NOMINATION

BASHKIR SHIKHANS TORATAU, KUSHTAU AND YURAKTAU

Russian Federation, Republic of Bashkortostan

Proposal for Inscription on THE UNESCO WORLD HERITAGE LIST

Contributors:

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- Ufa University of Science and Technology
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Supported by:

- ANO Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism
- Committee of the Republic of Bashkortostan for UNESCO

2023

CONTENTS:

EXECUTIVE SUMMARY

State Party	Russian Federation
State, province or region	Republic of Bashkortostan, Ishimbai and Sterlitamak Districts
Name of nominated property	Bashkir Shikhans Toratau, Kushtau and Yuraktau
Geographical coordinates to the nearest second	The nominated property consists of three separate localities with the following approximate center point coordinates: • Toratau Shikhan N53°33'15.57 E56°05'56.78 • Kushtau Shikhan N53°41'55.69 E56°04'57.13 • Yuraktau Shikhan N53°44'29.72 E56°05'49.86
Textual description of the boundary(ies) of the nominated property	The Toratau Shikhan: The boundaries of the Shikhan run along its foothill, mainly coinciding with the 205 m horizontal in its western part and 275 m horizontal in its eastern part. The Kushtau Shikhan: The Shikhan consists of 2 separate localities. The boundaries of the main locality run along the foot of the hill in its western part, mainly coinciding with the 150 m horizontal. The northern and eastern boundaries of the Shikhan gradually rise to its top (375 m), further, in the south, the boundary sharply descends to the 150 m horizontal. The smaller locality is on the steep southern slope of the Shikhan and is separated from the main one by a narrow line of ski slopes. The Yuraktau Shikhan: The boundaries of the Shikhan run along its foothill, mainly coinciding with the 125 m horizontal in its northern, western and southern parts and 150 m horizontal in the eastern part.

A4 or A3 size map(s) of the nominated property, showing boundaries and buffer zone (if present)	Location of the serial property Bashkir Shikhans of Toratau, Kushtau and Yuraktau on the map of the Republic of Bashkortostan. Scale 1:1 500 000. Topographic map with exact indication of the boundaries of the Toratau Shikhan locality. Scale 1:25,000. Topographic map with exact indication of the boundaries of the Kushtau Shikhan locality. Scale 1:50,000. Topographic map with exact indication of the boundaries of the Yuraktau Shikhan locality. Scale 1:25,000. Maps on 4 sheets of A3 format are attached to the nomination dossier.
Criteria under which property is nominated (itemize criteria)	(viii)
Cultural Landscape	NO
Draft Statement of Outstanding Universal Value	**a) Brief synthesis** The Bashkir Shikhans are three isolated hills in the Southern Fore-Urals, located in a 20-kilometer chain along the right bank of the Belaya River, in the territory of the Republic of Bashkortostan, Russian Federation. The Bashkir Shikhans, bioherm buildups of the Early Permian, are second to none in the world in terms of visibility and accessibility for study. They give an idea of how the organic world was developing in the Early Permian, and also represent unique palaeoecological features, by studying which, one can trace the history of the development and change of palaeoecosystems over time. Each of the Shikhans is unique in its own way, as it contains a different set of facies and fossils. The Shikhans are natural nonrecoverable features. They were forming over 16 million years in certain geological conditions in the zone of transition from the shallow sea of the Eastern margin of Laurasia to the deeper region of the Ural sedimentary palaeobasin. They were built by ancient organisms that became extinct at the end of the Permian period.

Draft Statement of Outstanding Universal Value

The nominated serial property, the Bashkir Shikhans, is an outstanding landscape illustrating the important stage in the geological history of the Earth. The property reflects the history of the ancient Ural Ocean and the formation of Pangea, the development of the organic world of the Early Permian and the formation of reef palaeocommunities and buildups on a planetary scale. The Bashkir Shikhans are a unique natural phenomenon due to the amazing combination of ancient and modern forms of the Earth's surface, while the good exposure of this geological feature turns it into a natural museum, a laboratory that is available for study by both specialists and students, young geologists and all nature enthusiasts.

b) Justification for Criteria

The serial natural property, Bashkir Shikhans, is nominated according to criterion viii.

The Toratau, Kushtau and Yuraktau Shikhans are part of a grandiose system of ancient reef buildups, which can be traced from the Caspian Sea to the Arctic Ocean. The Sterlitamak group of Shikhans were forming during 299-283 million years. The uniqueness of the Bashkir Shikhans lies in the fact that here the fossil reefs of the Early Permian are open for study in natural outcrops and contain various fossil remains of excellent preservation. Other fossil reefs on the globe are either poorly exposed or overlain by younger sediments. The Bashkir Shikhans were brought to the surface as a result of Alpine tectogenesis during the last 5 million years.

The geology of the Bashkir Shikhans is a clear evidence of the history of the development of the Earth, its flora and fauna, at the end of the Carboniferous the beginning of the Permian. Here there are outcrops of rocks formed in warm marine conditions, as evidenced by a wide variety of palaeontological fossils. Fossil flora and fauna are represented by calcareous algae (35 species), foraminifers (about 100 species of small foraminifera and 53 fusulinid species), hydroids, corals (25 species), bryozoans (more than 80 species), brachiopods (more than 150 species), gastropods, cephalopods, trilobites, ostracods, echinoderms, conodontophorids, fish and others.

Draft Statement of Outstanding Universal Value

c) Statement of Integrity

The Toratau, Kushtau and Yuraktau Shikhans, formed in the system of reef buildups in the Early Permian, raised to the surface as a result of tectonic movements in the Neogene and facetted by weathering processes in the Quaternary. They represent an integral natural complex, the main components of which are inextricably linked by a common origin and dynamics of natural development.

The Shikhans are of sufficient size for long-term conservation and preservation of their Outstanding Universal Value. Additional protection is provided by the buffer zones created around all three geological objects.

Despite the fact that the Shikhans are located in the populated territory of the Ishimbai District in the Republic of Bashkortostan, they are not damaged, retain their geological and palaeontological integrity and form an amazing bright landscape, which additionally represents an aesthetic appeal.

The nominated property is protected on the basis of the laws of the Russian Federation and the Republic of Bashkortostan. The Shikhans are complex natural monuments of the Republic of Bashkortostan. In addition to legal protection, the nominated property is protected by the population of the Republic, which considers them as features of national pride, worships them and sings them in folk songs and legends.

e) Requirements for protection and management

Currently, the Bashkir Shikhans of Toratau, Kushtau and Yuraktau have the status of complex regional natural monuments, which guarantees their safety. The protection regime of the nominated territory is established by the Federal Law of the Russian Federation On Specially Protected Natural Areas, the Regulations on Natural Monuments in the Republic of Bashkortostan, as well as the Decree of the Government of the Republic of Bashkortostan On Amendments to the Decree of the Council of Ministers of the BASSR On the Protection of Natural Monuments of the Bashkir ASSR. The nominated serial object is part of the aspiring Toratau Geopark (Toratau aUGGP), which provides the property with additional guarantees of safety and integrity.

Control over compliance with the regime of protection of natural monuments and their buffer zones is carried out by the territorial committees of the Ministry of Nature Management and Ecology of the Republic of Bashkortostan. An independent assessment of

Draft Statement of Outstanding Universal Value

the state of protected localities is carried out once every 4 years by a third-party scientific organization that performs an inventory of specially protected natural areas as part of the work on maintaining the cadaster of protected areas.

Natural monuments and their protected zones are marked with warning and information signs along the perimeter of their boundaries. All natural monuments and their protected zones (if any) are necessarily taken into account when creating plans and prospects for economic and social development, territorial integrated schemes, land management schemes and district plans. On the territories of natural monuments and their protected zones, any activity that entails any violation of their safety is prohibited.

To implement strategic projects aimed at solving the complex tasks of the nominated property and creating a meaningful context for its development, a medium-term management plan for the period 2024-2028 was developed.

All Special Protected Natural Areas are the areas of the nominated territory. They have sufficient financial and administrative resources for the long-term preservation of the declared Outstanding Universal Value.

Name and contact information of official local institution/ agency/organization

Organization: Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization

Address: 450076, Russian Federation, Republic of Bashkortostan, Ufa, Zaki Validi str. 2, Toratau congress hall

Tel: +7 (347) 292-93-98
E-mail: geopark.toratau@mail.ru
Web address: https://geopark-toratau.ru/

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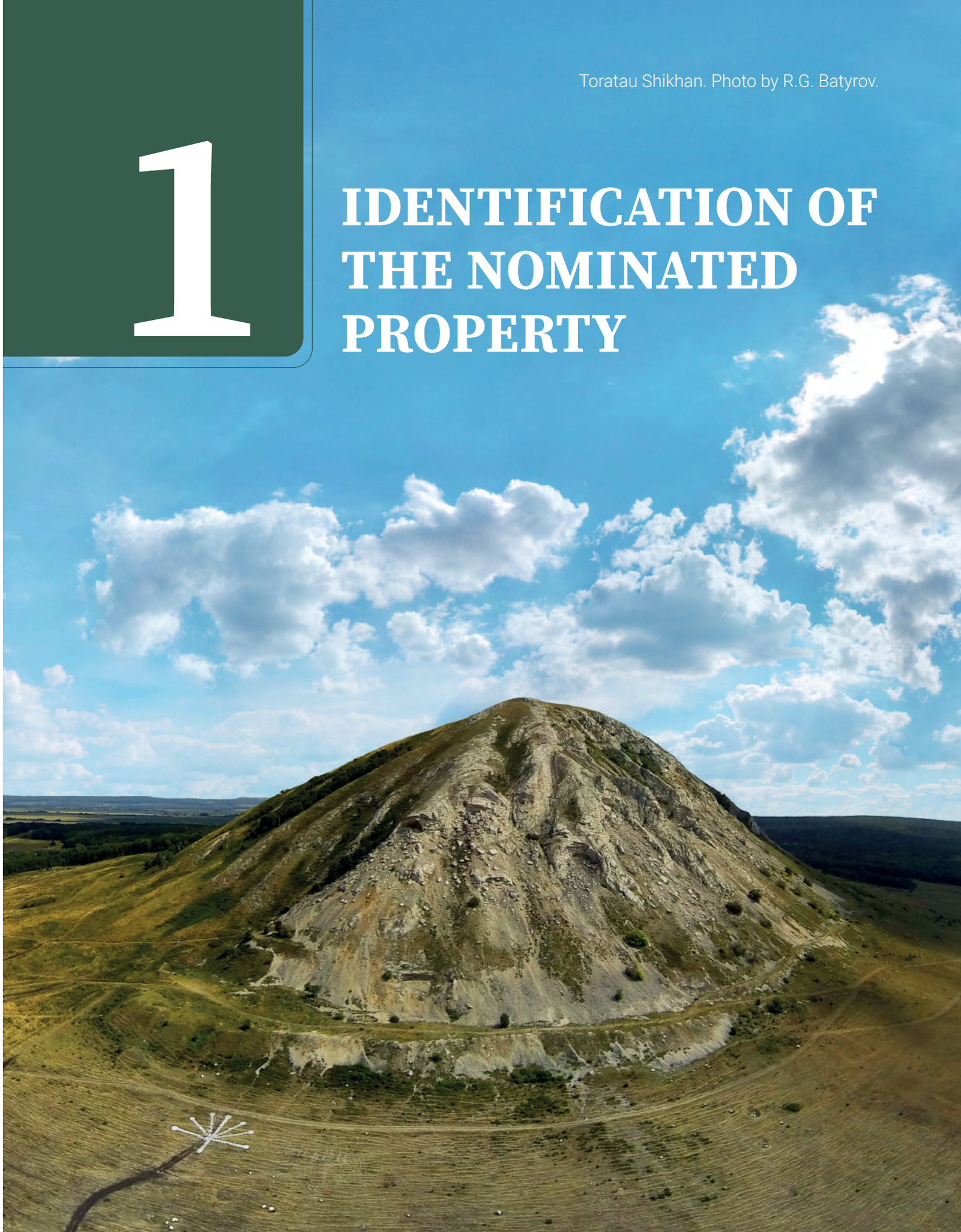
IDENTIFICATION OF THE NOMINATED PROPERTY



Toratau Shikhan. Photo by R.G. Batyrov.

