

The Far North: Plant Biodiversity and Ecology of Yakutia

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The Far North: Plant Biodiversity and Ecology of Yakutia

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Problems of the Cryolithozone

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Afterword

Instead of summarizing and concluding the information given in this book, we would like to emphasize on another topic: plans for the future and basic issues requiring further investigations. In other words, what to do next?

There are many interesting themes and issues that are waiting for specialists. The flora of Yakutia is still subject of study, especially the territories of South and South-East Yakutia bordering on the mountainous systems of South Siberia and the Far East. The recent 30 years of investigation have yielded over 400 species of higher vascular plants being first recorded in Yakutia, including its interior regions. And such hard-to-reach places as highlands, especially in the North-East, represent the real botanical “Klondike”; however, it would not be so easy to find a floristic “nugget”. This refers both to higher vascular plants and other plant groups.

Despite the low biological diversity (less than 2000 species of higher vascular plants), various territories are characterized by large numbers of endemic species. This is especially true for the north-eastern regions and some ranges in the North. The number of endemic and rare species of Yakutia is probably much higher than presently recorded.

The vegetation of Yakutia features the following interesting phenomena and issues:

- Xerophytization of the vegetation of Central Yakutia. There are still many places in the region to be explored by florists and geobotanists;
- The phytocoenoses of Yakutia are characterized by rather low α - and β -diversities. The reasons for this seem to be clear. However, the level of knowledge is not even throughout the territory of Yakutia due to varying approaches of community description.
- There are unique ecosystems in Yakutia that are more characteristic for more southern latitudes (steppe, tundra-steppe, etc.)
- There are patches of dark coniferous forests in the South, their elements penetrating northwards;
- North-West Yakutia features a specific interrelation between relief and vegetation, particularly where at low altitudes the flat territory is covered by alpine tundra communities;

- The interrelation between the tundra and valley species complexes in the river valley communities in South–East and South Yakutia is intriguing where arctic alpine and alpine species grow at all levels of the floodplain;
- In the Verkhoyansk Range, the link-up of the zonal forest and tundra vegetation at high altitudes needs careful research, when joint boundaries are obliterated.
- The gradual transition between the *Larix* forests and woodlands and *Pinus pumila* shrubberies in the highlands of North-East and South Yakutia is striking and a vegetation continuum is clearly seen. The syntaxonomical delineation of the continuum is of great interest.
- The largest botanical-geographical barrier in North-East Yakutia, the Verkhoyansk Range and other mountainous systems of North-East Russia as a whole, still warrants careful botanical and ecological investigation.

The typology of following vegetation is least studied in Yakutia:

- Bogs;
- Riparian and aquatic vegetation;
- Maritime vegetation;
- Psammophytic vegetation;
- Petrophytic vegetation including that of the slopes of mountain rivers;
- Alpine vegetation.

Other vegetation types are also waiting for more detailed investigation, since the size of Yakutia is very large and provides florists and geobotanists with work for a further hundreds of years.

We hope that foreign specialists, having become interested in the objects and ideas described in this book, will join us to study the Yakutian flora and vegetation in collaboration. For joint projects, please apply to any author:

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Introduction

The flora and vegetation of the Soviet Union have always attracted experts in botany from Western Europe and other countries. Up to the early twentieth century foreign explorers had a better opportunity to study the vegetation of the Russian Empire. After the Great October Socialist Revolution ideological obstacles hampered the development of scientific contacts and joint expeditions for several decades. Presently the situation has finally changed. Important international projects are implemented aiming to study the flora and vegetation of the former USSR countries: Kazakhstan, the Caucasus, Russian territories in the Altai, northern Russia, the Far East, etc. The study of the Yakutian flora and vegetation with international participation has a rather occasional character. However, such episodic cases pave the way for further comprehensive investigations to be conducted in collaboration with foreign colleagues.

Most botanical works on Yakutia have been published in Russia and in Russian. This significantly hampers the distribution of unique and interesting information abroad. And this is a common situation for many Russian regions. The authors of this monograph made an attempt to solve this problem in part.

Yakutia, with an area of over 3 million km², not only covers one fifth of all Russia. It also features peculiar vegetation growing on perennially frozen grounds, the so-called permafrost or cryolithozone that thaws only several metres deep and allows for a short growing season. How can plants survive under such extreme conditions? What are the adaptation mechanisms that allow them to withstand the cold winters with the lowest temperatures reaching sometimes minus 70°C? How can they successfully grow and propagate during the very short growing season under unfavourable hydrothermal conditions (up to + 30°C in July and 200 mm of annual precipitation)? These are the questions that every botanist would like to have the answers on.

