



GEOLOGICAL MONUMENTS OF THE NATURE AND THEIR CONSERVATION POLICY IN BELARUS

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Abstract. The brief characteristics of geological, landscape and botanical monuments of the Belarus nature is given. Their protection is carried out within the framework of realisation of the National strategy and Plan of actions on preservation and sustainable use of a biological variety of the Republic of Belarus.

Key words: rock outcrops, boulders, geological ground, natural monuments, geological natural monuments, heritage, landscapes.

Abstrakt. Podana jest krótka charakterystyka geologicznych, krajobrazowych i botanicznych pomników przyrody białoruskiej. Ich ochrona jest prowadzona w ramach narodowej strategii i planu działania w zakresie ochrony i zrównoważonego wykorzystania biologicznej różnorodności Republiki Białoruskiej.

Słowa kluczowe: odsłonięcia skał, głazy, podłoże geologiczne, pomniki przyrody, pomniki przyrody geologicznej, dziedzictwo, krajobrazy.

Natural monuments include unique, non-renewable natural complexes and objects, which has ecological, scientific, historical and aesthetic values, together with the occupied area (Law of the Republic of Belarus *About especially protected natural areas*, clause 35). Protected objects are divided into botanical, hydrological and geological natural monuments, depending on their features.

Geological natural monuments (outcrops of glacial and interglacial deposits and bedrock, typical landforms, large boulders and their concentrations, other geological objects) have been recognised on the territory of Belarus, and are our heritage. Further development of biology, geology, other earth's sciences and natural history of our Motherland is impossible without their protection. There are 875 protected natural monuments of the state and local importance, and 511 of them are geological monuments. Control of their protection and utilisation is carried out by administrative bodies of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, in accordance with the Law.

Geological background. The diverse life forms, which provide for the natural wealth and inimitable beauty of every site of our country, was not immediately apparent. There were

long evolution processes that were associated with geological events. The Belarus territory has had a complicated and specific geological history. The arctic tundra with dwarf birch and polar willow was formerly spread in places where forests are growing nowadays. Mammoths and other arctic animals walked on the moss-sedge cover. During the last million years, such glacial epochs were repeated more than once. Later they were replaced by warm periods (interglacials) with natural environment very similar to the present-day, but with even more variety and exotics.

Heritage. Landscapes. During glaciations, the territory of the country was situated mainly in the marginal zone of ice sheets, so glacial ploughing and accumulation activity was here evident. These resulted in a widespread very thick (up 340 m) glacial deposits and many large and small erratic masses, glacial boulders and intricate landforms. Precisely, these formations are the main natural features, which are responsible for the morphological appearance and specific features of the territory. The last glacier retreated from the territory of our country about 17–18 thousand years ago. It left hills, deep valleys, lake basins and wide plains. However, its influence upon the plant and animal life was still evident for the next 10,000 years. The present-day landscapes formed gradually. Forests re-

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placed bogs, meadow spaces became larger or smaller, rivers formed vast valleys, lakes were overgrown and turned into bogs. Plant and animal communities found the most favourable conditions for the existence, and distribution areas were created and preserved until they have been changed by man (about 2500–3000 years ago).

This schematic picture of the natural environment change aimed to demonstrate that the modern biological diversity developed as a result of processes closely associated with the geological history. The relief and surface deposits are parts of biogeocoenoses, where the modern plant and animal life of Belarus was formed and developed.

The Cherevki Peninsula (Miadel district). Rare plants of *Anemone sylvestris*, *Gentiana cruciata* and *Pulsatilla pratensis* grow within the standard kame relief.

Polesie Hills (Postavi district). The rare species of *Campanula latifolia* is growing in the Janovitsa river valley within terminal morainal landforms with thermokarst and erosion forms.

Naroch lake's shore scarp (Miadel district). An unusual cliff formed as a result of the high sandy coast destruction by wave erosion. The rare plant species of *Linnaea borealis* is preserved there.

Diagil Hollow (Miadel district). A representative of the arctic flora *Rubus chamaemorus* was preserved within the glacial ploughing relief, which is a standard of the ice marginal zone.