1. IDENTIFICATION OF THE NOMINATED PROPERTY

1.a Country (and State Party if different)

Russian Federation

1.b State, Province or Region

Republic of Bashkortostan, Ishimbai and Sterlitamak Districts

1.c Name of nominated property

The Bashkir Shikhans of Toratau, Kushtau and Yuraktau

1.d Geographical coordinates to the nearest second

Id n°	Name of the component part	Region (s) / District (s)	Coordinates of the central point	Area of nominated component part (ha)	Area of the Buffer Zone (ha)	Map N°
001	Toratau Shikhan	Ishimbai District	N53°33'15.57 E56°05'56.78	47.70	129.221	2
002	Kushtau Shikhan	Ishimbai District	N53°41'55.69 E56°04'57.13	325.30	250.650	3
003	Yuraktau Shikhan	Sterlitamak District	N53°44'29.72 E56°05'49.86	64.10	68.077	4
			Total area (in hectares)	437.10 ha	447.948 ha	

1.e Maps and plans, showing the boundaries of the nominated property and buffer zone

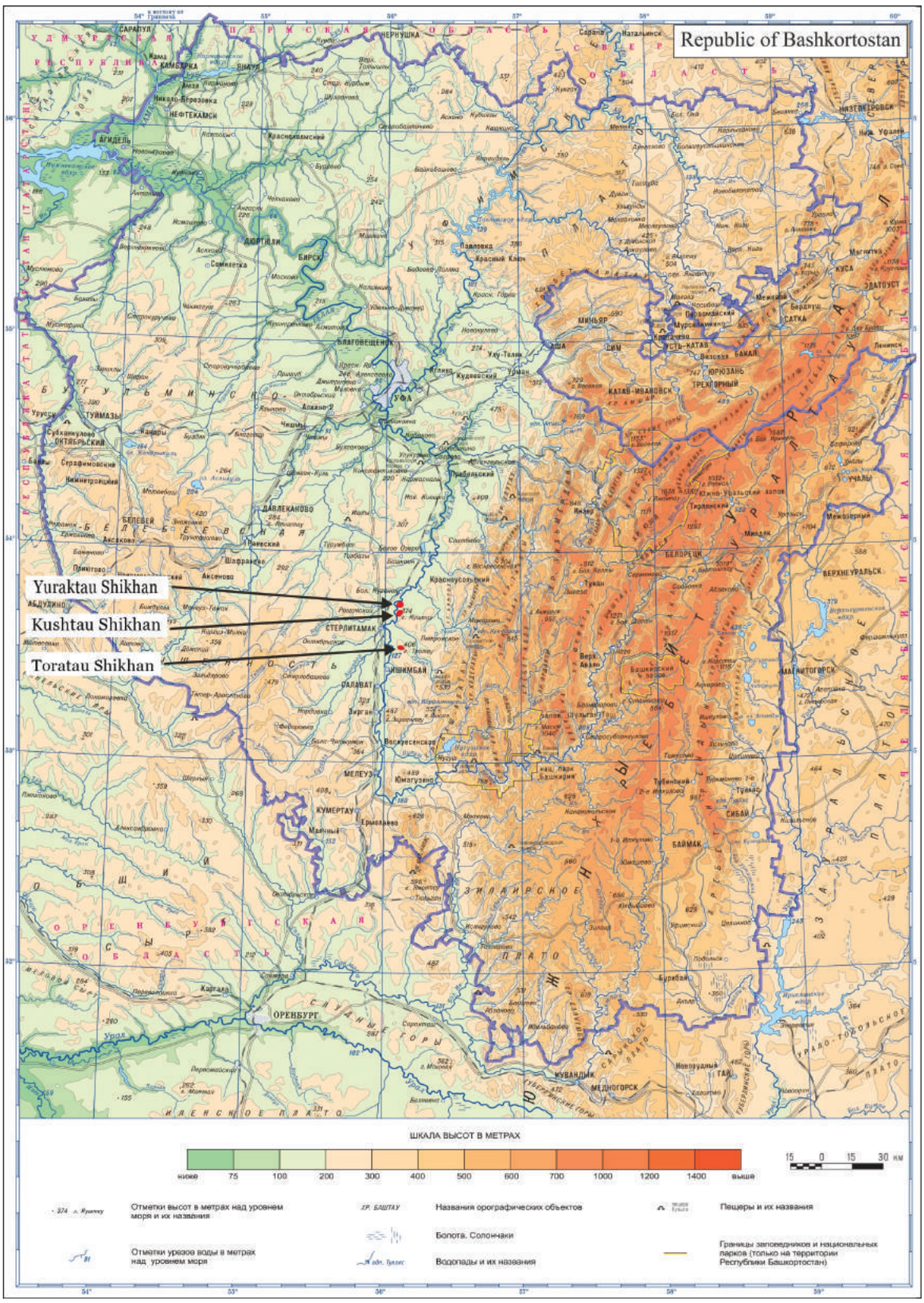


Fig. 1. Location of the nominated serial property, the Bashkir Shikhans of Toratau, Kushtau and Yuraktau, on the map of the Republic of Bashkortostan. Scale 1:1 500 000.

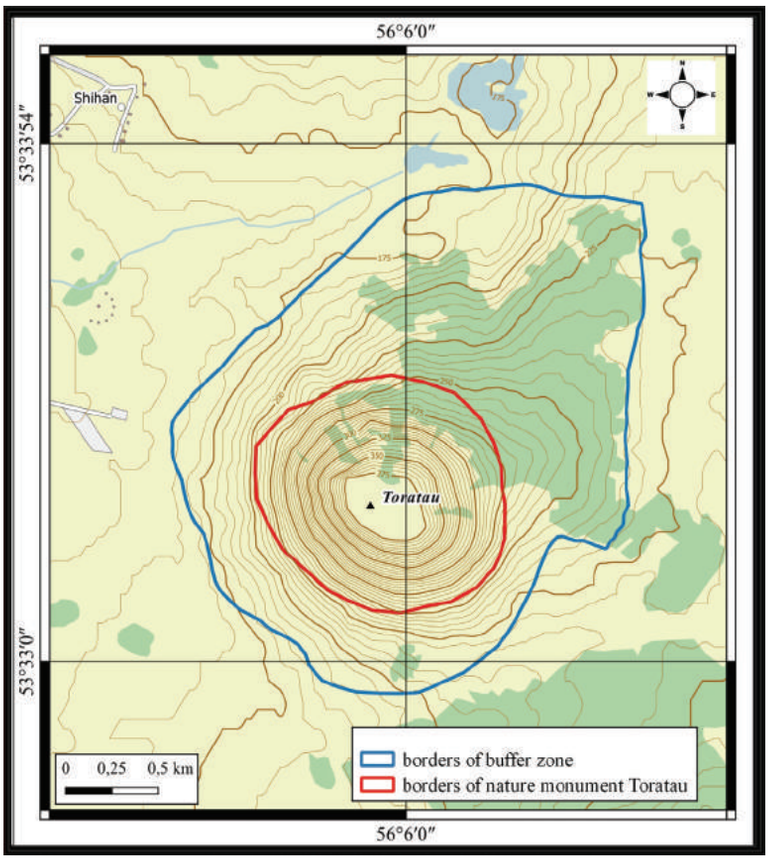


Fig. 2. Topographic map with exact indication of the boundaries of the Toratau Shikhan locality.
Scale 1:25 000.

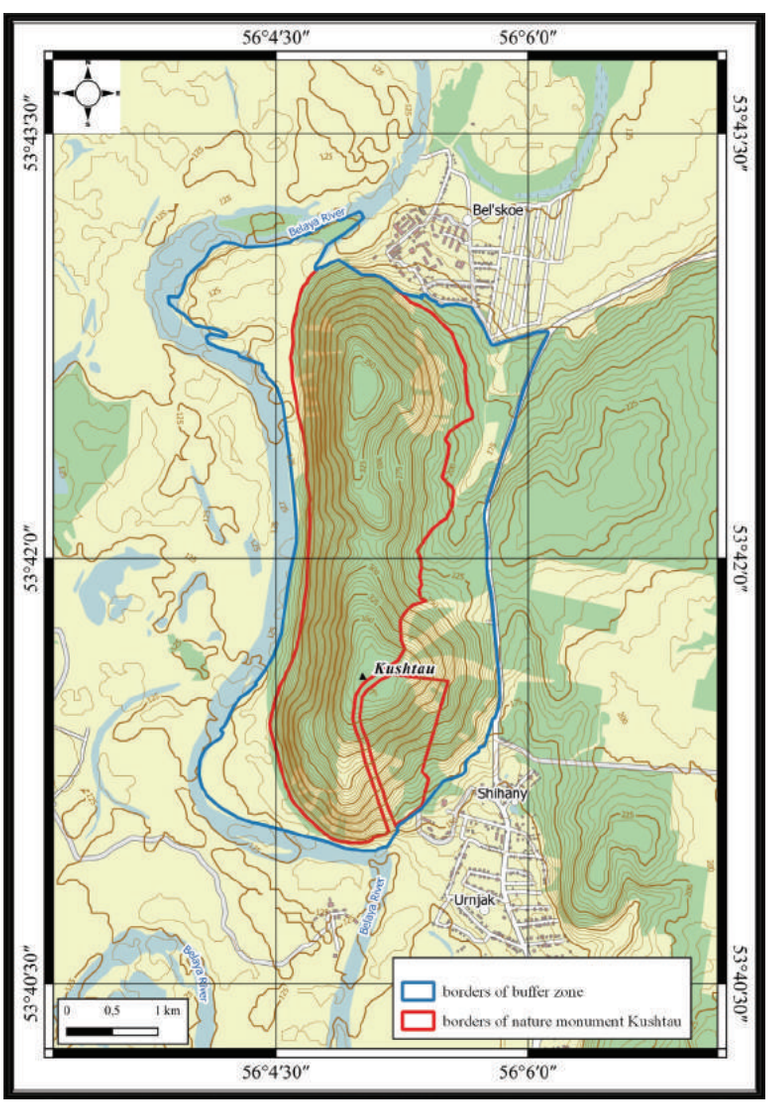


Fig. 3. Topographic map with exact indication of the boundaries of the Kushtau Shikhan locality.
Scale 1:50 000.

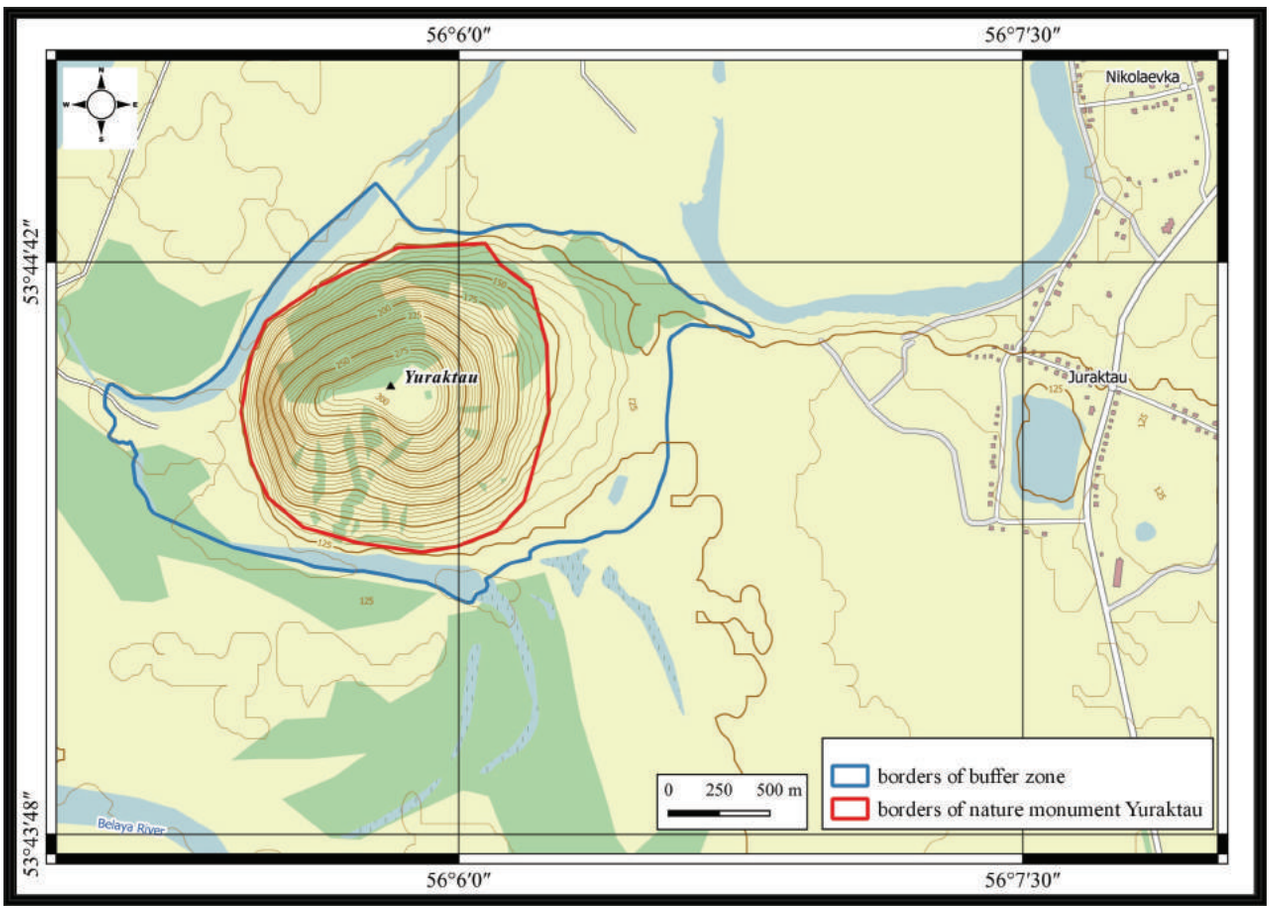


Fig. 4. Topographic map with exact indication of the boundaries of the Yuraktau Shikhan locality. Scale 1:25 000.

