habitats and a number of medieval churches and castles throughout Georgia was studied by Chelidze (1972). The lichen flora of Tbilisi vicinity was studied by Batsatsashvili and Chelidze (2004).

Large collections from Georgia, many other parts of the Caucasus, and some other areas are kept in the Herbarium of Tbilisi Botanical Garden and Institute of Botany (TBI), Georgia. Lichen collections are also kept at the Herbaria of the State Museum of Georgia (TGM) and Ivane Javakhishvili State University of Tbilisi (TB), Georgia.

More than 730 species of lichens (987 taxa including subspecies, varieties and forms) recorded in the country were included in the *Flora of Spore-Producing Plants of Georgia* (Nakhutsrishvili, 1986). However, the existing Flora needs taxonomic revision and update.

A number of regions are still lichenologically uninvestigated and thus further studies are necessary to give the full picture of Georgia's lichen diversity as well as determine the distribution ranges of separate species in the country.

Results

The paper presents 17 new records of lichens from Georgia. The presented species/varieties were collected in 7 floristic regions of the country (Abkhazeti, Kakheti, Kartli, Kiziki, Meskheta, Racha-Lechkhumi, and Svaneti) in 1962-2009. Four of the reported taxa are recorded in Vashlovani Protected Areas, Kiziki, East Georgia.

Floristic regions of Georgia are given according to Ketskhoveli et al. (1971-2005).

The taxa were identified according to Tomin (1937, 1956) and Kopaczewskaja et al. (1971, 1977).

Notes on taxonomic characters and ecology are given for 2 taxa (*Hypogymnia subduplicata* (Rass.) Rass. and *Parmelia saxatilis* (L.) Ach. var. *divaricata* Delise ex Nyl.) not well represented in the lichenological literature.

Selected specimens examined

Aspicilia esculenta (Pall.) Flagey. Georgia: Kartli, the village Ertatsminda vicinity, Kaspi district, on

calcareous soil, S slope, 5.06.1967, Tz. *Inashvili* (TBI5008743).

Caloplaca lobulata (Flörke) Hellb. Georgia: Kiziki, David Gareji Monastery vicinity, on *Pyrus caucasica*, 31.03.2009, Tz. *Inashvili* (TBI5008739).

Cladonia caespiticia (Pers.) Flörke. Georgia: Kartli, the settlement Bakuriani vicinity, Borjomi district, c. 1600 m, on a stub in spruce-pine forest, 6.07.1967, Tz. *Inashvili* (TBI5008738).

Hypogymnia farinacea Zopf. Georgia: Kartli, the castle Aletsistsikhe vicinity, the gorge of the river Dzama, Kareli district, c. 2200 m, on the trunk of *Betula* sp. in birch forest, 15.07.1967, Tz. *Inashvili* (TBI5008735).

H. subduplicata (Rass.) Rass. Georgia: Svaneti, the base of Mt. Shkhara, the village Ushguli vicinity, Mestia district, c. 2600 m, on rock with thin soil cover, 6.08.1963, Tz. *Inashvili* (TBI5008734).

Notes. Known from the Russian Federation (the Far East) (Kopaczewskaja et al., 1971), China (Wei, 1991).

“Grows on mosses and moss-covered rocks. The species is close to *H. physodes* (L.) Nyl. and *H. vittata* (Ach.) Gas. by thallus colour and general appearance but differs from both of these species by orbicular lobe axils. It also differs from *H. physodes* by rounded perforation on the lower surface and from *H. vittata* by convex lobes with the smooth upper surface developed much better than the lower one” (Kopaczewskaja et al., 1971).

Lecidella stigmatea (Ach.) Hertel & Leuckert. Georgia: Kiziki, Vashlovani Protected Areas, Dedoplistskaro district, on a stone, 21.04.1988, Tz. *Inashvili* (TBI5008723).

Leptorhaphis lucida Körb. Georgia: Kakheti, near the Shakriani bridge, the town Telavi vicinity, on the trunk of *Populus* sp. in riparian forest, 9.10.2000, Tz. *Inashvili* (TBI5008736).

Parmelia saxatilis (L.) Ach. var. *divaricata* Delise ex Nyl. Georgia: Racha-Lechkhumi, the village Glola vicinity, Oni district, c. 1500 m, on branches of *Picea orientalis* in abies-spruce forest, 19.07.1963, Tz. *Inashvili* (TBI5008726).

Notes. Known from Asia (the Russian Federation, China, Japan). Reported for North America (Kopaczewskaja et al., 1971; Reilly, 1972) but not verified. Mentioned also for Germany by Poelt (1964).

