MODERN CONDITION OF THE LICHEN FLORA FROM PRYKHANKAYSKAYA VALLEY AS INDICATOR OF ANTHROPOGENIC TRANSFORMATION OF THE LANDSCAPES

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The aim of this investigation is the estimation of modern condition of Prykhankayskaya valley landscapes using lichenological and lichen indication methods.


Kunashi
Hokkaido
Sapporo
Russia
SEA of JAPAN
China
Khanka Lake
PDRK

Prykhankayskaya valley covers territory around Khanka Lake which is the greatest freshwater lake of Far East.

The valley is surrounded with foothills of Sikhote-Alin and Vostochno-Manchjurskie mountains.

Deciduous forests composed of Querqus mongolica prevail in foothills.

Meadows prevail around Khanka Lake

Material and methods

- The investigations of lichens from this territory in 2004.
- The studying was conducted using standard methods taking into account geographical conditions.
- For each lichen species life condition, percentage covering were estimated, also coefficient of occurrence (R) was calculated

  R = a 100/N,

  where R – coefficient of occurrence, a – number of sites where the species was found, N – total number of studied sites.
- We have made 22 control sites, 50 descriptions and have collected 700 lichen samples.

the main studied sites

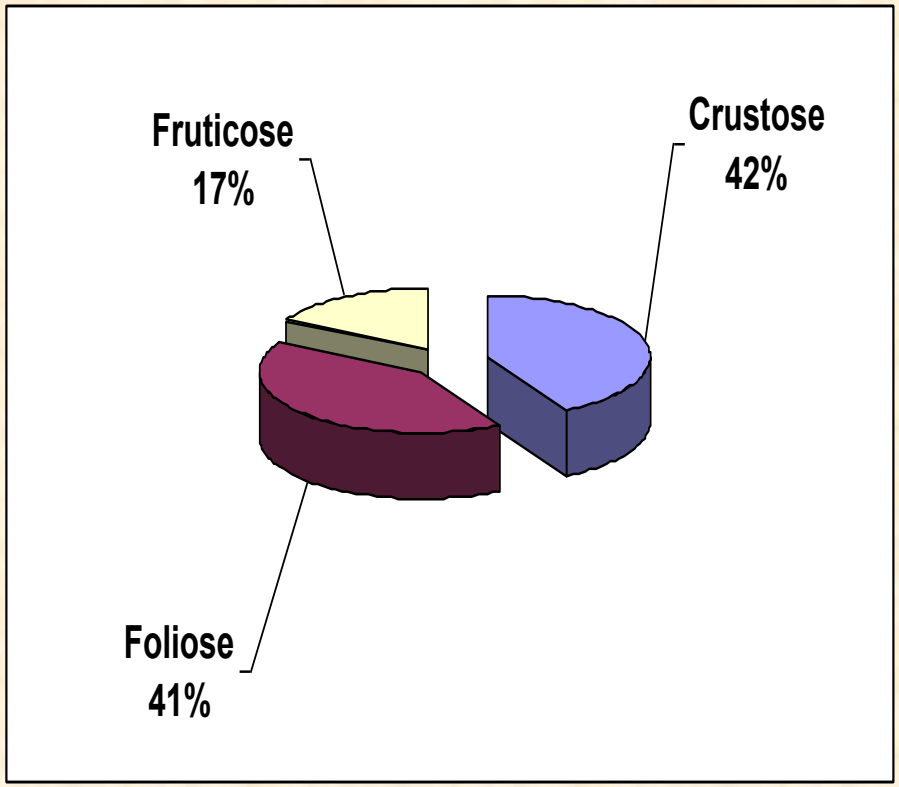
The leading families of the lichen flora from Prykhankayskaya valley

Family	Number of Genera	Number of Species	% total number of species
Physciaceae	9	43	20,2
Parmeliaceae	13	29	13
Cladoniaceae	1	28	12,6
Lecanoraceae	3	18	8,1
Teloschistacea	3	16	7,2
Pertusariaceae	2	15	6,8
Collemataceae	2	11	5
Peltigeraceae	1	9	4
Ramalinaceae	1	7	3,2
Verrucariaceae	2	6	2,7
Total:	37	182	82,8

The composition of the leading families of Prykhankayskaya valley lichenflora includes families which are typical for Temperate Holarctica.