1.f Area of nominated property (ha.) and proposed buffer zone (ha.)

Area of nominated property: 437.10 ha

Buffer zone: 447.948 ha

Total: 885.048 ha

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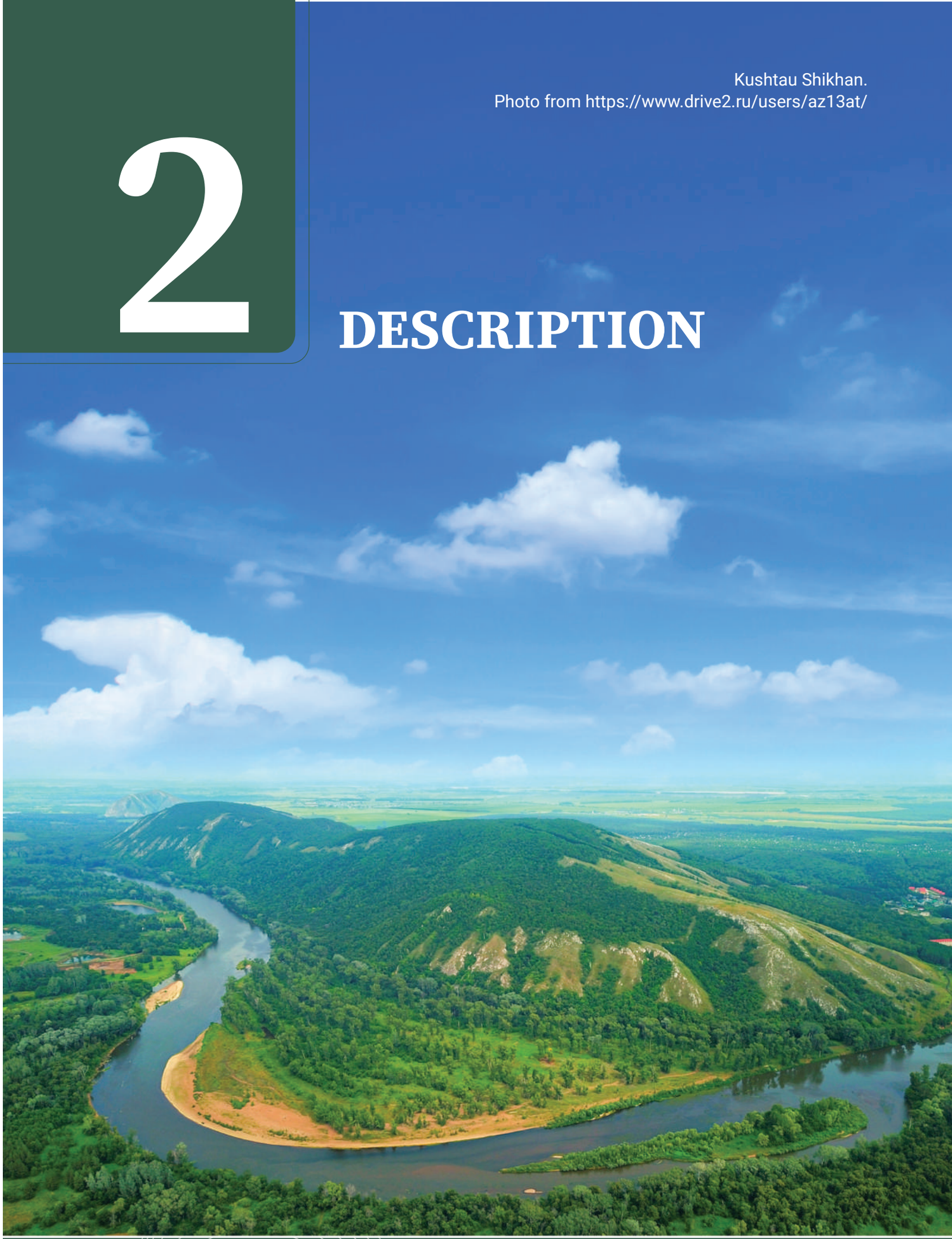
DESCRIPTION



Kushtau Shikhan.
Photo from https://www.drive2.ru/users/az13at/

2. DESCRIPTION

2.a Description of nominated property

The Bashkir Shikhans are three isolated hills in the Bashkir Fore-Urals, located in a 20-kilometer chain along the right bank of the Belaya River, 150 km south of Ufa, in the territory of the Toratau Geopark. The Shikhans are the remnains of a grandiose barrier reef formed in the warm sea of the Early Permian (299–283 Ma) and stretching from the Northern Caspian Sea to the Polar Urals. All three Shikhans have a conservation status of complex natural monuments.

Geological structure and relief

Geological exploration of the territory

One of the earliest literary references to the Bashkir (Sterlitamak) Shikhans can be found in the monograph named “The Geology of Russia in Europe and the Ural Mountains”, edited by British geologist Roderick Murchison, French geologist and palaeontologist Eduard de Verney and the Russian naturalist Alexander von Keyserling (Murchison et al., 1845), published in English (Fig. 5). The monograph was written based on the material of expeditions to Russia in 1840–1841. When crossing of the Southern Urals, R.I. Murchison, E. de Verneuil and the group accompanying them, collected numerous brachiopods, one species of trilobites and other fossils. The fauna was described in the second volume of the monograph, published in French. Roderick Impey Murchison, who led the expedition, was a British geologist, president of the London Geological Society, an honorary member of the Imperial St. Petersburg Academy of Sciences. He owns the establishment of the Permian system.

The assumption about the reef nature of Shikhans was first made by Soviet scientist – geologist and palaeontologist D.V. Nalivkin in 1932. After the discovery of oil in the Urals since 1932, special interest arose in Shikhans due to their similarity to buried oil and gas massifs.

In the early period of study of the Shikhans, the deposits up to the Upper Sakmarian of the Lower Permian were attributed to the Upper Carboniferous and were indexed as C3 I-I Triticites and Pseudofusulina members, C3III-a – as the lower part of the Schwagerina member, C3 III-b – as the upper part of the Schwagerina member, C3 iv – as the Tastubian formation (Rauzer-Chernousova, 1940).

In 1941–1943, a group of micropalaeontologists revised the biostratigraphy of reef-type limestone massifs by foraminifera on the basis of previously drilled boreholes (9000 thin sections) and new collections (about 2000 thin sections). The results of these efforts were published in eleven papers of the Institute of Geological Sciences (IGN AN USSR) (Foraminifera..., 1949). Those studies became a reliable foundation for subsequent geological and palaeontological work. Stratigraphic subdivision by fusulinids was made by Soviet micropalaeontologist D.M. Rauzer-Chernousova (1949, 1950).

Since 1941, geological work was carried out by the Bashkir Expedition of the Academy of Sciences of the USSR, as a result of which the issues of facies, the genesis of limestone massifs and palaeogeography of the Sterlitamak-Ishimbai District were studied and generalized in more details. Particular attention was paid to tectonic and erosional factors in the formation of the buried massifs and separated hills.

In 1942–1943, the Bashkir Oil Expedition, based in Ufa, organized special work to study the Shikhans. The Shikhan expedition was led by geologist, palaeontologist and stratigrapher I.V. Khvorova. Among the Shikhans, the least studied was the carbonate massif of the Kushtau mountain due to its high forest cover.

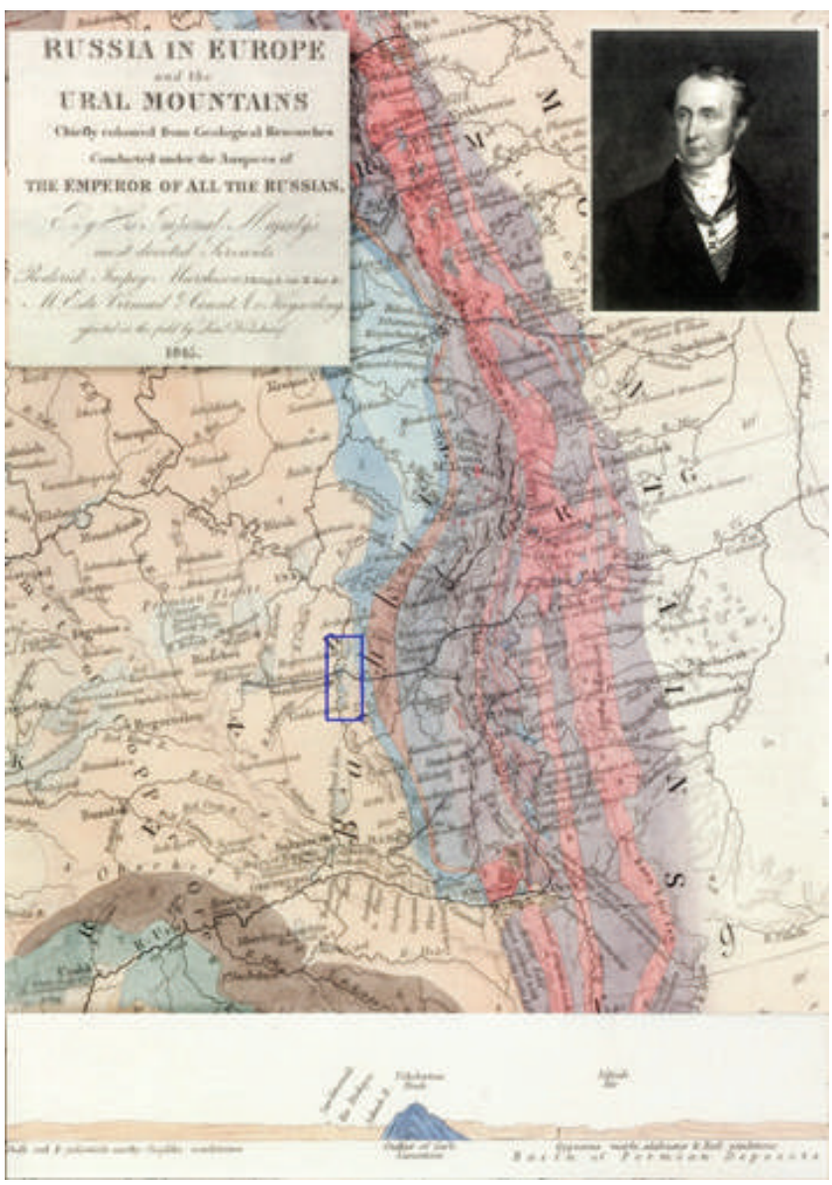


Fig. 5. Portrait of Roderick Impey Murchison and his geological map (fragment, 1845), and the geological cross-section through the Cheke-Tau Shikhan (the modern name is Shakhtau). The Shikhans are marked with a blue rectangle.

