

TRANSLATOR'S NOTES

Thirty years have passed since this book was published in Russian; yet it remains the only reliable source of data and manual for those who want to know the willows of Russia and adjacent countries. Books like this should be available to readers worldwide.

English-speaking readers of this book have to keep in mind the following details concerning names and notions.

Before 1917, major administrative units within the territory of Russia were called governments. During the Soviet and Post-Soviet time, governments were and are now named *oblast's* (*oblast* means *area*). Some of the larger ones are called *kray's*. *Kray* sufficiently corresponds to *province*, hence *kray's* will be called *provinces* here.

Oblast's and provinces are divided into smaller entities called *rayon's*, which may well correspond to *districts*. Each province, oblast, and district has its central city or town.

Names of provinces, oblast's, and districts are adjectives derived from names of their capitals: *Tambovskaya Oblast* is a derivative from *Tambov*, *Krasnoyarskiy Province* from *Krasnoyarsk*, *Krasnoyarskiy District* from *Krasnyy Yar*. In English, flexions are optional, so that one may say either *Moscow Oblast* or *Moskovskaya Oblast*, *Tver Oblast* or *Tverskaya Oblast*, and so on.

Since the time this book was published in Russian, the political map has changed tremendously. Entire countries have disappeared (like the USSR or East Germany), or emerged (like Ukraine or Czech Republic), or changed their names (like Belarus, formerly Byelorussia). Many cities restored their original names after the collapse of the Soviet regime: St. Petersburg, Nizhniy Novgorod, Samara, Tver, Bishkek, and others. Some of the states that became independent denied russified spellings of their cities' names: Tallinn in Estonia, Ashgabat in Turkmenia, and many others. In the translation, I used different approaches when dealing with this problem. One can find references to "old" and "new" names. Some of traditional Russian spellings (like Ashkhabad) are retained, as they are still used in Russia, others are abandoned (Beijing is used instead of Peking). One particularly curious situation is to be mentioned here in order to avoid confusion: when the authorities in Leningrad made their decision about restoration of the original name, those ruling the oblast did not oblige. Therefore, Leningradskaya Oblast still retains its name of the Soviet period, while its center is called St. Petersburg.

To facilitate a better orientation of the reader, an index of geographical names with brief explanations has been added as a supplement.

Some traditional expressions of the Russian physical geography are unfamiliar to English-speaking readers. For example, there exists a commonly used term for the temperate climate territory within the European part of Russia. In Russian, it sounds like *srednyaya polosa* (which literally means *the Middle Stripe*). Here, we will call it *the European temperate belt*. Another expression describes the territory of European Russia north of the fertile chernozem soil area: *the non-chernozem belt* (versus *chernozem belt*).

There is some confusion in understanding the name *Central Asia*. In Russia and the USSR, traditionally, Central (*Tsentralnaya*) Asia was understood as the territory of the Tibet and Mongolian Plateau, while the term *Middle* (*Srednyaya*) *Asia* was retained for the southern states, formerly republics of the USSR, now independent: Kirghizia (Kyrgyzstan), Uzbekistan,

Tadjikistan, Turkmenia (Turkmenistan), and a part of Kazakhstan. In the English-speaking countries, the situation is different. Webster's Geographical Dictionary formerly advised to use the name *Soviet Central Asia* for what was *Middle Asia* in Russian. This convenient option is obviously not available any more. In the Oxford Atlas of the World (1997), the territory of the former southern Asiatic republics of the USSR is called merely *Central Asia*, which may bring about some confusion. In this translation, we will stick to the term *Middle Asia*. It sounds somewhat outdated (the name *Middle Europe* was also abandoned for *Central Europe*), yet it helps to discriminate between two different territories, though the "real" Central Asia is mentioned in the book just some few times.

In Russia, a trivial way to name territories close to prominent objects is to derive their names from names of these landmarks with the help of prefixes *cis-* or *pre-* (*pri-*) or *trans-* (*za-*). That has some correspondence in English, but not fully. Common examples of translated names are *Transcaucasia* (*Zakavkazye*), *Transbaykalia* (*Zabaykalye*), and *Transcarpathia* (*Zakarpatye*). *Ciscaucasia* does not sound that perfect, although it is acceptable (I preferred *the Northern Caucasus* as a synonym). In Russian, there exist more names of that kind, which are unfamiliar to English readers. I tried to translate them using this uniform approach: and hope that *Prepolar Urals*, *Pre-Uralia*, *Trans-Uralia*, *Prebalkhashia*, *Trans-Onega Region*, and other *pre-* and *trans-* names will find their way when introduced to English.