Rock outcrops have special scientific importance. They are closely associated with the evolution of the biological diversity in our country. Among them, there are deposits of old water bodies exposed in the river banks, slopes of trench or quarries. Diverse plant (pollen, seeds of herbaceous and arboreal plants, fruits, microscopic green, brown and diatom algae, etc.) and animal remains (mollusc shells, mammal bones, chitin's fragments of insects, etc.) were well preserved in such rocks. They may be used to determine the geological, climatic, plant and animal evolution trends of the past, and also to predict their changes in the future. These deposits contain only 5% of glacial strata but are very important for understanding the geological and biological processes on the Earth.

Full geological sections in bore holes and specially in geological outcrops have the important stratigraphical and palaeogeographical significance.

Orsha (Orsha district). Dolomites at the Dnieper river shore include well preserved plant and animal remains that lived in the ancient sea 375 million years BP

Korchevo (Baranovichi district). There are sediments of Narev Glaciation (18 isotopic stage) and Korchevo Interglacial with one climatic optimum (17 isotopic stage).

Krasnaya Dubrova (Rechitsa district). The till, sediments of the Serevch Glaciation (16 isotopic stage) and the organic strata of the Byeloveza Interglacial with two optima, were revealed here (15 isotopic stage).

Obukhovo (Verkhnedvinsk district). Peat preserved here includes remains of more than 60 species of arboreal, meadow and water-marsh plants that existed 480–550 thousand years BP (15 isotopic stage).

Ishkold (Baranovichi district). There are Alexandrya with the three optima (11 isotopic stage) and Ishkold with two optima (13 isotopic stage) Interglacials in this section.

Pushkary (Vitebsk district). The till and sediments of the Berezina Glaciation (14 isotopic stage) and organic formations of the Ishkold Interglacial with three optima (13 isotopic stage) are characteristic in this core.

Kolodeznyj Rov (Prinemanskaya; Grodno district). This is a rich occurrence of the fossil plants (pollen, spores, fruits and seeds, imprints of leaves — about 200 species), diatoms (96 species) and insects of the Alexandrya Interglacial, with two optima (11 isotopic stage).

Novye Belichi (Slutsk district). The Late Glaciation sediments (12 isotopic stage), lake strata of the Alexandrya Interglacial with one optimum (11 isotopic stage) and Early Glaciation sediments (10 isotopic stage) were discovered in the core.

Nizninskij Rov (the Shklov town). In the famous trench, were revealed the Dniepr till and Lateglacial sediments (216 ± 18000 years BP KTL-1M/85), the lake-bog sediment with the rests of more than 150 plants species and 13 animals species, living about 125–180 thousand years BP during the Shklov Interglacial, with three optima (7 isotopic stage). The age of the overlapping strata of the Early Glaciation sediments and till of the Sozh Glacial (6 isotopic stage) is dated for 162 ± 15000 years BP. KTL-2M/85.

Kosteshi (Lyuban district). The till and Dniepr Glaciation sediments (8 isotopic stage) and Shklov Interglacial formations with two optima (7 isotopic stage), were revealed here, covered by the Early Glaciation stratums and till of the Sozh Glaciation (6 isotopic stage).

Porsy–Makovje (Vilejka district). Site represented by the lake sediments of the Murava Interglacial with two optima.

Murava (Borisov district). The Murava Interglacial geological deposits have here the rich flora including 121 species of arboreal, bushy and herbaceous plants that grew 70–110 thousand years BP.

Cherikov (Cherikov district). The rich complex of the flora of the Murava Interglacial and Poozerje Glaciation was revealed in outcrop.

Rumlovka (Grodno district). There is the Sozh Glaciation till covered by the lake sediments of the Murava Interglacial with one optimum and Poozerje Glaciation.

Samostrelniki (Bogatyrevichi) outcrop in the Jan and Cecilia ravine (Mosty district). In the outcrop, lacustrine deposits occur with rich ancient Murava Interglacial flora remains (101 species) that existed 70–110 thousand years BP, and the early Poozerje Glaciation flora. The grave of legendary Jan and Cecilia glorified in the novel “On the Niemen” by Eliza Orzeszkowa, is located close by the ravine.