The field diaries of I.V. Khvorova, which describes the routes passed in the summer of 1942 on the Kushtau mountain, are available. These descriptions and observations of outcrops and pits remain, perhaps, the most complete to date, since the subsequent geological survey of the 200,000th scale did not add new details.

In 1950, the paper by D.M. Rauzer-Chernousova, who played a significant role in understanding the stratigraphy and palaeogeography of the territory, was published. It gives the distribution of facies and biocenoses of fusulinids for nine stratigraphic intervals from the upper part of the Asselian Stage (Shikhanskian horizon) to the upper part of the Sakmarian Stage (Sterlitamakian horizon), palaeogeographic schemes of the territory of the Sterlitamak-Ishimbai Fore-Urals for the Late Asselian and Artinskian (Early Sarginian) ages (Fig. 6).

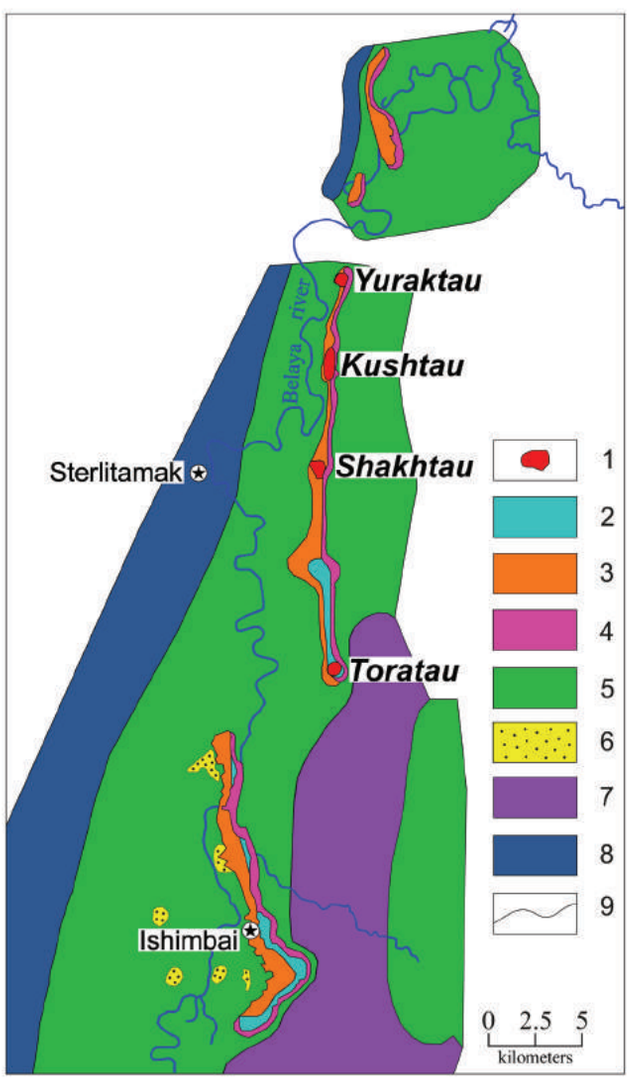


Fig. 6. Palaeogeographic scheme of the Late Asselian age in the Sterlitamak-Ishimbai Fore-Urals (Rauzer-Chernousova, 1950, p. 89, fig. 18 as amended by Kulagina et al., 2015).

1 – limestone massifs;
2 – bryozoan reef;
3 – the upper layer of the underwater bank (algae-bryozoan-coral);
4 – the lower layer of the underwater bank (algae);
5 – gentle bank slope and positive relief without reef formers;
6 – shoals;
7 – steep bank slope and deeper parts of the basin;
8 – flat bottom of the epicontinental sea;
9 – facies boundaries.

In addition to fusulinids, which formed the basis of the stratigraphic scheme, the fossil fauna of corals, brachiopods, bryozoans, and other groups was studied on the Shikhans. The first information about corals is known from the works of Soviet geologist and palaeontologist G.S. Porfiriev, including their remains on the southeastern slope of the Toratau mountain *Wentzelella (= Kleopatrina)* together with the Tastuba fusulinids (Rauzer-Chernousova, 1940). Data on the species composition of corals common in the deposits of Shikhans and their description were provided by Soviet palaeontologists and geologists E.D. Soshkina, T.A. Dobrolyubova and G.S. Porfiriev (1941). Based on the stratigraphic distribution of bryozoans studied by Soviet geologist and palaeontologist M.I. Shulga-Nesterenko, as well as other groups of fauna, a general stratigraphic scheme was developed, in which biostratigraphic units were compared for different groups of fossils (Rauzer-Chernousova, 1949). In the last approved stratigraphic scheme of the Urals (Stratigraphic..., 1993), this scheme is used with minor additions. In 1961–1962 in the territory of the Sterlitamak District, a geological survey was carried out at a scale of 1:50,000, and in 1963 – at a scale of 1:200,000. Survey geologic reports provide the geological structure of the area based on the updated stratigraphic map. The lower, Schwagerina horizon, originally attributed to the Sakmarian Stage, was singled out as an independent Asselian Stage of the Lower Permian, the middle horizon of the Sakmarian Stage was called the Tastubian horizon of the Sakmarian Stage, and the upper one was named the Sterlitamakian horizon.

In the 90s of the XX century, special work on studying reef masses of the Ishimbai District of Bashkortostan were carried out by the group of geologists from the Institute of geology and geochemistry of the Ural branch of the Russian Academy of Sciences jointly with French colleagues under the leadership of Soviet and Russian palaeontologist, specialist in palaeontology and stratigraphy B.I. Chuvashov. As a result of these works, interesting original results were obtained on the conditions of reef formation and the description of the fossils (Chuvashov et al., 1990, 1996). Permian reefs were demonstrated at the "Permian System of the Globe" International Congress in 1991, the materials of which were published under the editorship of B.I. Chuvashov and A.M. Neinr. Conodont fauna was used to subdivide the Lower Permian deposits (Chuvashov et al., 1996; Chernykh, 2012; Kotlyar et al., 2013).

After the detailed work of Rauzer-Chernousova (1950; Rauzer-Chernousova and Korolyuk, 1991; Korolyuk, 1985), the facies of the massifs and the patterns of their distribution were studied by French geologist E. Vennin (Vennin, 2007); she named the Shakhtau and Toratau massifs the *Archaeolithoporella-Tubiphytes*-bryozoans reef complexes according to the main frame-builders – Tubiphytes and bryozoans.

The general geological characteristics of the Toratau, Kushtau and Yuraktau Shikhans and the distribution of fossil remains on them were provided in a monograph devoted to the flora of Toratau (Chuvashov and Gareev, 2014) and in the article by B.I. Chuvashov (2016).

In 2015, Kazan hosted the XVIII International Congress on Carboniferous and Permian. On the pre-congress excursion the participants got acquainted with the famous Sterlitamak Shikhans (Chuvashov, 2015). Recently, new interesting finds of fossil on the Kushtau Shikhan have been published (Gorozhanin and Gorozhanina, 2019).

In 2017, “Syrievaya Kompaniya” (Raw Material Supply Company) Joint Stock Company completed prospecting and evaluation work for limestone on the Kushtau massif, having drilled more than a dozen exploration boreholes. The core was provided in 2022 by the management of “Syrievaya Kompaniya” (A.V. Shkurko) for study by scientists from the Institute of Geology of the Ufa Federal Research Center of the Russian Academy of Sciences.

Publications on the geological structure of the Early Permian reefs (Shikhans) of the Bashkir Pre-Urals, as well as palaeontological findings and the current state of study of plants and animals inhabiting the unique bioherm carbonate structures of the Lower Permian are presented in paragraph 7e.

Geological structure of the territory of Shikhans

The Shikhans are located in the transitional area from folded Urals to East-European Platform. The area includes tectonic zones (changing from east to west) of the Fore-Uralian Foredeep and the south-eastern edge of the East-European Platform (Fig. 7). In accordance with the structural-facies division of the current stratigraphic scheme of the Urals, the territory belongs to the western zone of the Belaya Depression (Stratigraphic ..., 1993, area 26, sheet 7).

Stratigraphy

The oldest rocks in the territory are Upper Devonian limestones, which are overlain by a thick sequence of Carboniferous carbonate deposits. Nowhere in the described area do they come to the surface and are discovered only by deep boreholes.

Permian deposits are widly spread here. The Permian System is represented by the Lower (Cisuralian) Series, in which the Asselian, Sakmarian, Artinskian, and Kungurian Stages are distinguished. The Asselian, Sakmarian, and Artinskian Stages create the Shikhan Mountains, ancient reef massifs. At depth, they are opened by numerous boreholes made when exploring oil fields. There are several mountains known as the Shikhans on the right bank of the Belaya River in an area of 1–2 km wide and 22 km long. They are located in the N-S direction separated by 1.5–5 km from each other. They are called Toratau, Kushtau, Yuraktau, and Shakhtau (now a quarry). Deposits of the Kungurian Stage form the territory adjacent to the Shikhans and often come to the surface (for example, near Toratau, Kushtau, etc.)

The Shikhans are composed of light grey biohermal (corals, palaeoaplysins, bryozoans, algae) and organogenic-detrital (foraminifers-bryozoans-crinoids) limestones. In some areas, the rocks are strongly dolomitized, sometimes turning into spongy dolomites. They contain lenses of carbonate breccias. To the west, reef limestones are replaced by layered organogenic-detrital limestones, argillaceous limestones, mudstones, marls, and breccias. The total thickness of reef limestones is up to 1200 m. Based on the stratigraphic scheme (1993) and taking into account new data, there are some units distinguished in the Toratau, Kushtau, and Yuraktau Shikhans (Fig. 8).

Rocks of the Asselian Stage are subdivided from bottom to top into Kholodnolozhian and Shikhanian horizons. The Kholodnologian horizon is subdivided into lower and upper subhorizons. The lower subhorizon is composed of bioherm limestones, which contain often *Tubiphytes*, foraminifers, foraminifers-algae in their composition. There are numerous *Schwagerina, Rugosofusulina stabilis* Rauzer-Chernousova. Also, there are interlayers of dark crinoidal limestones. Their thickness is 240–265 m. The upper subhorizon is composed of biohermal, fusulinids, foraminiferal-bioclastic, and bryozoan limestones. There are numerous brachiopods. The thickness is 220–230 m. The Shikhanian horizon is composed of biohermic, foraminifera, bioclastic, and ostracods limestones. The thickness is about 40–200 m. The total Stage' thickness is up to 700 m.

The Sakmarian Stage includes the Tastubian and Sterlitamakian horizons. The Tastubian horizon is divided into two fusulinid zones. It is composed of bioherm limestones, namely corals, palaeoaplysins, bryozoans, brachiopods, as well as bioclastic limestones. There are interlayers of dark brown marls. The rocks are heavily dolomitized. There are numerous fusulinids, small foraminifers, corals *Protowentzelella aseptata* (Dobrolubova), *Kleopatrina intermedia* (Porfiriev), *Permastraea campohylloides* (Dobrolubova) and *Pseudocystophora longiseptata* (Dobrolubova), ostracods *Elperscos orbiculata* Kotschetkova and C*arbonita abuncans* Kotschetkova. The thickness is up to 170 m. The Sterlitamakian horizon is composed of biohermal limestones, namely corals, palaeoaplysins, bryozoans, bioclastic limestones. There are numerous foraminifers, corals, and bryozoans. The rocks are dolomitized. The thickness is up to 300 m. The total Stage' thickness is up to 470 m.

The taxonomic diversity of palaeontological finds in the Lower Permian deposits of the Shikhans is demonstrated in Table 1.

The Artinskian Stage is subdivided into four horizons, namely Burtsevian, Irginian, Sarginian, and Saranian. The Burtsevian horizon is represented by bioherm limestones with foraminifers, corals, and bryozoans. The thickness is up to 170 m. The Irginian horizon is composed of cherry-brown and brown marls with sponge spicules and small ammonoid shells. The thickness is up to 190 m. The Sarginian horizon is composed of reddish-brown marls, often silicified, with numerous sponge spicules. In the Toratau Shikhan, marls directly overlie bioherm limestones. These rocks occur in limestone irregularities and are developed mainly on the northern slope of the Toratau massif. V.V. Chernykh identified conodonts namely *Neostreptognathodus peguopensis* Behnken, *N. exculptus* Igo and *Mesogondolella bisseli* Clark et Behnken. The thickness is from 0 to 100 m. The total Stage' thickness is up to 400 m.