Physical geographers of Asiatic Russia recognize a peculiar vertical zone of scanty alpine vegetation that develops in the severe conditions of East and Northeast Asia, *goltsy* (pl.), which may be translated as *barren heights*. Every particular mountain that is topped by vegetation of that kind is as well called *golets* (sing.). The territories below the barren heights are distinguished as yet another vertical zone, the name for which may be expressed as *subgoltsy*. However, this sounds awkward, and I used a descriptive expression *around barren heights* instead.

Wetlands is the term used to express the general meaning of the Russian *bolota*, except the cases when it was possible to distinguish bogs, fens, swamps, and other types from the context.

Some proper names (last names as well as geographical ones) have two spellings in this book: in English and Latin, such as *Görz* (*Goerz*), *Nazarov* (*Nasarov*), *Shlyakov* (*Shljakov*), *Polyakov* (*Poljakov*). Some, like *Lakschewitz*, have the latinized version only, the way they are known in the literature.

There is a number of local geographical terms that hardly have any analogs in other languages. These are retained and italicized in the text unless they constitute parts of geographical names, like "Bor" or "Kryazh". One can find their explanations on the following list.

LIST OF RETAINED LOCAL TERMS¹

Bor — Russian, a dry pine forest (e. g., Buzulukskiy Bor).

Golets (sing.), *goltsy* (pl.) — Russian, a barren height; in Siberia, a mountain that is higher than the upper forest limit, covered with the alpine tundra vegetation or without vegetation (e. g., Arshan Golets).

¹ The explanations of these terms are translated and adapted from a Russian geographical reference book (F. Milkov, 1970. A reference book on physical geography. *Mysl* Publishers, Moscow.)

- Kolok* (sing.), *kolki* (pl.) — a small grove, mixed-wood, or aspen (on the Russian Plain), or birch (in West Siberia), within the forest-steppe belt.
- Kryazh* — a chain of hills, usually, a remnant of eroded uplands (e. g., Yeniseiskiy Kryazh).
- Layda* — Finnish, a meadow on the Arctic Ocean Coast occupying a slanting shore that is flooded during high tides.
- Loshchina* — Russian, an ancient linear erosional depression with high, steep slopes that has surface runoff.
- Lozhbina* — Russian, an ancient linear erosional depression with slanting slopes that has surface runoff.
- Oblast* — Russian, territorial and administrative unit with a central city (its name constitutes an adjective derived from the name of the city); districts (*rayon*'s) are subordinate entities with smaller cities and towns as centers.
- Pad* — in Siberia and the Far East, a deep valley or shallow depression, often forested, usually having a stream on its bottom (e. g., Kedrovaya Pad Preserve).
- Plavni* (always pl.) — in southern Russia and neighboring territories, parts of flood plains of large rivers that are flooded during most of the year and develop a dense cover of *Phragmites*, *Scirpus*, *Typha*, *Carex*, and other water-loving plants.
- Sai* (pl.) — in Kazakhstan and Middle Asia, gullies, ravines, or dry beds of seasonal streams.
- Saz* (sing.), *sazy* (pl.) — in Middle Asia, a paludal, often saline meadow in the mountains. *Sazy* are very typical for the *syrt*'s in the Central Tien Shan as well as Pamirs.
- Solonchak* — a kind of saline soil in the desert or semi-desert belt, rarely in the steppes; a territory having the soil of that kind.
- Sopka* — 1. in Transbaykalia and the Far East, a round-topped hill or mountain.
2. on the Kamchatka Pen., a volcano (e. g., Klyuchevskaya Sopka).
- Stolby* (always pl.) — in Siberia and the Urals, distinct rocks of peculiar shapes formed as a result of the erosional process (e. g., Stolby near Krasnoyarsk).
- Syrt* — in Kazakhstan and Kirghizia, an elevated plain area: watershed plateau or uplands. *Syrt*'s may vary as regards their elevation from about 300 m (the watershed area between the Volga and Ural rivers) to high elevations (in the Tien Shan).
- Tugai* (pl.) — forested territories in flood plains or valleys of large rivers in Middle and Central Asia; the forests mostly composed of poplars, willows, and tamarisks.
- Yernik* — in Siberia and the Far East, a dwarf birch shrubland (sometimes together with low or creeping willows) in the tundra belt, or on bogs in the forest belt, or on barren heights.
- Zapadina* — Russian, a shallow depression of a round shape with enclosed drainage on a flat drainage divide in the steppe or forest-steppe belt.