Yakutia contains the vegetation of several natural zones, from the arctic deserts to the middle taiga with the elements of the southern taiga. Biodiversity, biogeography, ecology of flora and vegetation, these are the topics that are interesting to florists and plant sociologists, plant ecologists and ecophysiologicalists, as well as to other specialists in botany. We expect that this book will be able to fill a gap for foreign specialists on these important issues of nature investigation.

It may appear that the study of less than 2,000 higher vascular plant species and a description of their communities are not worth the trouble. However, after more than a century of investigations, the Yakutian vegetation is generally still an unexplored object, which gradually discloses its mysteries to persistent botanical explorers.

A reader who opens this book should realize that he holds in his hands the first generalization on the flora and vegetation of Yakutia based on long-term investigations by botanists mainly from the joint educational-research laboratory of floristics and phytocoenology of the Faculty of biology and geography (Ammosov Yakut State University) and the Institute for biological problems of the cryolithozone (Siberian Branch of the Russian Academy of Sciences). Most authors of the monograph have had an opportunity to explore various corners of this tremendous region lying in the core of the cryolithozone. They covered hundreds of kilometres by various means of transport: cars, helicopters, air planes, off-highway vehicles, and even on horseback, appreciating every rare opportunity to reach remote places. Many authors were the first to set foot in such lands reigned by wild animals and plants. And it is good that most of the territory of Yakutia still is wild nature.

There is no similar book in a Russian edition. It directly has come out in English, and it is very surprising and exciting that we could make it.

As will be clear from the contents of the book, the flora and vegetation of Yakutia are studied unevenly. This is explained by the history of interest in a certain object, and the presence of persons who initiated and developed research work on those objects.

The flora of Yakutia has been the object of study of many scientists. In the beginning of the twentieth century the Yakutian flora was described by academician V.L. Komarov. However, its structure and principles of spatial organization were revealed in the middle of the twentieth century by Mikhail Nikolaevich Karavaev. He worked at the Yakut State University for a certain period, though most of his life he headed the Herbarium of the M.V. Lomonosov Moscow State University.

Most of Yakutia is covered by forest. The study of forest communities has always been a constituent part of the research activity of the Institute for Biological Problems of the Cryolithozone, Siberian Branch of the Russian Academy of Sciences, as well as of the Yakut State University. Igor Petrovich Scherbakov has long headed the forest school of Yakutia. He initiated the investigation of forests on frozen grounds, which was continued by his followers.

The specialist in meadows, plant ecologist, botanist-geographer Konon Evseyevich Kononov was the founder of the Group of phytosociology at the Faculty of Biology and Geography (Yakut State University). The aim of the Group was to study the syntaxonomy and map the herbaceous vegetation. The main achievements of K. Kononov's research activities were to reveal the main principles of the meadow and steppe vegetation structure and the classification of herb vegetation using the Braun-Blanquet approach. He and his followers and colleagues were the first who familiarized the foreign specialists with the main syntaxa of the Yakutian meadow and steppe vegetation.

The famous geobotanist Valdimir Nikolaevich Andreyev came to Yakutia from Leningrad at a mature age. He studied the tundra communities and trained his followers who still study the flora and vegetation of Yakutia nowadays. His ideas on the principles of the distribution of the tundra vegetation, on the biology and ecology of tundra plants, have determined the general lines of investigation of the tundra flora and vegetation for many years. His organizational abilities and status as a leading botanist of Yakutia have allowed the publication of a number of summarizing works on the flora and vegetation of Yakutia.

We authors would never write this monograph without the works of their predecessors in the twentieth century. The list of those specialists is not limited to the abovementioned recognized leaders of Yakutian botany. Most of our elder colleagues are already no longer with us. However, they brought us up as specialists, and passed on their knowledge, experience and persistency in overcoming obstacles to study the flora and vegetation of Yakutia. We authors express their gratitude and dedicate this book to our teachers.

We authors also acknowledge everyone who took part in the preparation of the monograph, appreciate the patience of the scientific editor and management of the Publishing House. Without all this, the book would never have been published.

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