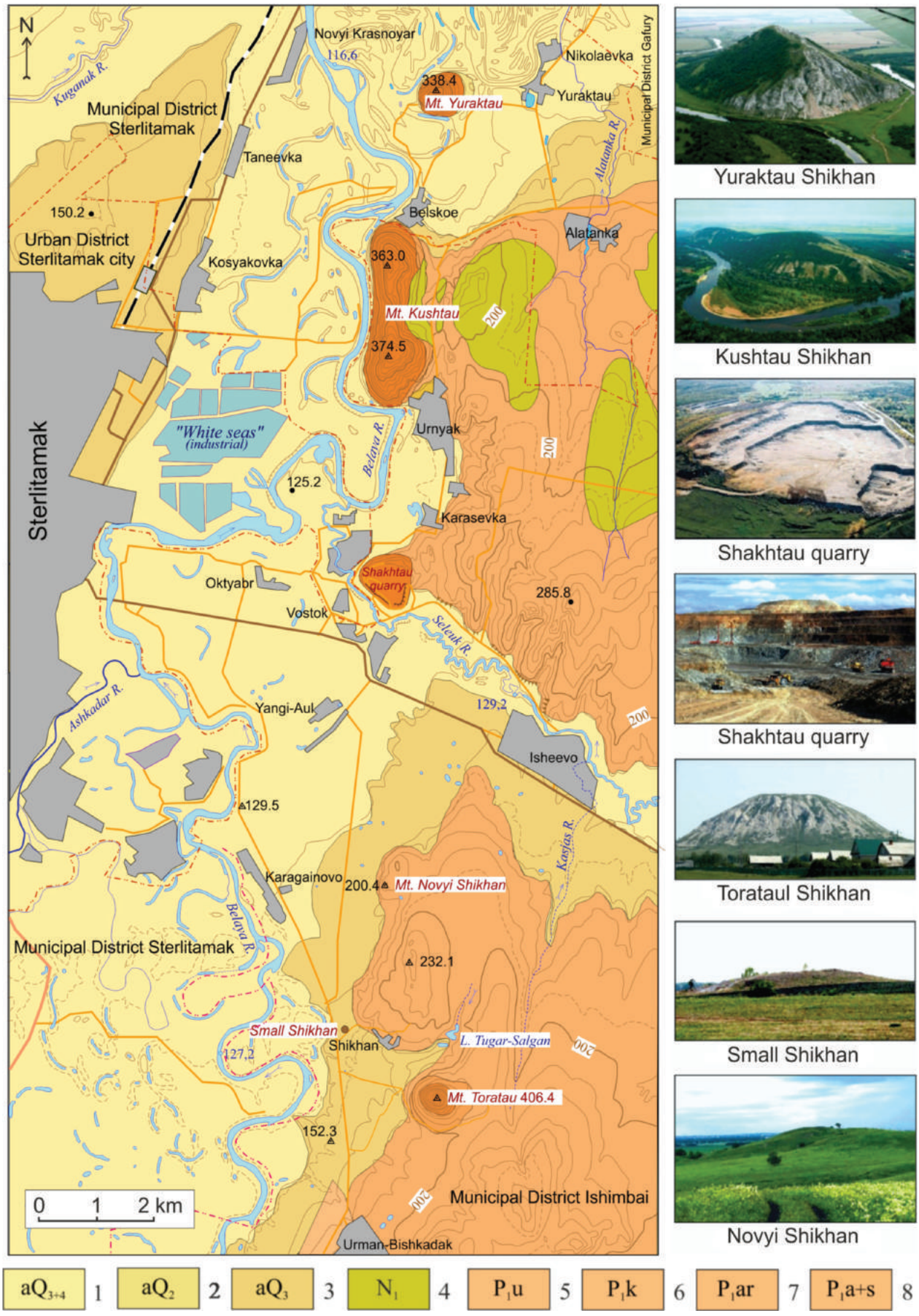


Fig. 7. Geological map with the location of the nominated property, the Bashkir Shikhans, and photographs of the single mountains.
(Smirnov, 2022, based on geological survey data: Sinitsyn, 1962; Imaev, 1963; Knyazev, 2020; Utaev, 2021).

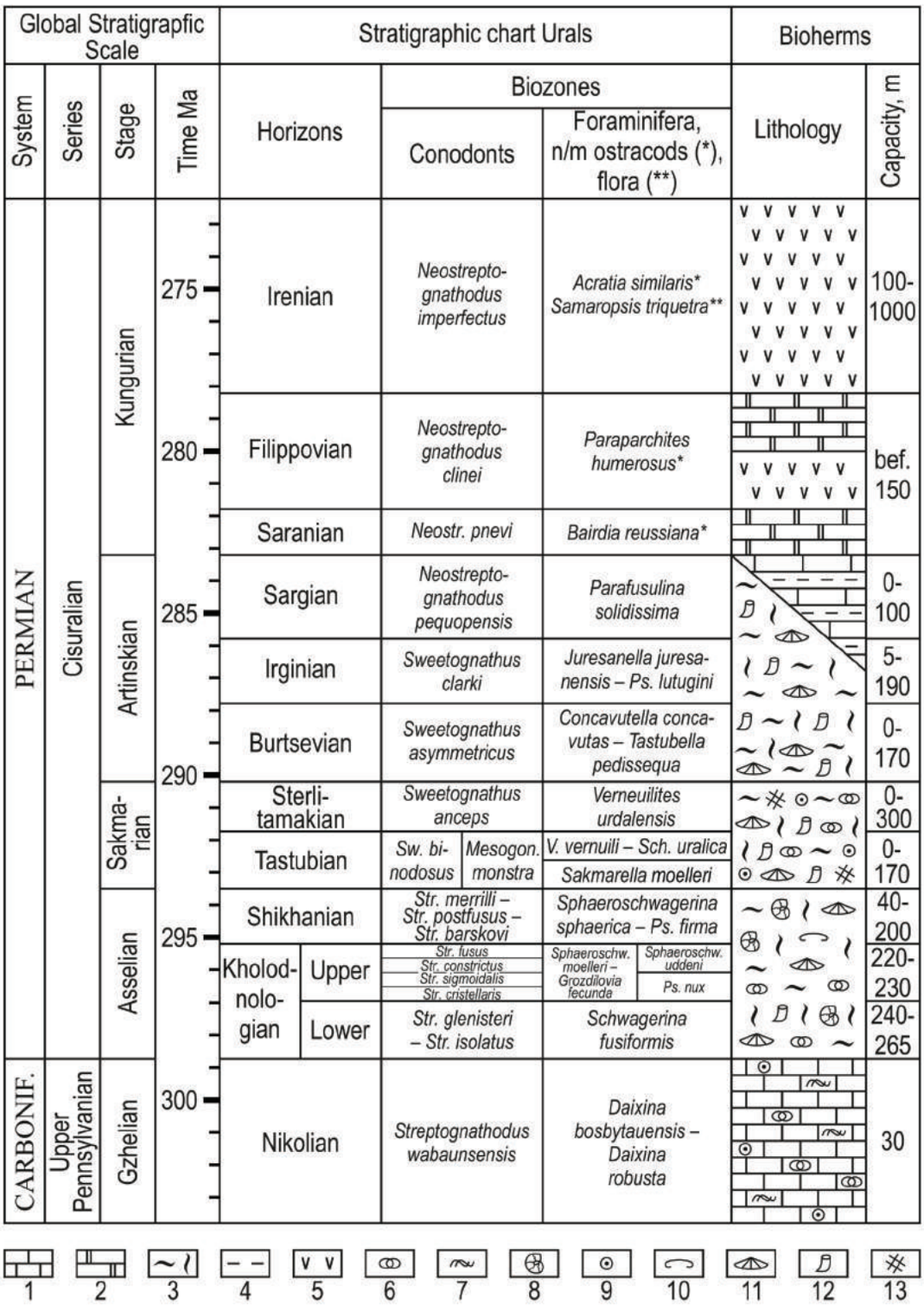


Fig. 8. Stratigraphic subdivisions of the lower part of the Permian System of the bioherm massifs according to (Stratigraphic..., 1993; Decisions of the ISCR, 1992, 1997, 2008); conodont zones are given according to (Chernykh, 2006, 2012; Chernykh et al., 2020, 2022).

Legend: 1 – layered limestones; 2 – dolomites; 3 – biohermal limestones; 4 – mudstones; 5 – gypsum and anhydrite; 6 - foraminifers; 7 – algae; 8 – cephalopods; 9 – crinoids; 10 – ostracods; 11 – brachiopods; 12 – corals; 13 – bryozoans. Str. – Streptognathodus; Str. postf. – str. bars. – Streptognathodus postfusus – Streptognathodus barskoviw; Pseudochw. – Pseudoschwagerina; Ps. – Pseudofusulina; V. – Verneuilites.

The deposits of the Kungurian Stage are quite widespread. In the eastern part of the region, they come to the surface, in the western part they are uncovered by boreholes. They are composed mainly of gypsum, anhydrites, rock salt, and partially of dolomites. Clastic rocks represented by sandstones and less often by conglomerates play a subordinate role. Large rock outcrops of gypsum are located on the right side of the Seleuk River valley from the Isheevo village to the Shakhtau quarry and Kushtau, where they form the monoclinal slope of the Shikhan uplift. The deposits of the Kungurian Stage are exposed in the eastern and south-eastern parts of the territory, overlying the Sakmarian and Artinskian carbonate rocks at the foot of the Shikhans. The total thickness of the deposits of the Kungurian Stage is up to 1000 m.

The Miocene deposits are found to the east of the Kushtau Shikhan. They are represented by quartz sand, pebble and clay, mainly white fatty and silty, brown coal. They are most developed in erosional-tectonic and karst depressions. The thickness is 150–230 m.

Quaternary system. The deposits of the Quaternary system are widely spread and reach considerable thickness (up to 25 m). They are represented mainly by alluvium, less often by colluvium and eluvium. Alluvial formations are composed of the floodplain and above-floodplain terraces of the Belaya River. Eluvium can be found on the crests of watersheds. Colluvial formations are most typical at the foothills of the isolated mountains and uplands composed of the Kungurian rocks, where they are represented by loam with gravel of the Permian rocks. The thickness is from 2 to 10 m.

Table 1. Taxonomic diversity of palaeontological finds in the Lower Permian deposits of the Shikhans.

Fossil group	Toratau genus/ species	Kushtau genus/ species	Yuraktau genus/ species	Maly Shikhan genus/ species	Shakhtau genus/ species
Algae	1/1	12/17	1/1		22/35
Higher plants (trunks)					1
Fusulinids	4/5	7/15	7/15	3/3	17/51
Small foraminifers	12/28	20/40	17/27	10/13	29/98
Sponges	+		+		+
Ostracods	16/19	+			+
Trilobites	1/1	1/1	1/1		4/4
Ciclids					1/1
Corals	3/4	1/1	6/8	5/8	14/25
Palaeoaplysins	+	+	+	+	+
Ammonoids	15/22	2/2	3/3	12/13	22/32
Nautiloids	11/12	2/2	4/4	6/7	37/45
Gastropods	1/2	7/8	11/12		90
Bryozoans	18/47	6/7	9/18		20/45
Brachiopods	40/65	17/49	43/72	18/23	31/120
Echinoderms (Crinoids)	+	+	+		+
Conodonts	2/5				3/3
Fish	5/6				

«+» – fauna is present without defined species

Tectonic structure of the territory

The geotectonic position of the Bashkir Shikhans is determined by their location in the south-eastern part of the East-European Platform – in the marginal part of the Fore-Uralian Foredeep – a large depression in the Earth's crust that arose in connection with the formation of the Ural Fold Belt during Late Paleozoic. The Shikhans are limited to the uplifted part of this depression, the Shikhan-Ishimbai Saddle (SIS), which divide it into two depressions, the Belay and Mrakovo. The Shikhan Saddle is a south-eastern continuation of the South Tatar arch, which arose as an uplift, or tectonic block that is transverse to the extension of the Urals. It appeared at a later time as a result of the global geodynamic processes in the Alpine-Himalayan Fold Belt, which brought a section of the Preuralian Foredeep bed with reef structures and oil deposits to the surface of the Earth, making them accessible for observation and more detailed study. The tectonic factors that influenced the reef massifs of the Shikhan type can be divided into two groups: palaeotectonic (palaeogeodynamic) and neotectonic. Palaeogeodynamics is one of the factors of a global scale. It was it that determined the time and place of the formation of reef masses in the Early Permian of the end of the Paleozoic Era (300–280 million years ago). The history of the development of the territory is described in more detail in Section 2b.