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FOREWORD TO THE ENGLISH EDITION

I could never have foreseen the possibility of publishing my book on *Salix* in English. The idea belongs to my younger friend, Alexei G. Zinovjev. Only thanks to his energy in solving all problems connected with the translation, editing, and publication, this book is coming into existence. Unfortunately, being densely occupied by other responsibilities, I have not been able to undertake any substantial revision or updating. All new species and nomenclature combinations mentioned in this translation were proposed in the original publication of 1968. (The pagination of the original publication is shown in the margins for easy references.) Citation of the literature remains the way it was back in 1968. Only a few purely technical faults detected in the original edition have been corrected. And, to meet the new political realities, relevant changes had to be introduced into paragraphs treating the geographic distribution of species. As a kind of partial substitute for updating, I am supplying here the following enumerations: new *Salix* species described since 1966 from the geographic area treated in my book; my own publications on *Salix* since 1967; and the most important publications by other authors.

My cordial thanks are due to Alexei G. Zinovjev for his indefatigable pushing of everyone's efforts (including my own as well); to Irina N. Kadis for her interested and careful translation; to the Arnold Arboretum of Harvard University for the financial support of the preparation of the book; to the Department of Biology at the University of Joensuu for granting the use of their facilities and promotion of the publication; to Jorma Tahvanainen and Heikki Roininen for all their help and inspiration during the editing and publishing process; and, of course, to my old good friend, George W. Argus, who has taken up the tedious task of the scientific recension of the manuscript.

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A. Skvortsov

*To my parents
with infinite gratitude*

FOREWORD

The genus *Salix* is one of the largest in the flora of the USSR and the largest one in the dendroflora. In the majority of the USSR regions, willows play an important role in the vegetation structure and are commonly utilized for a variety of purposes. In well-watered habitats, particularly, river valleys, banks of streams, and lake shores, willows are nearly always among dominating plants. In the forest belt, they are as well found in other habitats. In the vegetation cover of the forest-tundra and tundra, their role is especially prominent. Among our arborescent species, willows are the ones reaching the highest latitudes in the north. Only dwarf birches and some heather species can compete with them. In the subalpine and alpine zones of many mountain systems, willows are nearly as important as in the arctic regions: in the mountains, as well, very few arborescent plants can ascend as high as willows do.

In the economics, the willows are used in many different ways. They are a source of cheap wood, the main or even the only one in many regions. They are indispensable for stabilization of soil on slopes and banks and fixing of sand. As ornamental plants, weeping and white willows along with red osiers are most popular; however, the assortment of ornamental willows may be further enriched. Willows are also excellent forage plants: their foliage and young shoots are favorites of sheep, goats, cattle, and reindeer. The ability of willows to bloom very early in spring makes them particularly valuable as nectariferous plants. They are as well utilized as a source of various chemical compounds, such as tannin or salicin. They provide excellent material for wickerwork and shaft bows: baskets, furniture, yurt frames, and vine stalks are made of willows. Naturally, different species are more or less suitable for different purposes.

In spite of wide distribution and various applications, the willows are still insufficiently known as regards their systematics. Poor knowledge of the willow systematics constitutes a problem when regional vegetation is being described in detail. It is also an obstacle for appropriate utilization of willow species. Confusion in the systematics of the genus *Salix* affects general botanical research in such areas as, for example, segregating of botanical districts or study of development of cryo- and mesophilic floras.

The genus *Salix* has been long considered to be a difficult one for the systematics. "Species of this genus are extremely difficult to clarify" (Linnaeus)¹. "In temperate and cold regions, countless willows are strikingly, luxuriously inconstant in their habits, which is a matter of trouble and confusion for botanists" (Endlicher)². "The genus is notorious for the variation that occurs

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¹ "Species huius generis difficillime extricantur" (Linné 1753: 1022).

² "In temperatis et frigidiusculis hemisphaerae borealis utrinque continentis innumerae Salices mira formarum inconstantia luxuriant, botanicorum crux et scandalum" (Endlicher 1841: 178).

within species, and for poor definition of morphological boundaries between many of the commonly recognized species" (Raup 1959: 7).