Ponemun (Grodno district). There are the powerful deposit strata of the Murava Interglacial with one optimum and early Poozerje Glaciation.

Doroshevichi (Petrikov district). The sediments of the fossil peat bog with the rich flora of the Murava Interglacial (one optima; 5e isotopic stage) and Poozerje Glaciation (5d isotopic stage) were found on the shore of the Pripjat River.

Timoshkovichi (Korelichi district). There are strata of the late Sozh Glaciation deposits and lake-bog deposits with

pollen, fruits and seeds rests, molluscs of the Murava Interglacial, with one optimum.

Loev (Loev district). On the shore of the Pripyat River, the stratum of the fossil peat with the rich flora of the Murava Interglacial (one optimum) have been found.

Zaslavl (Minsk district). The stratum of the relict bog of the Murava Interglacial and sediments of the early Poozerje Glaciation settle in the wall of the quarry.

Knyazevodtsy (Mosty district). In this outcrop the Murava Interglacial is present.

Kobelyaki (“Podneprovje”). There is till of the Sozh Glaciation (6 isotopic stage), loess deposits and palaeosoils with the rich complex of the fossil rests of the tundra plants and animals of the Poozerje Glacial.

Strusto, Sudoble, Koldychevskoye, Bogdanovskoye, Wygonotshi, Zabolotje, Oltush, Drivyaty, Richi, Volos, Novyato, Tshuchino, Medvezino, Veprin, Polyanovka, Smychok, Starye Stajki. The full sections of the lake, bog, river plain deposits of the late Poozerje Glaciation and Holocene.

Adrov (Orsha district). Late Poozerje Glaciation sediments and river plain deposits with the pollen, spores and molluscs.

Peski (Mosty district). The full section of the alluvial and river plain deposits of the Holocene.

Zacenje (Borisov district), Starye Voikovichi (Baranovichi district). The Holocene lake-bog deposits with pollen and spores plants, as well as with archaeological finds.

Boulders. A typical feature of natural landscapes in our country is the abundance of erratic boulders. These are large, rounded and soled rock fragments more than 10 m across. Some

of the boulders are preserved as natural monuments. These erratics are valuable relicts of glacial epochs and geological processes. The petrographical composition of these stones and their distribution pattern are used to locate source sites, to reveal the ways of movement of glaciers and their maximum limits.

Big or Damned Stone (the village of Gorki Shumilino district). Numerous moss and lichen species are growing over this erratic boulder composed of rapakivi-granite. This is the largest boulder found in the territory of Belarus, 10.6 m long and 3.7 m high.

Prusogorski Stone (Vologin district). The rare plant of *Dactylorhiza majalis* grows in abundance near this 3.2 m long and 1.1 m high granite erratic boulder.

Stony Bulls (Borisov district). 21 lichen species (among them rare *Rhizocarpon grande*, *Aspicilia cinerea*, *Cladonia glauca*, *Parmelia conspersa* and *Paraleucobryum longifolium*) grow over this 3,2 m long and 2,1 m high granite erratic boulder. A legend tells that God turned a ploughman and his bulls into stones as a punishment for the work at Eastertide.

Plissa Big Stone (Glubokoye district). 9 rare moss and lichen species (*Umbilicaria deusta*, *Lecidea fuscoatra*, *Parmelia saxatilis* and *Parmelia loxodes*) are growing over this 3 m long and 1.9 m high granite erratic boulder.

Plissa Big Stone (Novogrudok district). Near granite erratic boulder (2.9 m long and 1.6 m high) are found Numerous fox holes.

Butevtsi Big Stone (Braslav district). Rare moss and lichen species (ex.gr. *Cladonia fimbriata*) are growing over this 3.2 m long and 1.4 m high gneiss erratic boulder.

CONCLUSION

The protection policy of the nature monuments of region is carried out within the framework of implementation of the National Strategy and Action Plan for the Conservation and Sustainable Use of Biological Diversity in the Republic of Belarus. Extension number of nature monuments and strategy of their

protection in Belarus are a supreme task of reconstruction history of development natural environment in the past and forecast the evolution in the future, taking into account its condition at the present stage.