The Shikhan uplift is elongated in the N-S for a long distance. This uplift reaches its greatest width at the latitude of the Kushtau Shikhan (about 8 km), and narrows to the north and south.

According to the Carboniferous and older deposits, the Shikhan uplift has the form of a flexure. Upper Carboniferous deposits within the described structural element are represented by normally layered carbonate rocks. In the reef massifs, the Asselian, Sakmarian, and Artinskian deposits are represented by massive organogenic limestones. To the east, on the monoclinal slope of the uplift, as well as in the area between individual reef limestones, the Asselian, Sakmarian, and Artinskian deposits are composed of carbonate-marl rocks of small thickness. From the surface, most of the Shikhan uplift is composed of gypsum of the Kungurian Stage.

Since the time of the first scientific description of the isolated mountains their nature remains questionable. Scientists discuss, whether these mountains are brachyanticlinal folds, erosional remnants, or reefs (Shamov, 1957; Korolyuk, 1985). In the guide to the excursions of the international congress in 1937, D.V. Nalivkin was the first to call them reef buildups. Since then, this opinion has prevailed in numerous scientific publications (Nalivkin, 1937; Chuvashov et al., 1996).

Genetic types and landforms

Reef buildups of the Early Permian are the isolated mountains (Shikhans), clearly expressed in the modern relief inside the continent far from the sea and ocean coasts. The Bashkir Shikhans and their immediate environs are located within the hilly-ridged foothills of the western slope of Urals (Smirnov, 2005). To the west of the Shikhans, there are wide and flat Pleistocene accumulative river terraces of the Belaya River valley with an absolute elevation from 115 to 160 m. To the east, in the area of halogen rocks, structural-denudation hilly-ridged foothills of the western slope of the Southern Urals are formed with absolute elevations of dividing spaces of up to 290 m. Tops of the isolated mountains with absolute elevations of 338.4 m (Yuraktau), 374.5 m (Kushtau) and 406.4 m (Toratau) rise 220–240 m above the surrounding area.

The formation of the isolated mountains is determined by the leading role of positive tectonic movements during Neogene and Quaternary. Along with neotectonic uplifts, the main condition for their formation is selective denudation due to the greater resistance to denudation agents of marine reef carbonate rocks, in comparison with the surrounding lagoonal sulphate deposits that are more susceptible to destruction by exogenous processes in the east and non-lithified alluvial formations in the west. This predetermines the denudation-lithomorphic genesis of the Shikhans, which at present are erosional-denudational remnants caused by the activity of river erosion in the Neogene-Quaternary period in conjunction with the general denudation of the territory.

The main geomorphological feature of the most elevated Shikhans of Toratau and Kushtau are their flattened tops, which are “islands” of the Early-Middle Pliocene levelling surface (Smirnov et al., 2022), preserved after the general peneplanation of the Southern Urals and Fore-Urals, at the end of the Miocene – the beginning of the Pliocene (Rozhdestvensky, 1971).

Geological processes

Recent geological processes in the region of the Shikhans, as well as in other regions of the world, are represented by endogenous and exogenous processes.

Recent endogenous geological processes create the general uplift of the area at a rate of 2.8–4.8 mm per year (Rozhdestvensky, 1971). According to the general seismic zoning of the territory of the Russian Federation, the region of the Shikhans is the one with an estimated seismic intensity of 6 (according to the MSK-64 scale) and a hazard rate of 1–5% for 50 years (Code of Rules 14.13330.2018, 2018). Earthquakes causing deformation or destruction of buildups and structures have not been recorded in the area of the Shikhans in the last 100 years.

Exogenous geological processes are mainly represented by processes caused by weathering and gravitational forces (screes), surface waters (river erosion) and ground and surface waters (karst).

Screes are developed on the slopes of the Shikhans. Along the hollows, they cover almost all the mountains. In the upper and middle parts of the western slopes of the Shikhans, screes are rather active (10–15 centimeters or more per year). On the eastern slopes they are less active. And in the lower gentle parts they are immobile. The formation of the rocky, often steep western slopes of the Shikhans and the development of screes were facilitated by the lateral erosion of the Belaya River in the Pleistocene-Holocene time. Recent river erosion manifests itself in the erosion and destruction of banks at 0.5–3.0 m per year (anomalously up to 5.0 m per year) (Smirnov, 2022).

Karst in the area of the Shikhans is the most common and remarkable geological process. It manifests through both surface (wells, funnels, basins, ponors, karst logs and lakes) and underground structures (caves and grottoes). The frequency of occurrence of surface karst manifestations in the vicinity of Shikhans is the highest in the East-European Plain (Fig. 9).

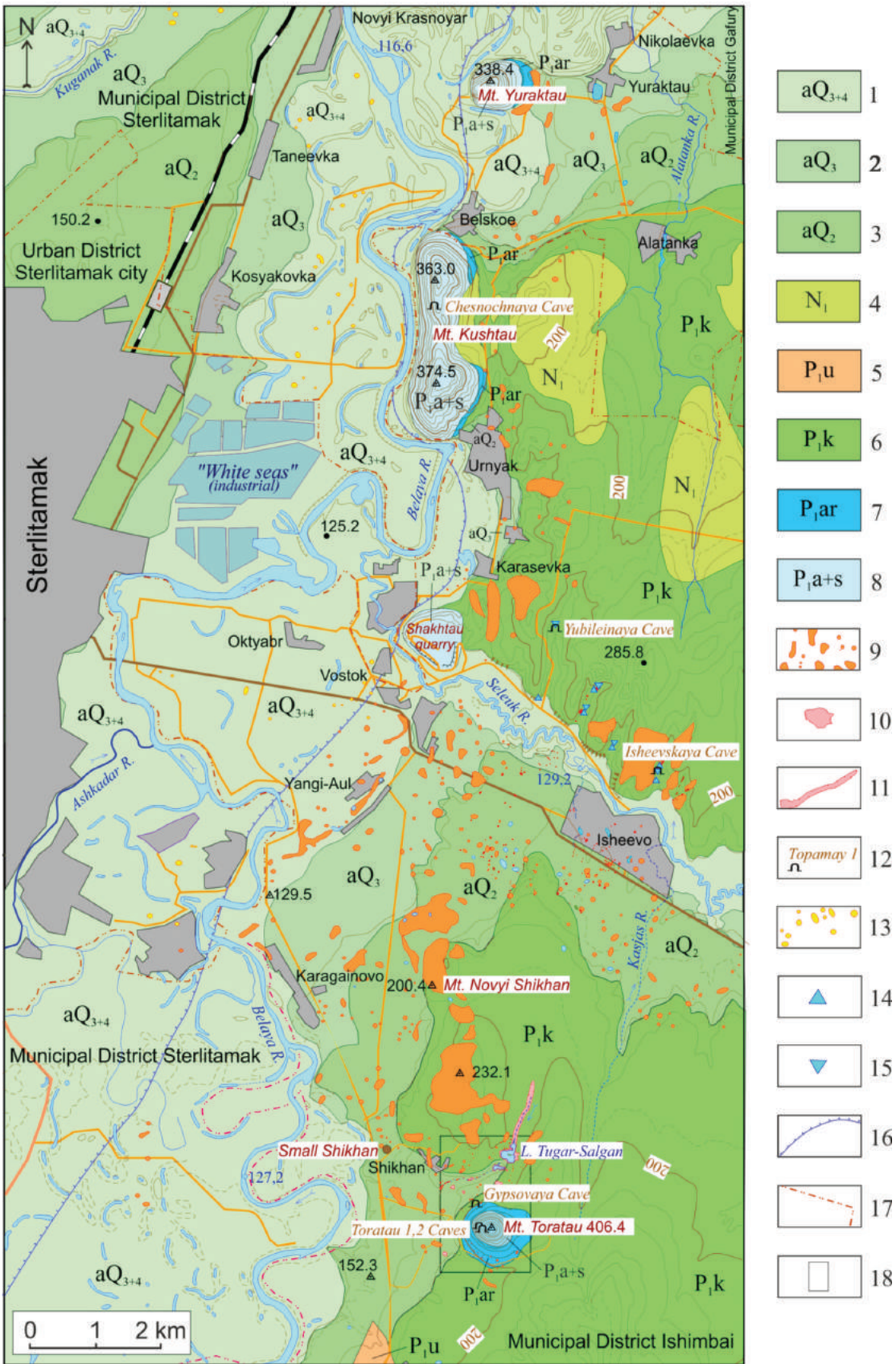


Fig. 9. Karst map of the Bashkir Shikhans and their environs (Smirnov, 2022).

Legend. Types of karsts according to the composition of karst rocks and the nature of their overlap with non-karst deposits. Sulphate overlapped karst (suballuvial or Kama type) within: 1 – floodplain and 1st above flood-plain terrace; 2 – II above flood-plain terrace; 3 – III above flood-plain terrace; sulphate karst: 4 – overlaid; 5 – closed (Russian type); 6 – covered (suballuvial-diluvial or Central European type); carbonate karst: 7 – overlaid (suballuvial-diluvial or Central European type); 8 – open (Mediterranean or uncovered type). Manifestations of karst: 9 – karst fields and separate funnels, 10 – karst hollows, 11 – karst logs, 12 – cave and its name. Other designations: 13 – suffusion funnels, 14 – spring, 15 – ponor, 16 – right side of the palaeovalley, 17 – municipal borders, 18 – inset contour of a larger map.

Oil-bearing reef reservoirs

The Shikhans are part of the near N-S reef belt in the western marginal part of the Fore-Uralian Foredeep, where in 1932 an oil field was discovered near the village of Ishimbaevo, confined to a reef structure. Many oil and gas fields in the world, including very large ones, are discovered in reef structures of this type. The Ishimbai field was included in many textbooks on petroleum geology as a reference oil deposit in reef structures. With the discovery of oil in Ishimbai, oil prospecting began in the Volga-Ural region, which led to the discovery of a large oil and gas province, which is one of the oldest in Russia and is still being actively developed.

Four independent mountains located on the Shikhan uplift are elevated above the Ishimbai oil field located at a depth of 0.5–1 km. They served as an important element in the forecasting and subsequent discovery of oil fields in reef structures located to the south and north of the Shikhan uplift – Stolyarovsky, Kumertausky, Sovkhozny, Kartashevsky, and many others. The Shikhans are the reservoir of palaeo-oil deposits brought to the surface of the Earth and made available for study.

Residual bitumen found in the carbonate deposits of the Bashkir Shikhans is not only a historical monument associated with the discovery of the Ishimbai oil field, the first Volga-Ural oil-bearing province of Russia, but also a good guide on the types of carbonate reservoir rocks for oil geologists.

Description of Toratau, Kushtau and Yuraktau

Each reef massifs (Toratau, Kushtau and Yuraktau) is unique and authentic, despite the similar external and geological structure. The Shikhans are part of a single reef system and differ from each other in the specifics of palaeontological communities and features of palaeogeographic conditions.

1. Summary description of the Toratau Shikhan

General georeferencing

The Toratau mountain is the southernmost and the highest of four isolated Shikhan mountains in the Shikhan tectonic block. It is located between the cities of Sterlitamak and Ishimbai, 1 km southeast of the Shikhan village and 2.2 km northeast of the Urman-Bishkadak village (Fig. 10).

Toratau mountain looks like a truncated cone with steep slopes and a flat top. The height of Toratau is 406.4 m above sea level, the relative height is 279.2 m above the Belaya River, the length is about 1000 m, and the width is about 800 m. The area of the shihan projection is about 42 hectares. About a kilometer north of the Toratau Shikhan, there is a picturesque karst lake, which is a regional complex natural monument “Tugar-Salgan Lake and its environs”.

Stratigraphy (Fig. 11, 12).

The Toratau reef massif is composed mainly of Asselian (Shikhanian horizon) and, to a lesser extent, Sakmarian (Tastubian horizon) deposits. The stratotype of the Shikhanian horizon of the Asselian Stage of the Cisuralian Epoch of the Permian System was described using the Toratau mountain. The thickness of reef limestone reaches 500 m.

