

Distribution features of epiphytic lichens on *Populus maximowiczii* in Yuzhno-Sakhalinsk city and its suburbs

Vladimir V. Kaganov^{1,2} <https://orcid.org/0000-0003-1444-9813>, vladimirkaganov@mail.ru

Alexander V. Kordyukov¹ <https://orcid.org/0000-0002-1430-1627>, a.kordyukov@imgg.ru

Alexander K. Ezhkin¹ <https://orcid.org/0000-0002-2242-2250>, ezhkin@yandex.ru

¹ Institute of Marine Geology and Geophysics, FEB RAS, Yuzhno-Sakhalinsk, Russia

² Sakhalin Branch of the Botanical Garden-Institute, FEB RAS, Yuzhno-Sakhalinsk, Russia

[Abstract PDF ENG](#) [Резюме PDF RUS](#)

[Full text PDF RUS](#)

Abstract. The results of research of epiphytic lichens as bioindicators of the atmosphere pollution in Yuzhno-Sakhalinsk city and its suburbs are reported. *Populus maximowiczii* was chosen as the most common tree species in the plantings of the city as a lichen substrate. Control sites was chosen in natural habitats of *Populus maximowiczii* in surroundings of the city. In total, 47 lichen species were registered on bark of *Populus maximowiczii* on all sites. Three clusters of anthropogenic influence on lichens were defined by the results of the cluster analysis of 15 stations where species composition and occurrence frequency were registered. Four groups of lichen sensitivity to anthropogenic influence were identified according to confinement to these three clusters. The analysis of species distribution by the degree of sensitivity was made for each site.

Keywords:

lichenindication, biomonitoring, urban zone, anthropogenic impact

For citation: Kaganov V.V., Kordyukov A.V., Ezhkin A.K. Distribution features of epiphytic lichens on *Populus maximowiczii* in Yuzhno-Sakhalinsk city and its suburbs. *Geosistemy perehodnykh zon = Geosystems of Transition Zones*, 2021, vol. 5, no. 4, pp. 428–438. (In Russ., abstr. in Engl.). <https://doi.org/10.30730/gtr.2021.5.4.428-438>

Для цитирования: Каганов В.В., Кордюков А.В., Ежкин А.К. Особенности распространения эпифитных лишайников на коре тополя Максимовича в городе Южно-Сахалинск и его окрестностях. *Геосистемы переходных зон*, 2021, т. 5, № 4, с. 428–438. <https://doi.org/10.30730/gtr.2021.5.4.428-438>

References

1. Byazrov L.G. **2002.** *Lishayniki v ekologicheskoy monitoringe [Lichens in ecological monitoring]*. Moscow: Nauch. mir, 336 p.
2. *Doklad o sostoyanii i ob okhrane okruzhayushchey sredy Sakhalinskoy oblasti v 2020 godu [Report on the state and protection of the environment in the Sakhalin Region in 2020]*. Min-vo ekologii Sakhalinskoy oblasti. [The Ministry of ecology of the Sakhalin Region]. Yuzhno-Sakhalinsk: Eykon, 2021. 179 p.
3. Ezhkin A.K., Galanina I.A. **2016.** Epiphytic lichens of deciduous trees in the city of Yuzhno-Sakhalinsk and specifics of their distribution by sensitivity to the anthropogenic impact. *Vestnik Severo-Vostochnogo nauchnogo tsentra DVO RAN = Bull. of the North-East Scientific Center FEB RAS*, 4: 95–107.
4. Erofeeva I.A., Sergeeva I.V. **2014.** The use of epiphytic lichens in bio-indication of the environment. *Agrarnyy nauchnyy zhurnal = [Agrarian Scientific Journal]*, 10: 18–20.
5. Zemtsova A.I. **1968.** *[The climate of Sakhalin]*. Leningrad: Gidrometeoizdat, 197 p.
6. Korznikov K.A., Ezhkin A.K. **2019.** Ash and elm forests of the Tym' river valley, Sakhalin Island. *Byul. Botanicheskogo sada-instituta DVO RAN = [Bull. of the Botanical Garden-Institute FEB RAS]*, 22: 1–14. <https://doi.org/10.17581/bbgi2201>
7. *[Identification guide to the lichens of USSR]*. Iss. 2. *[Morphology, taxonomy and geographical distribution]* (ed. A.N. Oksner). **1974.** Leningrad: Nauka, 284 p.
8. Sabirov R.N. **2017.** [On the populus planting in Yuzhno-Sakhalinsk]. *Vestnik Sakhalinskogo muzeya [Bulletin of the Sakhalin museum]*. Yuzhno-Sakhalinsk, 24: 314–323.
9. *Flora of lichens in Russia: Biology, ecology, diversity, distribution and the study methods*. **2014.** (Authors: M.P. Andreev, T. Akhti, A.A. Voytsekhovich et al.). Moscow; Saint Petersburg: Tov-vo nauch. izd. KMK, 392 p.
10. Adjiri F., Ramdani M., Lograda T. **2019.** Relationship between lichen diversity and air quality in urban region in Bourdj Bou Arrridj, Algeria. *Biodiversitas J. of Biological Diversity*, 20(8): 2329–2339. <https://doi.org/10.13057/biodiv/d200831>
11. Das P., Joshi S., Rout J., Upreti D.K. **2013.** Lichen diversity for environmental stress study: Application of index of atmospheric purity (IAP) and mapping around a paper mill in Barak Valley, Assam, northeast India. *Tropical Ecology*, 54(3): 355–364.
12. Foucard T. **2001.** *Svenska skorplavar och svampar som växer på dem*. Stockholm: Stenströms bokförlag Interpubl., 392 p.

13. Herzig R., Schindler C., Urech M., Rihm B., Lötscher H., Thomann G. **2020**. Recalibration and validation of the Swiss lichen bioindication methods for air quality assessment. *Environmental Science and Pollution Research*, 27(23): 28811–28812. doi:10.1007/s11356-020-09732-x
14. Kaganov V.V., Kordukov A.V., Ezhkin A.K. **2019**. Monitoring of recreational areas of Yuzhno-Sakhalinsk and its surroundings. *IOP Conf. Series: Earth and Environmental Science*, 324(2019): 012034. doi:10.1088/1755-1315/324/1/012034
15. LeBlanc F., De Sloover J. **1970**. Relation between industrialization and the distribution and growth of epiphytic lichens and mosses in Montreal. *Canadian J. of Botany*, 48: 1485–1496. <https://doi.org/10.1139/b70-224>
16. Pielou E.C. **1966**. Shannon's formula as a measure of species diversity: its use and misuse. *The American Naturalist*, 100: 463–465. <https://doi.org/10.1086/282439>
17. Pielou E.C. **1975**. *Ecological diversity*. New York: John Wiley & Sons, 165 p.
18. Shannon C.E., Weaver W.W. **1963**. *The mathematical theory of communications*. Urbana: University of Illinois Press, 117 p.
19. Tanona M., Czarnota P. **2020**. Index of Atmospheric Purity reflects the ecological conditions better than the environmental pollution in the Carpathian forests. *J. of Mountain Science*, 17(11). <https://doi.org/10.1007/s11629-020-6266-1>
20. Ward J.H. **1963**. Hierarchical grouping to optimize an objective function. *J. of the American Statistical Association*, 58: 236–244. <https://doi.org/10.2307/2282967>