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OBJECTIVES AND LANDSCAPE-BIOGEOGRAPHIC BACKGROUND OF THE USTYANSKY NATURE PARK (ARKHANGELSK OBLAST, MIDDLE TAIGA) PART 2. BIODIVERSITY OF THE "NAUCHNY" CLUSTER OF THE USTYANSKY NATURE PARK[1]

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The «Scientific» cluster projected within the framework of the Ustyansky Nature Park in the south of Archangelsk Oblast has an important significance for study and conservation of the European middle taiga biota. The paper presents the results of the flora and fauna study in the cluster. The cluster territory is located within two middle taiga landscapes in the interfluve area of Vaga and Northern Dvina rivers; thus, two subclusters are proposed: Zayacheritsky and Kokshengsky. The first subcluster presents the biota of moraine gently sloping plain; the second one includes the valley ecosystems of large northern Kokshenga River. The paper concerns the data on protected plants and animals' species populations. Flora, theriofauna and ornithofauna, as well as peculiarities of biota spatial organization are well studied during many years of research and student training conducted by the Geography faculty of Lomonosov Moscow State University. This experience represents the basis for different environmental educational programs and for specially protected natural areas forming.

Key words: middle taiga, European part of Russia, Ustyansky Nature Park, «Scientific» cluster, flora, theriofauna, ornithofauna, rare species.

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Conclusions

1. The Scientific Cluster is distinguished by the degree of knowledge of natural conditions and primarily regional biodiversity within the framework of the Ustyansky Natural Park, which creation is planned in the watershed basin of the Vaga and Severnaya Dvina rivers. The cluster is represented by two subclusters. The subcluster Zayacheritsky is located in the valley of a small river Zayachya. This territory is characterized by moraine-erosion landscape ecosystems, various as in biogeographic aspect. The Kokshengsky subcluster is located in the middle reaches of the Kokshenga River, one of the cleanest rivers in the European part of Russia. Here the ecosystems of the large river valley are dominating. A well-developed system of segmented meadow-shrub floodplains is presented here, accompanied by bayou lakes and pine forest terraces and spruce forests over watershed area. Many years of experience in the study of the cluster biota was accumulated during field studies and summer scientific trainings of students from the Faculties of Geography of M.V. Lomonosov Moscow State University and University of British Columbia (Canada), as well as during winter route accounting.

2. The territory of the Scientific Cluster is of high scientific value both from the botanical-geographical and zoogeographic points of view.

[1] The first part of the article is available in Vol. 3, No. 2 of "Ecosystems: Ecology and Dynamics" and can be found there [http://ecosystemsdynamic.ru/wp-content/uploads/2019/06/All-Number-EED-No2-2019-P-1-250.pdf].

3. The total flora species richness is about 500 species of vascular plants. Among them, 43 rare and in need of protection were identified within the cluster area (including 7 species of ferns, 1 gymnosperms species, 35 angiosperms species: 15 monocotyledonous and 20 dicotyledonous plants). These plants are included into the «Red Data Book of the Arkhangelsk Oblast» (2008) or recommended for protection. There are some plant species located at the ranges' borders (northern, eastern and western) within the Cluster territory. This phenomenon is the significant factor for including this territory into the list of SPNA (Special Protected Natural Areas) because the study of species growing near the ranges borders is of great interest for biogeographical point of view.

4. Despite the fact that during intensive agricultural development, the most of the zonal vegetation communities of the middle taiga have been severely disturbed, at present time there are conserved some rare undisturbed communities within the Scientific Cluster and they are of great nature conservation value. These communities are following: 1) sedge-sphagnum transitional bogs in the floodplains of the Zayachya river tributaries; with many orchids plants' species included into the «Red Data Book of the Russian Federation» (2008) and the «Red Data Book of the Arkhangelsk Oblast»; 2) forest communities with linden (*Tilia cordata* L.) in the Kokshenga valley; while the linden is a broad-leaved tree species, extremely rare plant species in natural habitats of the Ustyansky region and in need of protection; 3) vegetation communities with participation of May lily (*Convallaria majalis* L.), the plant growing in the vicinity of the range north-eastern boundary in the Kokshenga valley; 4) island small-leaved birch and aspen forests with participation of nemoral plant species and of high botanical diversity; these communities are retained in unsuitable for plowing sites among agricultural lands; 5) fragments of primary intact spruce forests (bilberry, green moss, haircap moss types), virtually disappeared in middle taiga now.

5. There are 46 mammals' species within Scientific Cluster and among them 8 species are rare and protected, listed in the «Red Data Book of the Russian Federation» (2001) and the «Red Data Book of the Arkhangelsk Oblast» (2005, 2008). 148 birds' species live within this territory and among them 19 species are of the same status. There are Eurasian curlew, continental population of oyster catcher, European mink, flying squirrel among rare and protected animal species. The conservation of these rare species as well as their habitats demands especial attention under planning of Special Protected Natural Areas.

6. The fauna of birds and mammals of continuous forested areas within the territory of the Scientific Cluster preserves mainly the taiga aspect with insignificant participation of southern origin species. There are animal species located at the borders of their ranges within the territory of the Cluster. Birds and mammals species of southern origin occupy leading positions in the short-term succession stages after deforestation, in overgrown agricultural lands.

7. Rare ecosystems of high nature conservation value due to the unique mammals and birds population urgently need in high conservation status. These ecosystems are following: 1) Unique virgin spruce massifs as well as old-age forests in the upper reaches of the Zayachya river where the number of rare mammals and birds have their habitats (for example, lynx, owl, gnome owl, wood grouse, flying squirrel); also these forests supply successful reforestation within clearings and burns; 2) High-bonitat forests in Kokshenga-river valley; 3) Island forests as habitats of high faunistic diversity preserved among agricultural lands of Zayacheritzky subcluster; 4) Upper bog Zayachya Chist and ecotone ecosystems along its periphery supplying habitats for grey crane, wood grouse and resting sites for numerous flocks of brants, goose, swans during their spring and summer migrations.

8. A serious threat to the existence of rare and species-rich floodplain forests and tall grass communities in the valley of the Zayachya river represents the activities of the agricultural complex in the Nagorskaya village. In recent years, large-scale pollution of the Zayachya river and its tributaries by the liquid and solid wastes of this agricultural complex threatens the conservation of rare natural ecosystems and protected species of plants and animals.

9. The Scientific Cluster is an important permanent station for the study and monitoring of middle taiga ecosystems, their regional biodiversity and the impact of modern climate

transformation on the biotic components of the landscape. There are currently no such scientific stations with a long period of comprehensive scientific biogeographic and landscape research in the central sector of the European taiga. There are no natural protected areas here as well.

10. Out of 46 species of mammals in the territory of Scientific Cluster 8 species are rare and protective, out of 148 bird species 19 are referred to this group. Animal species that live at the limits of the boundaries of their areals inhabit this cluster. Thus, it is a significant factor for inclusion of this territory into the list of specially protected natural territories.