Tubiphytes facies and facies of polyphyletic bioherms are distinguished. Also, there are thick bryozoan bioherms with abundant and diverse brachiopods of the Tastubian horizon. In the mid of the western slope, there is a layer of limestone with scalloped folds. In several places on the massif, there are some thin lenses of Lower Artinian rocks and bryozoan bioherms. In hollows on the slopes of the massif, there are small remnants of the Upper Artinian terrigenous-carbonate rock masses with poor benthic fauna and ammonite shells.

Archaelithoporella-Shamovella (=Tubiphytes) boundstones were found in the axial part of the Toratau massif, in which tubiphytes form draping structures and, in turn, are encrusted with *Archaeolithoporella* (calcite-producing cyanobacteria) in association with bryozoans. The axial part of the reef is also characterized by bryozoan bufflstones (microfacies in which the structure of the organisms of the frame builders is visible). The interreef facies

consist of bioclastic packstones and grainstones (=organogenic-detrital limestones with a significant amount of sparite cement). Facies of the outer part of the reef contain fragments of various organisms: ammonoids, foraminifers, brachiopods, crinoids, etc. (Vennin, 2007). Coral bioherms are also found here. In the western part of the slope there are interlayers of dark grey indistinctly bedded crinoid limestones. Limestones with well-preserved fragments of crinoidal stems can be observed in a cave in the upper part of the slope. Biohermal bryozoans, bryozoan-crinoids and palaeoaplysins with incrustations are observed near the Toratau 2 Cave, giving the limestone amazing bizarre patterns. Fossil residues include numerous small foraminifers, bryozoans, brachiopods, ammonoids and nautiloids.

Fig. 10. The Toratau Shikhan.

The Toratau Shikhan on Google Earth.

Western slope.
Photo by E.I. Kulagina.

North-eastern slope.
Photo by G.A. Danukalova.

The Maly Shikhan against the background of the Toratau Shikhan. Photo by E.M. Osipova.

Fig. 10. The Toratau Shikhan.

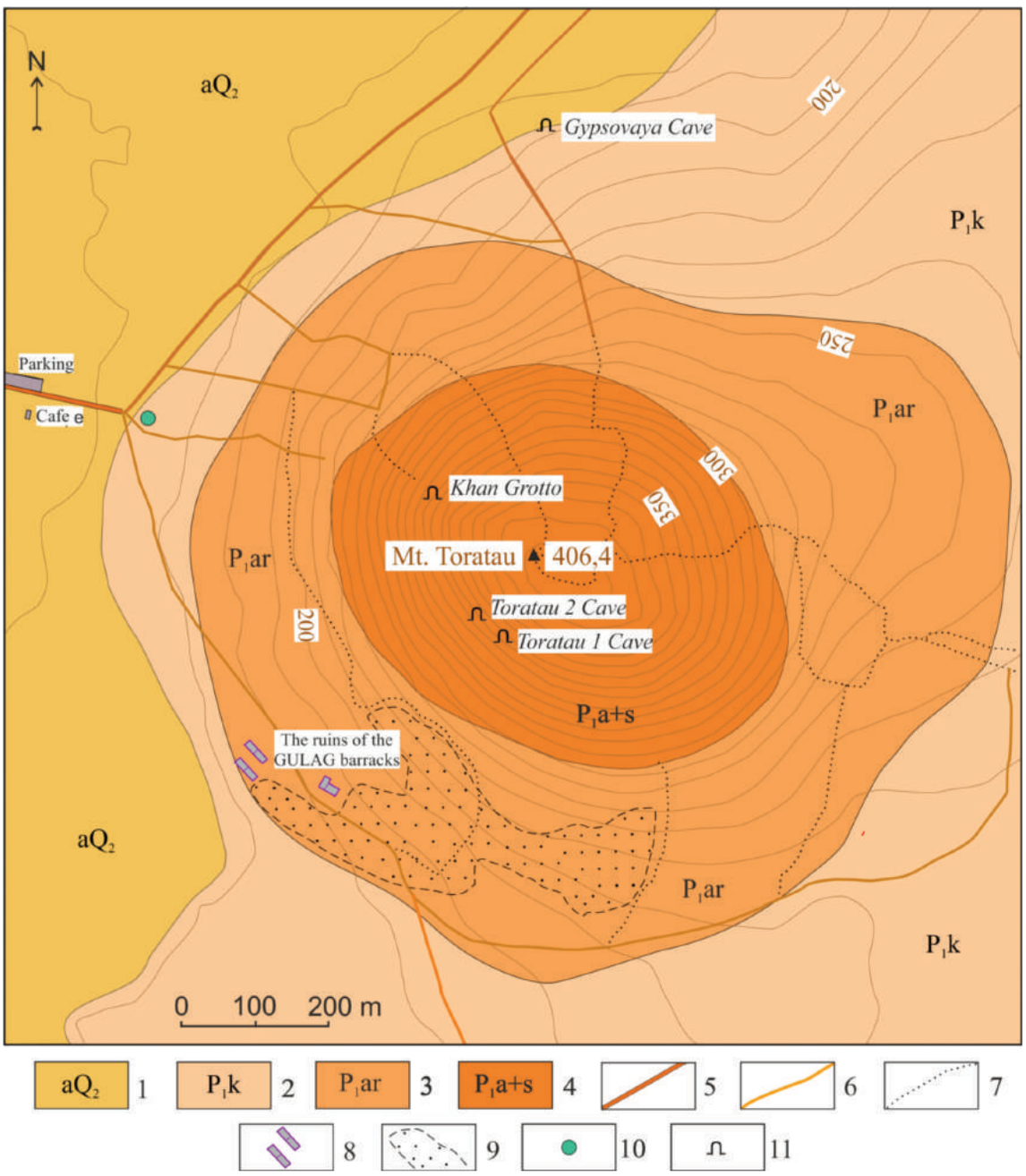


Fig. 11. Geological position of the Toratau Shikhan.
(Smirnov, 2022, according to Bogdanov et al., 1941; Fedorenko, 1957; Sinitsyn, 1962; Knyazev, 2020; Utaev, 2021).

Legend. Stratigraphic subdivisions: 1 – Middle Neopleistocene (alluvium of the III above floodplain terrace of the Belaya River valley). Cisuralian (Early) series of the Permian System: 2 – Kungurian Stage; 3 – Artinskian Stage; 4 – Asselian and Sakmarian Stages (not subdivided). Communication routes: 5 – paved roads; 6 – main country roads; 7 – main hiking trails. Other designations: 8 – ruins of GULAG barracks; 9 – excavation; 10 – projected memorial Yryuzar Tashy (Stumbling Stone from Bashkirian language).

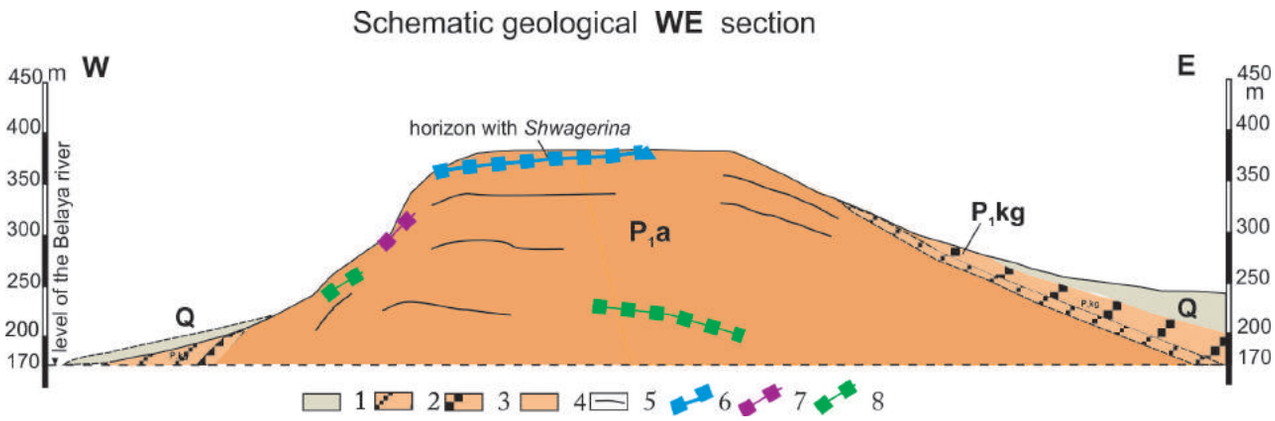


Fig. 12. Geologic cross-section of the Toratau mountain (according to V.M. Gorozhanin).

Legend: 1 – Quaternary deposits, 2–4 – Lower Permian deposits: 2 – Asselian limestones, 3 – Artinskian limestones; 4 – gypsum of the Kungurian Stage; 5 – bedding; 6–8 – marker horizons: 6 – *Schwagerina* horizon, 7 – bryozoan bioherms, 8 – *Tubiphytes* bioherms.

According to the recent cross-section, reef limestones of Toratau belong to the Sphaeroschwagerina moelleri – Pseudofusulina fecunda zone of the upper part of the Kholodnologian horizon and the Sphaeroshwagerina sphaerica zone of the Shikhanian horizon of the Asselian Stage. The domed surface of the mass is overlain by reddish-brown marls, often silicified with numerous sponge spicules. These rocks occur in limestone irregularities and are predominantly developed on the northern slope of the massif. Directly from the contact of limestones and marls, V.V. Chernykh identified the conodonts *Neostreptognathodus peguopensis* Behnken, *N. exculptus* Igo and *Mesogondolella bisseli* Clark et Behnken. (Chuvashov et al., 1996). The appearance of *N. peguopensis* is characteristic of the base of the Sarginian horizon of the Artinskian Stage, which may include marls in the upper part of the Toratau mass (Chuvashov et al., 1996). Additional information about the composition and facies of the rocks overlying the reef formations was obtained from vertical fractures (Neptunian dikes). The deposits were dated by conodonts and ammonoids from the upper part of the Tastubian to the lower part of the Sterlitamakian horizons of the Sakmarian Stage (Chuvashov et al., 1996). Thus, the actual reef massif began to form in the second half of the Asselian and the first half of the Sakmarian stages.

Palaeontology

Fossils of nine animal types on the Toratau Shikhan are sarcodes, sponges, cnidarians, arthropods, molluscs, bryozoans, brachiopods, echinoderms, chordates, Tubiphytes, and also some plants, which are conditionally attributed to algae (Fig. 13).

Of the sarcodes, there are representatives of the Foraminifera class. Of these, the most diverse are small foraminifers (Fig. 13 A–C). They belong to Parathuramminida, Hemigordiopsida, Archaediscida Endothyrida, Paleotextulariida and Lagenida. In total 28 species and 12 genera have been identified. Holotypes of four species have been described. They are kept at the Geological Institute of the Russian Academy of Sciences (Moscow). Fusulinids are rare, with five species and six genera known so far.

Corals are represented by four species of rugosa belonging to three genera. Amplexocarinia solitary rugosa often found there (Fig. 13G).

Bioherms composed of palaeoaplysins were found in the Toratau 2 Cave (Fig. 13J).

Molluscs are represented by cephalopods and gastropods. Cephalopods are divided into ammonoids and non-ammonoid cephalopods (nautiloids, bactritoids and orthoceratoids). Ammonoids are numerous, including 22 species belonging to 15 genera. They belong to two complexes of different ages, which differed in their way of life. The Asselian and Sakmarian ammonoids lived in the reef zone, while the late Artinskian ones lived on the open shelf of a shallow sea. The species diversity of the Toratau reef complex exceeds the richest coeval communities from other regions of the Southern Urals. Of the best-known localities of Late Asselian-Sakmarian ammonoids in the Southern Urals, 8–10 species of 8–9 genera were identified, and 12 species of 11 genera were identified in the Toratau Shikhan. Representatives of two ultra-endemic genera were found in the Toratau Shikhan: *Shikhanites* and *Protopopanoceras*, which are not found anywhere outside this zone. The holotypes of these forms are kept at the Palaeontological Institute named after A.A. Borisyak of the RAS (Moscow).