Grows on trunks and branches of various woody plants. It is clearly distinguishable by elongated, often scattered separate lobes with transverse cracks as well as isidia slightly reaching lobe edges and only sporadically occurring on the upper surface of the lobes (Kopaczewskaja et al., 1971).

Parmotrema arnoldii (Du Rietz) Hale. Georgia: Kartli, the village Tsorbiri vicinity, the gorge of the river Phronae, c. 1700 m, on the trunk of *Fagus orientalis* in beech forest, 22.08.1984, *Tz. Inashvili* (TBI5008725).

Phaeophyscia hirsuta Mereschk. Georgia: Kiziki, Vashlovani Protected Areas, Dedoplistskaro district, on the trunks of *Juniperus* sp. and *Pistacia mutica* in juniper-pistachio open forest, 30.10.1988 and 2.11.1988, *Tz. Inashvili* (TBI5008717, TBI5008718, TBI5008719).

Physcia biziana (A.Massal.) Zahlbr. Georgia: Kiziki, Pantishara, Vashlovani Protected Areas, Dedoplistskaro district, on the trunk of *Juniperus* sp. in juniper-pistachio open forest, 15.04.1988, *Tz. Inashvili* (TBI5008720).

Physconia detersa (Nyl.) Poelt. Georgia: Meskheta: the gorge of the river Didighele, Aspindza district, c. 1500 m, S slope, on a bryophyte-covered stone in pine forest, 21.07.1968, *Tz. Inashvili* (TBI5008727).

Ramalina obtusata (Arnold) Bitter. Georgia: Kartli, the village Ertatsminda vicinity, Kaspi district, c. 1000 m, on branches of *Picea orientalis* in beech-spruce forest, 26.06.1967, *Tz. Inashvili* (TBI5008744).

Squamarina gypsacea (Sm.) Poelt. Georgia: Abkhazeti, Gyuzlae vicinity, the Gagra range, c. 1500 m, on calcareous soil on meadow, 11.07.1962, *Tz. Inashvili* (TBI5008745).

Toninia sedifolia (Scop.) Timdal. Georgia: Kiziki, Pantishara, Vashlovani Protected Areas, Dedoplistskaro district, on the ground in pistachio open forest, 16.04.1988, *Tz. Inashvili* (TBI5008724).

Umbilicaria cylindrica (L.) Delise ex Duby var. *tornata* (Ach.) Nyl. Georgia: Svaneti, Mt. Goldashi, the settlement Lentekhi vicinity, c. 2500 m, S slope, on rock, 24.07.1979, *Tz. Inashvili* (TBI5008746).

Xanthoparmelia tinctina (Maheu & A.Gillet) Hale. Georgia: Meskheta, the settlement Aspindza vicinity, Aspindza district, on rock, 23.08.1967, *Tz. Inashvili* (TBI5008737); the village Kumurdo vicinity, Adigeni district, on a stone, 23.08.1967, *Tz. Inashvili* (TBI5008741); Kartli, the Armaziskhevi ravine, Mtskheta district, on rock, 23.08.1967, *Tz. Inashvili* (TBI5008740).

Discussion

The knowledge of the lichen flora of Georgia is incomplete. Although more than 700 species of lichens are recorded in the country, many regions are still lichenologically uninvestigated and continued collecting efforts must result in a large number of new records. In addition, the existing checklist (Nakhut-srishvili, 1986) requires taxonomic revision and update.

In this paper 17 taxa (15 species and 2 varieties) collected in 1962-2009 are reported for the first time for Georgia. In the above description of the selected specimens notes on distribution, ecology, and important taxonomic characters are given for 2 taxa: *Hypogymnia subduplicata* and *Parmelia saxatilis* var. *divaricata*, as both are not well represented in the lichenological literature.

Although the conservation status of a species is dependent on the state of knowledge of the lichen flora, the above listed species known only from a single or a few records in Georgia may be considered potentially threatened at national or even regional level.

Four of the reported species (*Lecidella stigmatea*, *Phaeophyscia hirsuta*, *Physcia biziana*, and *Toninia sedifolia*) are recorded in Vashlovani Protected Areas.

Further studies of the lichen flora of Georgia, and in general, the Caucasus – the isthmus between Europe and Asia and one of the world's 34 Biodiversity Hotspots – may reveal interesting distribution patterns of phytogeographically different lichen taxa in the region and will help in the identification of threatened species in need of conservation actions. In connection with this it is important to mention a paper by Helfer (2008) presenting an estimate of the completeness of

mycological exploration of South-West Asia and indicating little coordination of effort in the area as one of the greatest challenges for research. The same can be said of the 6 countries of the Caucasus Biodiversity Hotspot in terms of lichenological exploration of the region, where collaboration between relevant institutions is a necessary pre-condition for producing regional checklists for all lichen taxa and revealing lichen distribution patterns.

