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The Order Lecanorales Nannf. in the Lichen Biota of Azerbaijan

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Abstract:

The order of Lecanorales lichen biota of Azerbaijan has been analyzed on the basis of long-term research and compilation of published data according to the new nomenclature changes. A species composition numbering 441 to date has been found. Among them, there are 7 species firstly referred for the lichen flora of Azerbaijan, 1 species for the Caucasus.

Key words: order, Lecanorales, lichen biota, landscape species, family, Azerbaijan

The order Lecanoromycetes refers to the Ascomysota department, the *Lecanoromycetes* class, the *Lecanoromycetidae* subclass. This is one of the largest lichenized Ascomycetes orders, covering more than 30 families. It includes 269 genus, 5695 species [13, 14]. In the lichen biota of Azerbaijan taxonomically (the number of families, genus and species), this procedure also takes a leading position and plays an important role for the formation of the lichen flora.

Materials and methods

The material for this work was the results of years of research conducted by semi-permanent and synthesis of literature data [4, 5, 6, 7, 8, 9, 10, 11, 13]. Collection, herbarization and identification of lichens were carried by standard methods [12]. Specimens of the collection are stored in the Lichenological herbarium (LH) Institute of Botany National Academy of Sciences of Azerbaijan (Baku).

Results and discussion

As a result of generalization of literature data and the results of private research it is found that the lichen biota of Azerbaijan currently has 824 species, 4 subspecies, 86 varieties and 118 lichen forms of 14 orders, 54 families and 158 genus. The basis of lichen biota is lichens of the Lecanorales order combining together 441 species (53.5% of total species), 2 subspecies of 79 genus and 17 families.

Analyzing the composition of the leading families and genus of the Lecanorales order, it is noted that they constitute the basis polymorphic families and genus that are typical of temperate Holarctic region. It is established that the families leading by the number of genus are: *Parmeliaceae* (including 21 genuses), *Physciaceae* (13), *Ramalinaceae* (9), *Lecanoraceae* (9), *Caliciaceae* (4), four families (*Lecideaceae*, *Pilocarpaceae*, *Porpidiaceae*, *Stereocaulaceae*) contain 3 genus. Four families (*Catillariaceae, Cladoniaceae, Psoraceae, Rhizocarpaceae*) contain two genus. One genus represented five families only (*Biatorellaceae, Haematommataceae, Loxosporaceae, Sphaerophoraceae*).

The range of the families leading by the number of species includes: *Parmeliaceae* (93 species or 11.3%), *Lecanoraceae* (83 or 10%), *Physciaceae* (67 or 8.13%), *Ramalinaceae* (60 or 7.28%), *Cladoniaceae* (51 or 6.1%),

Lecideaceae (27 or 3.27), *Rhizocarpaceae* (13 or 1.5%). The average number of species in the family is 24. The level of the species richness is found in 7 families uniting 394 species (48%) of the total number of the lichen flora. The high position of these families is due to ecological plasticity of their representatives growing on different substrates, different environmental conditions. The remaining 10 families cover 47 species.

Analysis of the generic spectrum showed that the largest number of species was representatives of 11 genus including more than 10 species belonging to the leading genus polymorphic. These are: *Lecanora* - 54 species (6.65 % of the total number of species), *Cladonia* - 46 species (5.58%), *Lecidea*- 26 species (3.15%), *Rinodina* - 20 species (2.42 %), *Parmelia* - 18 species (2,18%), *Lecania* - 15 species (1,82%), *Physcia* - 15 species (1,82%), *Ramalina* - 15 species (1.82%), *Usnea* - 14 species (1. 69 %), *Bacidia* - 13 species (1.57%), *Rhizocarpon* - 12 species (1.45 %). They bring together 248 species (30 % of total species) lichen biota. The remaining 68 genus include 193 species (23 % of total species). 35 genus include 2-8 species, 33 genus are monospecies.

The most abundant genus *Lecanora* (the *Lecanoraceae* family) presented crustose lichens widely widespread in the Holarctic and beyond. This genus is one of the leaders (54 species), both among the genus of this family, and the genus of lichens in the region as a whole. They may be found in all zones (from the low-lying parts to highlands), in the lesser and Greater Caucasus (within Azerbaijan), Kura-Araks lowland, and Talysh. The representatives of the genus are found on the wood substrate (*Lecanora allophana* (Ach.) Rtshl., *L. nemoralis* Mak., *L. intumescens* (Dicks.) Rabenh., *L. pulicaris* (Pers.) Ach., *L. subfuscata* H. Magn.) and others, as well as in the outputs of silicate rocks and limestones: *Lecanora atrynea* (Ach.) Rtshl., *L. crenulata* (Dicks.) Hook., *L. cenisia* Ach., *L. dispersa* (Pers.) Sommerf., *L. frustulosa* (Dicks.) Ach. The epiphytic lichens (31

species) dominate here. *Lecanora oxneri* Novruz., *L. leptyrodes* (Nyl.) Nilss., *L. multispora* Mak., *L. rupicola*, *L. pachycheila* Hue may be mentioned among rare and poorly known species of the Lecanora genus. The first is endemic to Azerbaijan. The species was described by V.S. Novruzov, Belokan region [11], on the silicate rock at a height of 3200 m above sea level - the second one new for the lichen biota of Azerbaijan, described by us from Agsu region, is built in walnut grove, on the bark of walnut [3]. The nemoral (20) and boreal (11) species dominate in the genus.