The major causes of that "notoriousness" of the genus are considerable genotypical polymorphism of species and a large range of specimens' variability together with intricate differences between some species (see chapter 3, section 4). Two more circumstances complicate the whole picture. The first one is sex differentiation of plants and different time of development for flowers and leaves, which prevents the observer from seeing all relevant characters on a single plant. The second complication is comparatively high frequency of natural interspecific hybrids.

Among numerous Russian researchers who studied the willows, the most prominent were R. Trautvetter, E. Wolf, P. Lakschewitz, and M. Nazarov. Works of a number of West European and Japanese researchers were as well of great importance. M. Nazarov summarized knowledge and notions acquired by 1935–36 in his review of the genus *Salix* compiled for the "Flora of the USSR" (volume 5, 1936). Authors of nearly all of subsequent "floras" and other publications on the systematics of the willows used that work by M. Nazarov as a framework, either following his treatment completely or making only some insignificant changes (mostly describing new species). However, the review of the genus *Salix* in the "Flora of the USSR", though being very important and significant, was nothing more than a compilation which lacked critical revision of the material available by 1935–36. A critical approach would have made it possible to treat many facts in a very different way even at that time. More than thirty years passed since M. Nazarov finished his work. These were the years of intensive investigation of the flora of this country. Bulky new collections are now mostly concentrated in newly-developed botanical research institutions. New herbarium collections from Asiatic Arctic and the extreme Northeast as well as those from Yakutia, the Far East, and Middle Asia are particularly numerous. The USSR territory has become larger. The concept of the species and understanding of species criteria have developed considerably. Finally, abundant new literature sources have appeared, which need critical evaluation and comparison. Suffice it to say that new willow species that have been described since 1936 count 48.

These circumstances obviously reveal the necessity of a new critical treatment of the willows of the USSR.

The author started his research in 1949–51 with a study of the willows in the temperate belt of the European Russia during the wintertime. The study demonstrated that some morphological characteristics of the willow buds were very constant and of great taxonomical value. That made it possible to create a key for identification of those willows during the winter (Skvortsov 1955). In 1953, the author traveled around Alma Ata and along the Ili River. Attempts to identify specimens from Middle Asia revealed complete confusion in the taxonomy of the Middle Asiatic willows. That was the challenge that stimulated the author to start a thorough study of the willows. In 1955, the author got an opportunity to begin his regular work on the revision of the systematics of willows growing on the territory of the USSR.

Having been brought up as a biologist and systematist, the author considers the species limits to exist objectively. According to this notion, a space that a particular species occupies in nature constitutes its very important characteristic, indeed, not less important than any morphological or physiological characters of individuals belonging to that species. Therefore, the author was trying to equally divide his attention between geographical characteristics of species and their morphological characters and differences. The territory of the USSR is really huge, yet to be restricted by the USSR border means failure to provide complete geographical descriptions for