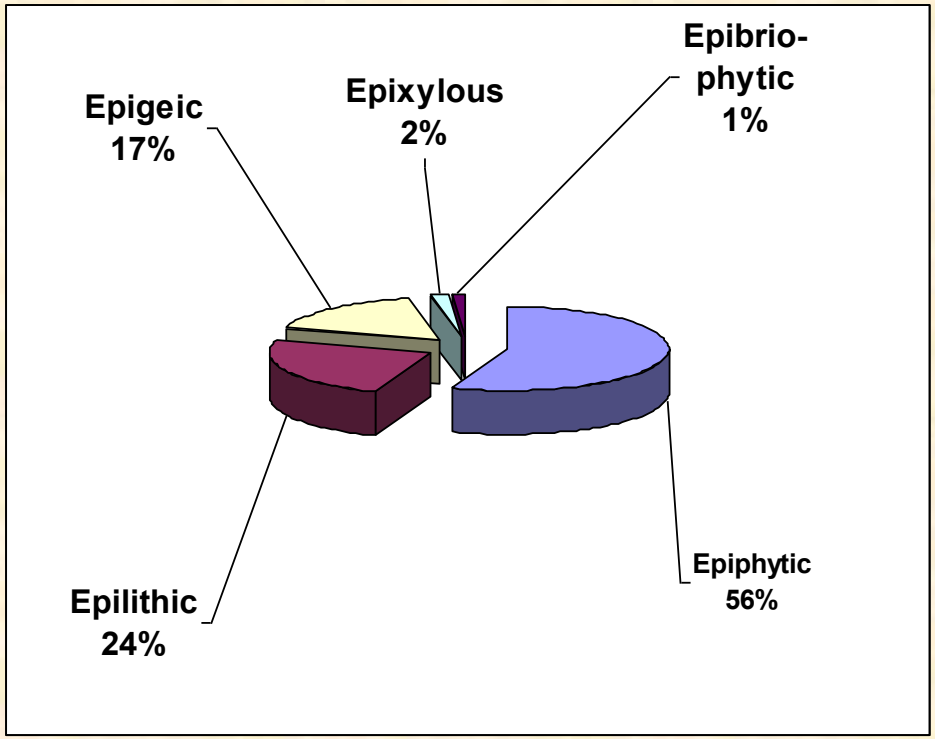
Considerable proportion of the nemoral species in the families *Lecanoraceae, Parmeliaceae*, *Pertusariaceae, Physciaceae* reflects nemoral patterns of the lichenflora, but the presence of the families *Cladoniaceae*, *Lecanoraceae*, *Parmeliaceae*, *Peltigeraceae, Physciaceae* emphasizes boreal patterns of the lichenflora. Also here mountain patterns are reflected by families *Acarosporaceae, Hymeneliaceae, Porpidiaceae, Rhizocarpaceae, Stereocaulaceae.* Characteristic property of the lichenflora from Prykhankayskaya valley is considerable part of the families *Ramalinaceae, Teloschistaceae* и *Collemataceae,* which is evidence of some common features of the studied lichenflora with Mediterranean lichenflora. East-Asiatic features are reflected by presence of the families *Pertusariaceae* and *Lobariaceae*.

Biomorphological structure of lichens



- Crustose lichens prevail in continental, arid, arctic and alpine zones.
- Foliose lichens predominate in humid warm and tropical areas.
- Fruticose lichens are considerable part in Northern mesophilous landscapes.

Substrate groups of the lichens



Substrate is the important factor for the lichens distribution. The more various substrate conditions, the richer lichenflora.

Epiphytic lichens grow on the tree trunks.

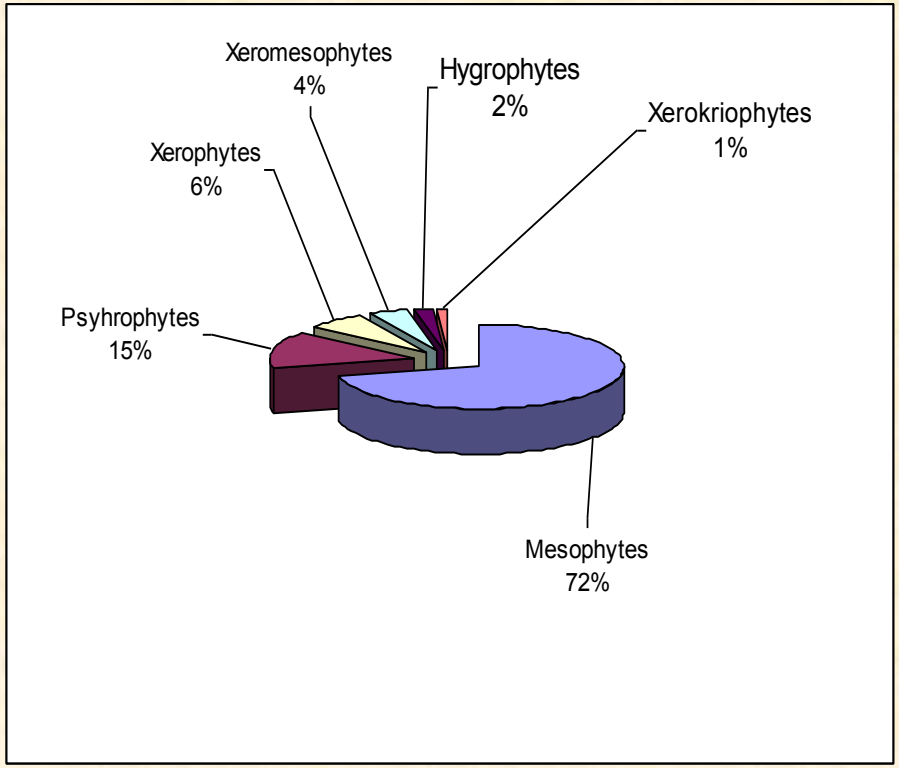
Epilithic lichens grow on rocks.