The *Cladonia* genus includes 46 species. In the study area they grow in the soil, forming a ground layer of moss and lichen groups such as *Cladonia furcata* (Huds.) Schrad., *C. fimbriata* (L.) Fr., *C. rangiformis* Hoffm.; on mossy rocks : *C. pyxidata* (L.) Hoffm., *C. subulata* (L.) Wigg.; on the cover at the base of a mossy tree trunks, on rotting stumps : *C. ochrochlora* Flörke, *C. squamosa* (Scop.) Hoffm. in wet and dry habitats. Among the rare species the following are marked: *C. alpina* (Asahina) Yoshim, *C. amaurocraea* (Flörke) Schaer., *C. bacilliformis* (Nyl.) Glück, *C. cenotea* (Ach.) Schaer., *C. rei* Schaer. Among the representatives, as far as 12 species have been found in the Lesser Caucasus, only 5 species in Talysh, only 3 species in the Greater Caucasus. Interest is a lichen *C. cenotea* (Ach.) Schaer., the rare one for the region studied and new one to the lichen flora of Azerbaijan. The specie was found by us on the root margins in the forest of Zangilan region (23.07.1984, LH). The boreal species (18-0.97 %) involved in the formation of the ground cover of the forest phytocenoses dominated in the *Cladonia* genus.

The representatives of the *Lecidea* genus (26 species) are found on the bark of trees, as well as on the rocky substrate. The lithophile lichen dominates here (14 species). Species of this genus are distributed between nemoral (6), evriholarctic (6), arcto-alpline (4), boreal (4), montana (3), alpine (1), xerocontinental (1) and multiregional (1) geographical

elements. Among the interesting kinds, the *Lecidea confluens* (Weber) Ach, a discovery collected by us on the rocks in Kelbedzher region is to be noted. [27. 07. 1985, (LH)]. This specie is new to the lichen biota of Azerbaijan. Among the 26 species of the *Lecidea* genus, nine lichens are found in the Lesser Caucasus only.

The identified species of the *Rinodina* genus combine 20 species. They are found at the outputs of rocks, limestone and in the bark of trees. The greatest number of species (13) is marked on solid rocks. The every holarctic lichens (7 species) and montana (5 species) dominate in the genus. The remaining species are distributed between nemoral (3), boreal (2) hypo arctic montana (2) and arcto-alpine geographical elements. The *Rinodina boleana* Giralt, rare lichen observed by us in Dashkesan area on the bark of trees is particularly noteworthy among the species of this genus. The species is referred for the first time for the lichen flora of the Caucasus [2].

The *Parmelia* genus includes 18 species. The representatives of the genus are foliose lichens growing on the bark of trees, on the ground, as well as stones and rocks. The species of the genus are represented by nemorals such as *Parmelia fuliginosa, P. perlata* (Huds.) Ach., *P. ullophyllodes* (Vain.) Savicz, boreal *Parmelia subaurifera* Nyl., *P. loxodes* Nyl., hypoarctic montana - *P. soredians* Nyl., montana *P. carporhizans* Tayl., *P. laevigata* Ach., and xerocontinental, desert- steppe and multiregional species. Among the interesting species of the *Parmela* genus, the *Parmelia rudecta* Ach. and *Parmelia fraudans* Nyl., new ones for the area studied are to be noted. The first species was discovered in Kedabek area on stony substrate [1], the second - in Kelbedzher area, also on hard rock [08.07.1985, (LH)]. The representatives of the *Parmelia* genus grow in the Greater and Lesser Caucasus, the Kura- Araks lowland and Talysh.

The *Lecania* genus includes 15 species. 11 of them are collected on the bark of trees, 4 - on stones and rocks. They are

distributed between nemoral (7 species), boreal (4) evriholarctic (3) and arid (2) the geographical elements. Among the species of this genus, there are some quite rare and interesting lichens such as: *Lecania alexandrae* Tomin, *L. bullata* Oxn., *L. ephedrae* Elenkin, *L. saviczii* Novruz. Most of the species are concentrated in the Greater Caucasus; some species are also noted in the Lesser Caucasus and Talysh.

The same number of species (15) is also found in the *Physcia* and *Ramalina* genus. The representatives of the *Physcia* genus referred to foliose lichens are met on the bark of trees, rocky substrates, and some species, like *Physcia caesia* (Hoffm.) Hampe ex Fürnr. are found soil, too. Among the representatives of the *Physcia* genus, the rare lichens: *Physcia biziana* (A. Massal.) Zahlb., *P. endoaurantiaca* Barkhal., *P. subnuda* Novruz found in the region and beyond are to be noted. The first refers to xeromeridional, the last two refer to the montana geographical element.

