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COMPARATIVE ASSESSMENT OF FLORISTIC DIVERSITY OF THE HIGH-MOUNTAIN ECOSYSTEMS IN THE NORTHERN AND SOUTHERN URALS

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Abstract

Comparative assessment of floristic diversity of vascular plants of the high mountain areas within the framework of large regions (the Northern and Southern Urals), selected model mountain massives and separate subdivisions of altitudinal differentiation of landscapes has been carried out.

Introduction

Intensive economic use of the high mountain areas (exploitation of entrails of the earth, road construction, grazing, haymaking, felling, purveyance of plant raw material, recreation, tourism, and so on) exerts essential effect on the plant world of this territories. Under the influence of increasing anthropogenic impact, such sequences as impoverishment of local floras, disappearance of rare aboriginal species or reduction in numerosity of their populations and strengthening of the position of apophytes take place. For the elaboration of measures aimed at the conservation of the unique plant world of the high mountains which is of great value both from theoretical and practical view-points, the knowledge of general regularities in floristic diversity within different mountain regions and different altitudinal belts is necessary. The authors made an attempt of comparative assessment of floristic diversity of vascular plants of the high-mountain part of the Northern and Southern Urals within the framework of altitudinal differentiation of the landscapes (Gorchakovskiy, 1975; Gorchakovskiy, 1989). According to such approach, the belt of cold goltsy deserts, mountain-tundra belt, subgoltsy belt, and the upper part of mountain-forest belt were attributed to high mountains.

Materials and methods

Within the «Access» program, the database of the floristic diversity of vascular plants of the high-mountain ecosystems of the Northern and Southern Urals has been elaborated. The database is founded on the results of the authors' field investigations, data found in literature, and the materials from the Herbarium of the Institute of Plant and Animal Ecology of the Ural Division of the Russian Academy of Sciences. For each plant species, the following characteristics are included into database: distribution, position in the system of belts, appurtenance to one or another zonal, geographical, coenotic elements of flora, ecological group, life form. The regularities in plant species' distribution have been revealed by comparison of their presence in the regions of the I and II orders both in total and separately, exposing of similarity and difference between them. The Northern Urals as a whole (mountain massives Konzhakovskii Kamen', Denezhkin Kamen', Yalping-N'er, Chistop, Isherim, etc.) and the Southern Urals as a whole (mountain massives Iremel', Yaman-Tau, Zigal'ga, Nary, Taganai, etc.) were considered as the regions of the I order. The regions of the II order include the model mountains-masses – for the present instance, the Konzhakovskii Kamen' in the Northern Urals and the Iremel' in the Southern Urals. The species' presence within the regions of the I order have been characterized according to three subdivisions: the Northern and Southern Urals each taken separately, and the Northern and Southern Urals in total; within the regions of the II order, three subdivisions were established as well: Konzhakovskii Kamen' and the Iremel' each taken separately, and the Konzhakovskii Kamen' and the Iremel' in total. For characterization of the distribution of plant species, nine subdivisions were used: the belt of cold goltsy deserts (CGD), mountain-tundra belt (MT), subgoltsy belt (Sg), the upper part of the mountain-forest belt (MF), and a few combinations (CGD+MT, CGD+MT+Sg; MT+Sg+MF; MT+Sg; Sg+MF).

Results

Comparative assessment of floristic diversity at the level of the regions of the I order showed that a total of 637 species of vascular plants belonging to 71 families, 248 genera have been recorded within the high-mountain part of the Northern and Southern Urals. From the stated total number, 564 species occur in the Northern Urals and 405 species, in the Southern Urals. 332 species are common for the both regions of the I order; there were recorded 232 species exclusively in the Northern Urals and 72 species, in the Southern. Thus, a coefficient of floristic similarity between regions of the I and II orders equals 52%. The high-mountain flora of the Northern Urals is richer than analogous flora of the Southern Urals, and the features of its peculiarity are more pronounced. It may be explained, first of all, by the fact that the high-mountain landscapes are represented in the Northern Urals more completely and occupy larger area as well as that they are in an almost direct contacts with analogous landscapes of the Subpolar and, further, the Polar Urals. It creates favorable conditions for migration of plants and for floristic interchange. On the contrary, the high-mountain landscapes of the Southern Urals occupy a smaller area and they are isolated from their northern analogs by lowered wooded part of the Ural mountain country. The subgoltsy belt is more diverse in species composition: 455 species, and among them 182 species recorded exclusively in it; the increased floristic richness is related to the complex character of vegetation of this belt which includes the floristic elements of the adjacent belts (so called "marginal effect"). The next in floristic diversity is the mountain-tundra belt (371 species, including 111 that occur only in it) after which follows the upper part of the mountain-forest belt (144 species, including 39 that occur only in it) and, finally, the belt of cold goltsy deserts (41 species, including 1 that occurs only in it). A total number of the endemic and relict species in the regions of the I order equals 90, 45 of them occur in the Northern Urals and 13 in the Southern Urals; 32 species are common for both parts of the mountain country. Of special interest are the endemic plants attaching the features of peculiarity to the flora of the Ural high mountains (Gorchakovsky, 1969). A number of the Ural high-mountain endemics (for example, *Lagotis uralensis*, *Gypsophila uralensis*, *Anemone biarmiensis*, *Cerastium krylovii*) are widespread occurring both in the northern and southern parts of the mountain country. However, there are endemic species (for example, *Linum boreale*, *Cerastium igoschinae*) spread in the north but not found in the southern part of the mountain country. The number of endemics peculiar exclusively to high mountains of the Southern Urals (*Festuca igoschinae*, a few species of *Alchemilla*) is not great. At the same time, of a considerable interest are relicts as well. The analysis of them gives a valuable material for revealing the former connections of the Ural high mountains with landscapes of similar nature spread in the other mountain countries, and elucidates the history of formation of the flora of the Ural mountain country. Among them, in particular, there are the periglacial relicts penetrated into the Urals from high-mountain regions of Asia (*Primula pallasii*, *Phlojodicarpus villosus*, *Rhodiola quadrifida*, *Swertia obtusa*, *Alopecurus glaucus*, etc.) as well as the periglacial relicts of the mountain-European origin (*Alchemilla glabra*). Selective assessment of floristic diversity at the level of the regions of the II order gives, in general outlines, approximately the same results as in case of embracing of a vaster territory. However, for the detailed analysis, investigations within the bounds of larger regions are preferable. The data obtained may be used as a bases for disposition of a system of botanical reserves within the framework of altitudinal differentiation of the landscapes and for organization of phytomonitoring at the regional and local levels.

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