Epigeic Lichens grow on the ground.

Epixylous lichens grow on the wood.

Epibriophytic lichens grow on mosses.

Climatological lichen structure



Climatological lichen structure is the indicator of modern climatic conditions.

Among lichens from Prykhankayskaya valley mesophytes are the most part (72%), lichens of dry ecotopes are 11%, this ratio reflects location studied area in monsoon zone.

The most widespread lichen species

Very rare lichen species

Pseudocyphellaria crocata

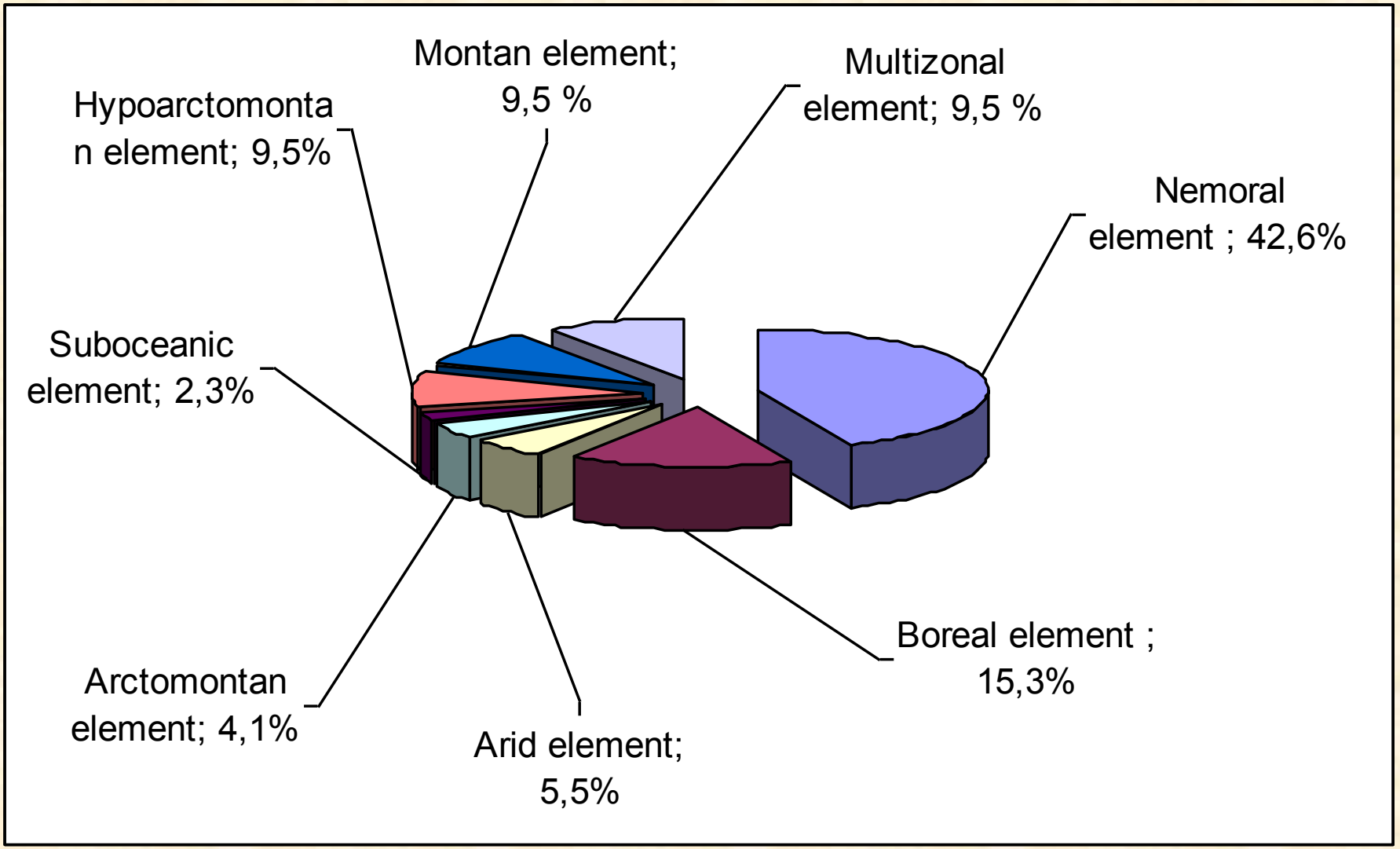
Evernia mesomorpha

Usnea longissima

- The most species richness was recorded in oak forests (154 species) and deciduous forests (109 species). Typical lichens from the such forests are tolerant species: *Candelaria concolor, Phaeophyscia hirtuosa, Physconia kurokawae, Lecanora allophana, Myelochroa aurulenta*.
- Specific species of willow and ash-tree forests are *Oxneria alfredi, Xanthoria parietina.*
- Originality of coniferous-deciduous forests lichenflora (114 species) is reflected by increasing of occurrence and high percentage covering of fruticose and foliose lichens from genera *Hypogymnia, Ramalina, Usnea.* In coniferous-deciduous forests epixylous and epibriophytic lichens were found more often than in others forest types.
- In shrubby vegetation type and on meadows Lichens are lacking or only few species were found. In that habitat types lichen from genera *Cladonia* and very rare from genera *Peltigera* were found.

Comparative analysis of geographic relations of modern lichen floras is the reliable basis to clarify flora origin and flora evolution. The lichen species from Prykhankayskaya valley were distributed among 8 geographical elements and 7 areal types.

Geographical structure of the lichen flora



The richness and diversity of lichen flora of Prykhankayskaya valley are emphasized by endemic, relics and rare species.

- 7 lichen species were found here which are in Red book of Russia* and Red book of Prymorsky kray** – *Coccocarpia palmicola**, *Lobaria isidiosa** **, *Parmelina quercina** **, *Punctelia rudecta***, *Rimelia cetrata** **, *R. reticulate***, *Pyxine sorediata**.
- One lichen species is endemic – *Pyxine sibirica*.
- Relics of different ages are *Coccocarpia palmicola*, *Leptogium hildenbrandii, Lobaria retigera, Parmelina quercina*, *Phaeophyscia hirtuosa, Punctelia rudecta*.

Epiphytic lichens are used to estimate modern state of ecosystems because they are the very sensitive component, which responds to any changes of ecological balance.

