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FLORISTICS AND ECOLOGY OF SOME URAL MOUNTAINS VEGETATION

The Ural Mountains are an attenuated range extending from about 52° to 68°N, over 2,000 km almost from the Caspian Sea to the Arctic Ocean. A comparable chain in North America is from southern California to southern Alaska, through the Sierra Nevada, Cascades and Coast Ranges of British Columbia. Although the highest Ural elevations are in the north (1894 m), the range does rise in the south to above timberline (to 1639 m) from the lowlands (<200 m) to east and west. The range is isolated—by almost 2,000 km of taiga from the Scandinavian mountains to the west, by over 2,000 km of steppe from the Carpathians, by 1,300 km of desert from the Caucasus to the southwest, and by over 1,000 km of steppe and desert from the mountains of Central Asia.

The flora and vegetation of the Urals have been well studied. By the end of the 19th century a notable series of Russian botanists had visited or lived in various parts of the Urals and reported on its flora and vegetation. Representative perhaps of later, more intensive Soviet work are two papers by K. N. Igoshina. In 1964, she published a long, summary paper on the vegetation of the Urals in the series *Geobotanika* (16:83-230). This had been preceded in 1952 by a detailed paper on the subalpine to alpine vegetation of the central Urals (*Geobotanika* 8:289-354). Her experience has been long, full and active, and her studies are a part of a large and significant literature. P. L. Gorchakovskiy's work is more recent and uses new concepts and data. Whereas Igoshina's first work dates from circa 1925, Gorchakovskiy's began a quarter century later. He edited (1961) the papers given at a conference in Sverdlovsk on "Questions of vegetation classification," much of it using Ural vegetation as examples and heavily weighted with scientists well acquainted with this vegetation. In 1965 he edited another volume on "Geography and dynamics of the plant cover," this time devoted exclusively to Ural vegetation. These are volumes 27 and 42 of *Trudy Inst. Biol., Ural Filial*, Akad. Nauk USSR, Sverdlovsk. In 1966 Gorchakovskiy published a 270-page monograph

on the flora and vegetation of the Ural high mountains. The book is one of the best of the international ecological literature on the circumpolar vegetation of northern hemisphere high mountains. Any ecologist interested in mountain vegetation will read Gorchakovskiy's work with profit, recognition, and appreciation. Gorchakovskiy's latest book¹ treats a limited kind of Ural Mountains vegetation but a very interesting one. Both books are well-organized, logical in argument, full of data, interestingly illustrated, including photographs. Only the latest is reviewed here.

The basic field data or documentation by means of stand surveys, e.g., for all the studies mentioned above is partly in the periodical literature. It is abundant and accessible through the references provided, e.g. in the book under review are listed 229 references, of which 20 represent pertinent work published in the Latin alphabet.

The complex western European broad-leaved deciduous forest reaches the western limits of the Soviet Union, but attenuates rapidly eastward south of the taiga. Gorchakovskiy discusses the eastern limits and the ecological relationships at those limits of *Quercus robur*, *Tilia cordata*, *Acer platanoides*, *Ulmus laevis*, *U. scabra*, *Carpinus betulus*, *Corylus avellana* and *Euonymus verrucosa* plus 29 nemoral, herbaceous plants.

The eastern limits of these species are mapped in detail at scales of about $1/5 \times 10^6$ and larger. Unfortunately the maps lack both scale and a latitude-longitude net, but river systems and cities provide orientation. Plant communities are described in terms of associated species. Ecology of individual sites and of the course of the species' limits are well-discussed. As Gorchakovskiy summarizes (p. 195), "In the central part of Europe the broad-leaved forests represent a solid, integral com-

¹ Gorchakovskiy, P. L. 1968. [Plants of the European broad-leaved forest at the eastern limits of their areas of distribution.] *Trudy Inst. Ecol. Rastenii u Zhivotnykh* vol. 59. 208 pp. Uralski Filial, Akademiia Nauk USSR, Sverdlovsk. 1 ruble, 22 kopeks.

plex of species. At their eastern distribution limit, on the contrary, this unity is upset, the ecological differences between species become more apparent, and the broad-leaved trees usually occupy different localities, separately dominate special and different communities, or form a part of other communities dominated by boreal plants."

The book is thus a very rich combination of plant chorology and ecology. Gorchakovsky shows how the herbarium method alone (p. 4) produces incomplete chorological results, and he appeals for more discriminating and generalizing taxonomy to help him in his ecological interpretations. A model ecological paper on Ural endemic and relict plants was published by Gorchakovsky in 1963 (*Materials on the History of the Flora and Vegetation of the USSR* 4:285-375).

The ecological discussion is thorough, if not instrumental. Again and again plants are said to occur at outlying stations on "limestone crags." The plants are not calcicoles, and only the openness and permanence of such extrazonal habitats seems capable of explaining the dis-

junct occurrence of these plants on them. Again, physiology seems to be an incomplete explanation for ecology.

Analogies with North American problems of floristics and ecology are interesting. We too have east-west continuities in flora and vegetation as well as great differences on either side of our central continental grassland. The boreal continuity in North America is as obvious as it is in the USSR, but we still have some continuities across the grassland besides those related to divergence from Mexico.

Gorchakovsky's book is thus a model, not a manual for us. It is a model deserving close attention, and recommendation to students that they study similar problems in similar ways.

A practical significance of Gorchakovsky's work is seen in its application to nature preservation. We do not ordinarily express this idea in such a precise way.

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