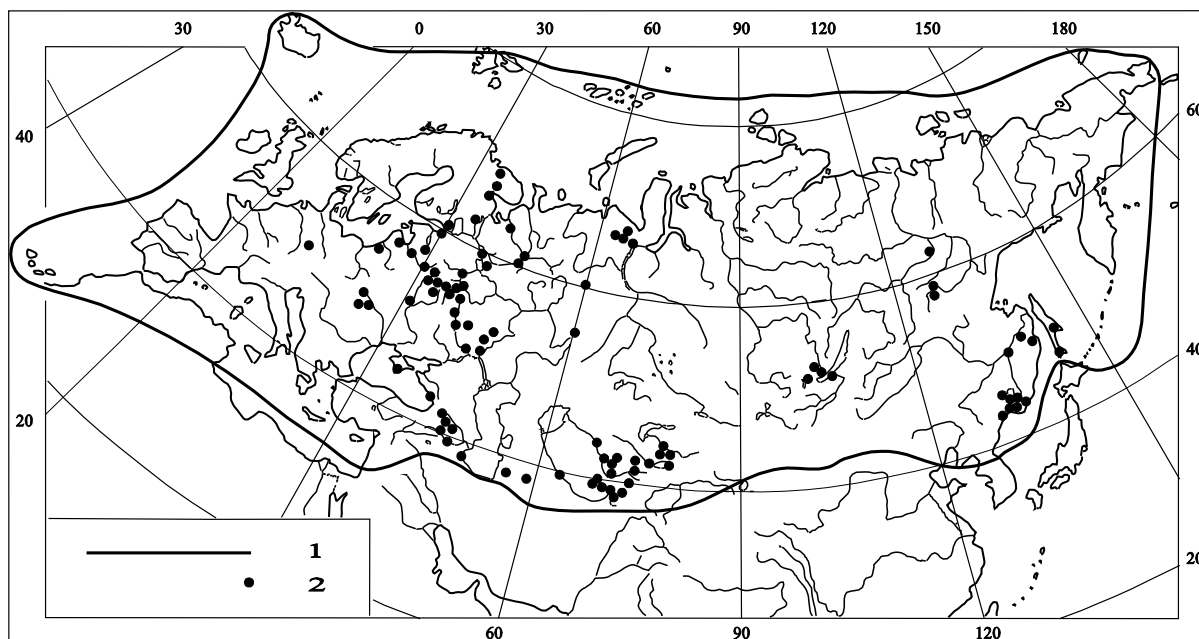


Fig. 1. Study area (1) and places of the author's own observations and collections (2)

the majority of species: their areas appear to be cut by political boundaries, and parts of areas beyond the borders remain unclarified. After a long period of hesitations, I made a decision to broaden my research in order to include a revision of the systematics of willows within floras of a number of adjacent and other closely located countries, particularly, those of Western Europe, Northern Africa, Asia Minor, and also the western part of China, Northeast China, Mongolia, and North Korea. That made it possible to present complete species ranges, at least their Old World parts. To accomplish this task, I had to include 18 European species alien to the USSR flora. See Fig. 1 for boundaries of the area under consideration.

We never know beforehand, which characters in any particular case will prove to be most important for species discrimination. Therefore, the most critical issue for the systematics of species is a possibility to study the largest possible number of characters in the largest possible number of specimens. Today, these are mostly traditional macromorphological characters that can be studied in accordance with that requirement. That is why consideration of these characters still remains the basis for the species systematics. The most effective methods are observations in nature, studies of herbarium collections, and, to a lesser extent, observations of cultivated plants. According to the literature data, the study of chromosomes is so far practically useless for the systematics of the willows; preliminary results of the research done by my colleague, M. Golysheva, appear to be similar. Therefore, I did not use the caryological method. The investigation of leaf anatomy proved to be much more fruitful.

Results of the research revealed that the real species composition of the USSR willows is very different from the one described in the literature. For example, of 203 species named in the literature for the USSR flora, 96 have proved to be synonyms and are to be eliminated from the list of distinct species. And this is not the matter of merely lumping "small" species into "large" ones. The author is by no means an advocate of "large" species-conglomerates. The matter is that the species have not been studied well enough. It is common knowledge that to "close" a species,

that is, prove its identity to another one described earlier, one has to study it much more thoroughly than to "open" it (all one has to do in order to "open" a species is to write and publish its description in Latin).

As the author proceeded with the work, some results were presented in separate publications (Skvortsov 1955–1968; Skvortsov, Golysheva 1966; Skvortsov, Derviz-Sokolova 1966). Contents of those publications is not duplicated here. Nearly all of comments and arguments regarding special problems of the taxonomy and nomenclature are omitted in this book as well as data on the leaf anatomy. However, one can find references to previously published material in appropriate places. Unfortunately, it was impossible to provide precise references to my review of the *Salicaceae* in the "Arctic Flora of the USSR", since by the time I finished working on the manuscript of this book, the review had not yet been published.

Due to restrictions regarding the volume of the book, I had to omit detailed morphological descriptions of species. Anyway, the presence of such descriptions does not appear to be critical in a publication addressed primarily to professionals. The possibility of applying the contents of the book for practical needs is provided through identification keys as well as diagnoses of sections and subsections.

On the other hand, I considered it important to include a few general chapters preceding the systematic overview. They constitute an introduction to the systematic part and, at the same time, contain essential conclusions and generalizations that may follow the systematic overview. A brief historical essay (chapter 1) may be of general interest even for taxonomists working on other groups as a certain piece of the history of the systematics.

The author hopes that this work will help to make our knowledge of the willows of the USSR and adjacent countries more consistent with modern achievements of systematics and floristics in these countries. By no means does the author feel that this work contains clues to all problems that exist in the area. Of course, a number of unsolved questions remain (see, for instance, notes to *S. saxatilis*, *S. rhamnifolia*, *S. phylicifolia*, or *S. rosmarinifolia*). New material and observations are needed to clarify them; there is no doubt that new problems will emerge with the future advance of the research.

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