In the studied area ecological balance is disturbed by anthropogenic influence both local (annual fires, forest chopping, ploughing of the fields and fertilizing soil, influence of motor transport) and regional levels (transboundary transportation of contaminants).

The basic anthropogenic factor in Prykhankayskaya valley is annual fires. Fire influence has effect on lichens almost everywhere. Background sites with high species diversity (73 lichen species) and high percentage covering (75-100%) are uncommon and located in Chernigovsky, Spasskiy, Khankayskiy and Pogranichniy districts.

Site where fires are often

Background sites

At the sites where fires are often, from 1 to 30 lichen species were found, percentage covering are 5-70%. At the tree trunk bottom lichens are lacking or very oppressed. The oppression becomes apparent as thallus depigmentation, destruction of upper cortex and hymenium. But sometimes healthy lichens occur. Such state of lichen flora may be explained by different sensitivity of lichen species to anthropogenic influence. Stronger anthropogenic influence was found at the sites which locate in vicinity of settlements in Chernigovskiy, Kirovskiy and Spasskiy districts.

At Prykhankayskaya valley under fire influence tolerant for this factor lichens appear instead of more sensitive ones. For example, at oak forests parmeliod lichens *Parmelia saxatilis* and *Parmotrema chinense,* are changed by physcioid lichens *Phaeophyscia melanchra, P. rubropulchra, P. hirtuosa, Physconia detersa*. At the most of studied sites nitrophilous lichens *Candelaria concolor, Xanthoria parietina* were found. These lichens are indicators of high content of nitrogen compounds in the air. These species are characterized by conspicuous percentage covering at the studied area (30-40 %).

CONCLUSION

- The lichen flora of Prykhankayskaya valley may be characterized as nemoral enriched by species of boreal, arctomontan, hypoarctomontan and montan also as arid and subocaenic geographical elements. It reflects relief, climatic and vegetation conditions of the area.
- Lichen indication investigations allow to made qualitative estimation of modern ecosystem conditions. As the result we indicate considerable anthropogenic influence. In the studied area we observe both short-term strong anthropogenic influence which leads to destruction of lichens and long-term anthropogenic influence that leads to depression of the lichens. As the result it leads to changes of lichen species composition, decreasing of lichen biodiversity in changed landscapes and changes taxonomic structure of region lichenflora.

Thank you for your attention!