References

- Acharius E (1810). *Lichenographia Universalis*. Gottingen: F. Dandewerts.
- Batsatsashvili K & Chelidze N (2004). Lichens of Tbilisi and its surroundings. *Notulae systematicae ac geographicae Instituti Botanici Tbilissiensis* 44-45: 68-88 (in Georgian).
- Bélanger C (1825-1829). *Voyage Aux Indes-orientales, Par le Nord de l'Europe, les Provinces du Caucase, la Géorgie, l'Arménie et la Perse, Suivi de Détails Topographiques, Statistiques et Autres sur le Pégou, les Isles de Java, de Maurice et de Bourbon, sur le Cap-de-Bonne-Espérance et Saint-Hélène, Pendant les Années 1825, 1826, 1827, 1828 et 1829*. Botanique. 4 Livraison. Partie II. Paris.
- Boissier E & Buhse F (1860). *Aufzählung der auf einer Reise durch Transkaukasien und Persien gesammelten Pflanzen*. Moskau: typ. Gautier.
- Chelidze N (1972). Mediterranean element in the lichen flora of dry habitats of East Georgia. In: *Proc. IV South Caucasian Symposium on Spore-Producing Plants*, pp. 95-97. Yerevan (in Russian).
- Elenkin A (1901a). Lichenological excursion to the Caucasus in 1899. *Izvestija Imperatorskogo S.-Peterburgskogo botanicheskogo sada* 1(3): 95-116 (in Russian).
- Elenkin A (1901b). Lichen formations in the Crimea and Caucasus. *Trudy Sankt-Peterburgskogo obshchestva estestvoispytateley* 32(1): 171-181 (in Russian).
- Elenkin A & Voronikhin N (1908). Foliicolous lichens in the Caucasus. *Trudy Sankt-Peterburgskogo obshchestva estestvoispytateley* 39(1): 236-258 (in Russian).
- Helfer S (2008). Mycota of South-West Asia. *Turk J Bot* 32: 481-484.
- Inashvili Tz (1963a). New lichen records in the USSR. *Botanicheskie materialy otdela sporovykh rasteniy Botanicheskogo instituta im. V. L. Komarova Akademii nauk SSSR* 16: 18-19 (in Russian).
- Inashvili Tz (1963b). Lichens from Georgia, new and interesting for the Caucasus. *Botanicheskie materialy otdela sporovykh rasteniy Botanicheskogo instituta im. V. L. Komarova Akademii nauk SSSR* 16: 20-22 (in Russian).
- Inashvili Tz (1964). *Collema callopismum* Mass., a new species for the lichen flora of the USSR. *Novosti sistematiki nizshikh rasteniy / Novitates systematicae plantarum non vascularium* 1: 250-251 (in Russian).
- Inashvili Tz (1968). For study of the lichen flora of limestones on southern slopes of the Western Greater Caucasus. In: *Proceedings of the 3rd Transcaucasian Conference on Cryptogams / Materialy III zakavkazskoy konferencii po sporovym rastenijam*, pp. 255-258. Tbilisi (in Russian).
- Inashvili Tz (1969). Some new and rare species of lichens for the Caucasus. *Zametki po sistematike i geografii rasteniy AN GSSR* 27: 10-13 (in Russian).
- Inashvili Tz (1970). New records of lichens from Georgia. *Zametki po sistematike i geografii rasteniy AN GSSR* 28: 10-12 (in Russian).
- Inashvili Tz (1974). Lichen flora of southern slopes of the Western Greater Caucasus. *Trudy Instituta botaniki AN GSSR* 27: 9-22 (in Russian).
- Inashvili Tz (1978). New and rare lichens for the Caucasus. *Zametki po sistematike i geografii rasteniy AN GSSR* 35: 81-83 (in Russian).
- Inashvili Tz (1980). Species of the family *Collemataceae*, new and rare for the USSR. *Novosti sistematiki nizshikh rasteniy / Novitates systematicae plantarum non vascularium* 31: 134-136 (in Russian).
- Inashvili Tz, Chikovani N & Murvanishvili I (2005). Cryptogams and fungi of forest belt of Lagodekhi State Reserve. *Bull. Georgian Acad. Sci.* 179: 551-553.
- Inashvili Tz & Kupradze I (2006). Materials to the study of lichens of Algeti State Reserve. *Proc. Georgian Acad. Sci., Ser. Biol. B* 3: 45-51.
- Inashvili Tz, Murvanishvili I & Tigishvili K (2006). Fungi and cryptogams of high-mountain ecosystems of Lagodekhi State Reserve. *Proc. Georgian Acad. Sci., Ser. Biol. B* 4: 51-59.
- Jatta A (1900). Lichenes. In: *Sommier S & Levier E. Enumeratio plantarum anno 1890 in Caucaso lectorum. Acta Horti Petropolitani* 16: 1-586.
- Ketskaveli N, Kharadze A & Gagnidze R (eds.) (1971-2005). *Flora of Georgia*. 1-15. Tbilisi: Metsniereba (in Georgian).
- Kopaczewskaja EG, Makarevicz MF, Oxner AN & Rassadina KA (1971). *Key to Lichens of the USSR. 1. Pertusariaceae, Lecanoraceae and Parmeliaceae*. Leningrad: Nauka (in Russian).