Species of the *Ramalina* genus are presented by bushy lichens growing on the bark of trees: *Ramalina calicaris* (L.) Rtshl., *R. farinacea* (L.) Ach., *R. fastigiata* (Liljebl.) Ach., *R. sinensis* Jatta (widely distributed); on the rocks: *R. maciformis* (Del.) Bory, *R. montana* Barkhal., *R. polymorpha* Ach.; on the basis of: *R. evernioides* Nyl. (rare). In the genus, the nemoral species (6) dominate, the further are distant xerocontinental (3) multiregional (2) mediterranean (2), boreal (2). They are found in the lesser and Greater Caucasus, the Kura-Araks lowland and Talysh.

The genus *Usnea* (14) brings together fruticose lichens that grow in the forest zone. They are dominated by species of montana (6) and boreal (5). The representatives of the genus inhabit the lesser and Greater Caucasus and Talysh in the bark of deciduous trees.

The species of the *Bacidia* (13) genus grow on tree trunks and are presented by boreal (6) nemoral (5) and multiregional (1) species growing on the Greater and Lesser

Caucasus, Talysh.

The representatives of *Rhizocarpon* (12) are collected on rocks. Among the species of the genus there is 1 - alpine, 1 – arcto-apline, 1 - hypoarctic montana, 1- montana, 2 - evriholarctic, 2 - boreal and 4 multiregional species. The main part (9 species) was noted in the Caucasus, 2 species in Talysh only, one of the Lesser Caucasus.

The *Bryoria* and *Melanelia* genus contain 10 species (1.21%). Among 10 representatives of the *Bryoria* genus, 8 species were found in the Greater and Lesser Caucasus, and in Talysh. Two species have been found only Lesser Caucasus. Among them, five species are boreal, two are evriholarctic, and one is hypoarctic montana, one is nemoral lichen growing on the branches and trunks of trees, as well as on the mossy rocks.

The representatives of the *Melanelia* genus are noted in the Greater Caucasus, Lesser Caucasus in the Kura-Araks lowland, Talysh. They are dominated by nemoral species (5). The remaining species of the genus are distributed among boreal species (3), arcto-alpine (1), hypoarctic montana (1) growing on the trees, and some on the rocky substrate.

The same number of species (8) is noted in the *Calicium*, *Cetraria* genus, and in the representatives of the *Toninia*, *Calicium* genus marked on the bark of deciduous trees. They include 4 - nemoral, 2 - boreal, 1 - evriholarctic and 1 - multiregional lichen species. Among them there are three quite rare types: *Calicium alboatrum* Flörke, *C. quercinum* Pers., *C. viride* Pers. growing in the forest zone of Talysh [8]. The representatives of the *Cetraria* genus have been collected on the ground and the bark of trees. Among the species found there are marked rare ones pertaining to the *C. juniperina* (L.) Ach. hypoarctic montana geographical element, the boreal *C. chlorophylla* (Wiild.) Vain. The last is firstly referred for the lichen flora of Azerbaijan [03.07.1984, (LH)]. Both species grow in the Lesser Caucasus. Lichens of the *Toninia* genus have been collected on solid rocks on the ground and presented by arcto-

alpine, xeromeridional, multiregional and mediterranean species. Among the eight species, six are reported to be found in the Lesser Caucasus only, one species - *T. cinereovirens* (Schaer.) Massal. in the Lesser Caucasus and Talysh, and the *T. sedifolia* (Scop.) Timdal specie - in the Lesser and Greater Caucasus, the Kura- Araks lowland and Talysh.

The *Candelariella* and *Placodium* genus include 7 species each one. The representatives of the *Candelariella* genus grow on stones and rocks, as well as on the trees. Species of the *Placodium* genus grow on stony substrate. Among them, two species have been found in the Lesser Caucasus only, and the rest - in the Lesser and Greater Caucasus, the Kura-Araks lowland and Talysh.

The *Phaeophyscia* genus is represented by 6 species (0.72%), four genuses such as *Anaptychia*, *Catillaria*, *Buellia*, *Hypogymnia* are presented by 5 species (0.60%) each one.

Based on the distribution of lichen species of the Lecanorales order by elements of flora it is noted that nemoral species (73) dominate due to the participation of the representatives of the families such as *Lecanoraceae* (27 species), *Physciaceae* (16), *Parmeliaceae* (14), *Ramalinaceae* (11). The species of the *Lecanora*, *Physcia*, *Parmelia*, *Ramalina* genus grow in many ecotopes, but mostly dominated in the forests in Azerbaijan, playing a significant role in nemoral terms of the lichen flora. On the other hand, the richness of the species of the *Cladoniaceae* (18 species) family has an impact on the boreal lichen flora of the region under study.

Thus, the analysis of lichens of the Lecanorales order has showed that it forms the basis of the lichen biota of Azerbaijan and plays an important role in its formation.

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