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- Kopaczewskaja EG, Makarevicz MF, Oxner AN & Rassadina KA (1977). *Key to Lichens of the USSR. 4. Verrucariaceae-Pilocarpaceae*. Leningrad: Nauka (in Russian).
- Nakhutsrishvili IG (1986). *Flora of Spore-Producing Plants of Georgia (Summary)*. Tbilisi: Metsniereba.
- Pakhunova V (1926-27). Notes on foliicolous lichens in Sukhumi and its vicinity. *Vestnik Tiflisskogo botanicheskogo sada* 3-4: 57-59 (in Russian).
- Pakhunova V (1933). Materials for study of Georgia's lichens. *Trudy Tiflisskogo botanicheskogo instituta* 1: 303-348 (in Russian).
- Pakhunova V (1952). Materials for study of the lichen flora of Gare Kakheti. *Trudy Tbilisskogo botanicheskogo instituta* 14: 11-29 (in Russian).
- Pakhunova V (1956). Lichen flora of Racha-Lechkhumi. *Trudy Tbilisskogo botanicheskogo instituta* 18: 139-180 (in Russian).
- Pakhunova V (1959). Representatives of the genus *Cetraria* in Georgia. *Trudy Tbilisskogo botanicheskogo instituta* 20: 59-72 (in Russian).
- Poelt J (1964). Mitteleuropäische Flechten VIII. *Mitteil. der Bot. Staatssammlung München* 5: 247-265.
- Rabenhorst L (1871). Uebersicht der von Herrn Prof. Dr Haussknecht im Orient gesammelten Kryptogamen. *Hedwigia* 10: 17-27.
- Radde G (1901). *Die Sammlungen des Kaukasischen Museums. Bd. 2: Botanik*. Tiflis.
- Reilly RW (1972). The Macrolichens of the Magdalen Islands, Quebec, Canada. *The Bryologist* 75: 179-184.
- Steiner J (1919). Flechten aus Transkaukasien. *Annales Mycologici* 17: 1-132.
- Tomin MP (1937). *Key to Foliose and Fruticose Lichens of the USSR*. Minsk: Publishing House of the Academy of Sciences of the Belorus SSR (in Russian).
- Tomin MP (1956). *Key to Crustose Lichens of the European Part of the USSR (except the Far North and Crimea)*. Minsk: Publishing House of the Academy of Sciences of the Belorus SSR (in Russian).
- Vainio E (1887). Monographia Cladoniarum universalis. *Acta Societatis pro Fauna et Flora Fennica* 4: 1-510.
- Vainio E (1894). Monographia Cladoniarum universalis. *Acta Societatis pro Fauna et Flora Fennica* 11: 1-499.
- Vainio E (1899). Lichenes in Caucaso et in Peninsula Taurica annis 1884-1885 ad. H. Lojka et M. Dechy Collecti. *Természeirajzi Füzetek* 22: 269-343.
- Voronikhin N (1919). Notes on foliicolous lichens in the Caucasus. *Izvestija Kavkazskogo muzeja* 12: 150-154 (in Russian).
- Voronikhin N (1927). Materials for the flora of fungi of the Caucasus. *Trudy Botanicheskogo muzeja AN SSSR* 21: 87-252 (in Russian).
- Voronov Ju (1915). Summary of data on the mycoflora of the Caucasus. Part I. *Trudy Tiflisskogo botanicheskogo sada* 13(2): 1-200 (in Russian).
- Voronov Ju (1923). Summary of data on the mycoflora of the Caucasus. Part II. *Trudy Tiflisskogo botanicheskogo sada* 2(3): 97-186 (in Russian).
- Voronov Ju (1916). Materials for the lichen flora of the Caucasus. *Izvestija Kavkazskogo Muzeja* 9: 203-227 (in Russian).
- Wei JC (1991). *An Enumeration of Lichens in China*. Beijing: Int Acad Publ.