Twelve species of nautiloids from eleven genera were identified (Fig. 13K), forming two assemblages of non-ammonoid cephalopods of the Asselian-Sakmarian and Late Artinian Stages. In 2020, two new species of nautiloids were described. Permian non-ammonoid cephalopods, by analogy with modern representatives of this group, belong to actively swimming predators.

There are two gastropod species there.

In the Toratau Shikhan, numerous ostracods that reached gigantic sizes for this group of fauna, exceeding 1 cm (Fig. 13 F), were found. Ostracods are represented by 16 genera and 19 species. Holotypes of eight species of ostracods from the Asselian Stage of Toratau and two holotypes from the Artinskian Stage of the Maly Shikhan, located near Toratau, have been described. The holotypes are kept at the Institute of Geology of the Ufa Federal Research Center of the Russian Academy of Sciences (Ufa). In 2019, new species of trilobite *Brachymetopus (Conimetopus) alekseevi* Mychko were found and described. This was the only find so far.

There are a wide variety of bryozoans. 18 genera and 47 species are known. Finds of fragments of colonies of Early Permian bryozoans on Toratau are confined to light grey limestones. They can be found in fragments and blocks on the mountain top (Fig. 13 I). Bryozoans are found in different types of limestones (massive, bioclastic, dolomitic) of bioherm facies, reef ridge, and detrital sediment accumulation zone. Holotypes of 15 species of bryozoans and the type species of a new genus originate from Toratau. The collection is kept at the Palaeontological Institute of the Russian Academy of Sciences.

The most numerous groups of fossils that can be found on the Toratau are brachiopods (Fig. 13 L), which are represented by 65 species belonging to 40 genera.

Echinoderm crinoids were permanent inhabitants of the slopes of biohermal structures. They formed settlements (underwater "meadows"), often together with bryozoans. The limestones of Toratau are dominated by crinoid stem segments 0.5–1 cm in diameter. The largest fragments were found in Toratau 2 Cave (Fig. 13 H). A teka of crinoid was also found here (Fig. 13 D). Segments of the stems of crinoids were easily transported by currents and could form aggregations in low areas of the relief.

From the detrital limestones filling the Neptunian dike on Toratau, conodonts were identified, represented by five species of *Mesogondolella* and one species of *Hindeodus* sp. This association belongs to the Sakmarian Stage.

So far, teeth of fish from Chondrichthyes, belonging to four orders and five families and including five genera and six species, have been described only from one of the three Shikhans – Toratau. Holotypes of all these species originate from Toratau and are stored in the Palaeontological Museum of St. Petersburg State University.

In total, 216 species of ancient animals have been identified in Toratau, including 38 species whose holotypes originate from Toratau.

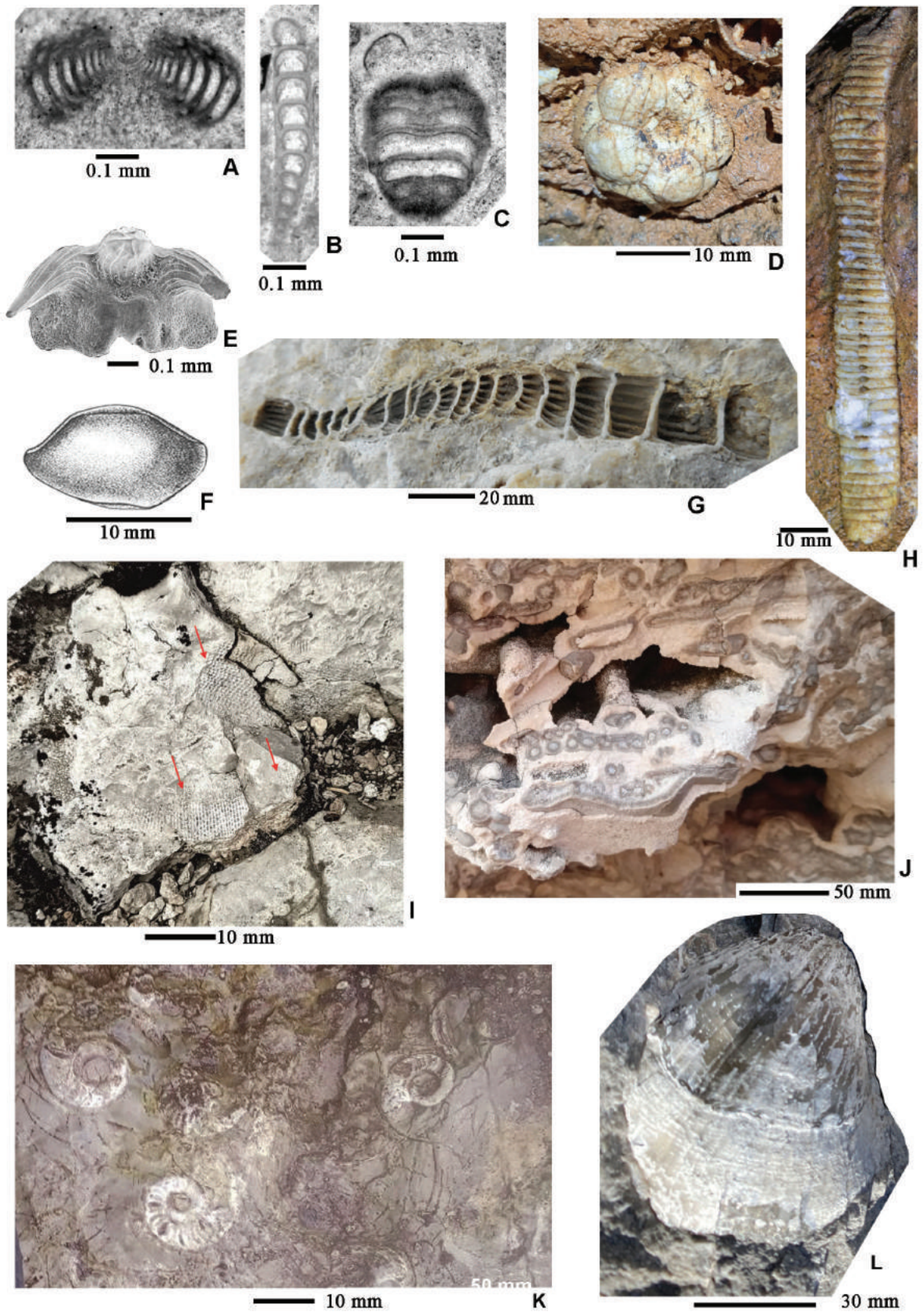


Fig. 13. Palaeontological remains of Toratau.

A-C – foraminifers in thin sections: A – *Postmonotaxinoides horridus* (Lipina), No. 10-1; B – *Nodosinelloides netchajewi* (Tcherdyncev), Toratau, No. 10-3; *Geinitzina magna* Lipina, No. 9-2. **D** – calyx of *Cadocrinus timanicus* Yakovlev, Toratau 2 Cave. **E** – tooth of the cartilaginous fish *Kungurodus obliquus* (Ivanov), occlusal view, PMSPU 109-2. **F** – *Bairdia convexa* Kotschetkova. **G** – *Amplexocarinia* sp. **H** – fragment of a crinoidea stem, Toratau 2 Cave. **I** – fragments of reticulated colonies of fenestratic bryozoans in limestones, excavation on the south-eastern slope of the Toratau. **J** – *Palaeoaplysina* limestone, Toratau 2 Cave. **K** – *Shatoceras umbilicatum* Leonova et Shchedukhin nautilids shells on the mountain top. **L** – *Choristites* sp. Photographers: A–C – T.V. Filimonova; D, G, H, J, K – Sh.I. Muslukhov; F – Kochetkova, Guseva, 1972, Tab. XV, fig. 2a; E – A.O. Ivanov; I – Z.A. Tolokonnikova; K – A.Yu. Shchedukhin; L – A.E. Davydov.

Structural features

The Toratau structure was formed due to its location in the fault zone of the Shikhan uplift, which occurred at the end of the Neogene (Puchkov, 2019). To the south of Toratau, similar carbonate massifs are submerged to a depth of 0.5–1 km. The Ishimbai oil field is timed to them.

The geological structure of Toratau was examined by many geologists (M.F. Mikryukov, D.V. Nalivkin, A.A. Bogdanov, D.M. Rauzer-Chernousova, D.F. Shamov, etc.). However, some issues are not fully covered in the literature and are debatable. D.M. Rauzer-Chernousova noted that the structural position of limestones is determined by the uplift of the Shikhan block along tectonic faults (Bogdanov, 1947) or along a flexure-like bend (Rauzer-Chernousova, 1950). D.F. Shamov considered the structure of the mountain in the form of horizontal layers with a sharply increased thickness of the Asselian deposits on the flat surface of the Carboniferous limestones (Shamov, 1984).

Taking into account the later geophysical data on seismic profiling, which showed the presence of a fault zone in the western part of the Shikhan uplift, the most reliable model is the one presented by A.A. Bogdanov.

It is difficult to determine the bedding elements in the limestones of Toratau. On the one hand, bedding is determined by the alternation of layers with different structures (grainstones, wackestones), and different compositions of the fauna enriched in bryozoans or brachiopods. The shells of brachiopods are clearly visible, usually leached, and layers can be traced through them. On the other hand, the determination of the bedding elements is complicated due to the disturbance of the bedrock outcrops by landslide processes (especially in the western part of the mountain). The sizes of slumped blocks reach several tens of meters, and it is difficult to determine whether the observed layering is in an original position (Fig. 14 a – d).

On the top of Toratau, traces of the once unified levelling surface (peneplain, which levelled the relief) have been preserved. The denudation plain in the Fore-Urals region has been developing from the Jurassic. The levelling of the relief was accompanied by the formation of a weathering crust, which was subsequently eroded. As in Yuraktau, several systems of fractures are developed in limestones – multidirectional fractures that divide the rock into rhomboid-shaped blocks, subvertical fractures of the cleavage of the N-S direction (Fig. 14 f – g), as well as denudation fractures parallel to the slope (Fig. 14 c).

The conclusion about a sharp tectonic rise in the Late Neogene (Puchkov, 2019) is confirmed by observations on relics of karst deposits recorded in the near-top part of Toratau. Here, in the form of horizontal stripes, traces of groundwater standing were established, which produced a karsting effect on the enclosing limestones. As a result,

calcite crusts were deposited in the fractures, typical for cave deposits (Fig. 14). Obviously, this process could be carried out only when the entire carbonate mass was under the surface of the earth at the level of groundwater. The tectonic rise of the block caused a sharp drop in the erosion base and the activation of karst processes. The remains of an ancient palaeokarst system found on the western slope of the mountain in the form of a ruined cave with rusty-brown walls due to staining with iron hydroxides, along with Toratau 1 and 2 Caves in the preroofed part of the mountain, testifies to the ancient, possibly Neogene origin of karst and the neotectonic activation of the Shikhan uplift. Karst crusts and fouling of karst cavities contain relics that testify to the circulation of hydrocarbon-containing fluids in the early stages of the formation of the karst system. Their study by modern research methods will allow to obtain new scientific ideas about the life stages of oil deposits in reef-type deposits (Ishimbai group). An isotope dating attempt will also be made to identify the time of the onset of karst processes in the Urals, which is currently considered Miocene. Mineralized solutions with oil and hydrocarbon gases caused secondary transformations of biohermal limestones: leaching, recrystallization and mineralization. Cavities and fractures in recrystallized limestones are inlaid with drusy calcite and also contain films of degraded bitumen.

Toratau limestones contain Neptunian dikes (Chuvashov et al., 1996; Vennin, 2007). However, there was no exact reference to them, and the morphology of the bodies was also unclear. Several such objects are located in the western and southwestern parts of Toratau. The dikes stretch north-south and north-west. Their material is contrastingly different from the host light organogenic limestones (Fig. 14 e). The formation of dikes occurred in the Sakmarian and Artinskian times during seismic processes, echoes of the Ural orogeny (Gorozhanin and Gorozhanina, 2022).

Fig. 14. Structural features of Toratau.

a – general view of Toratau from the west; b – gently sloping limestone bedding on the preroofed part of the southwestern slope; c – steep occurrence of slipped blocks of layered limestones on the southwestern slope; d – fuzzy gradation layering of bioclastic limestones in the block; e – contact of a Neptunian dike filled with dark grey micritic and crinoid limestone with host light bryozoan limestones; f – system of fractures dividing limestones into rhomboid-like blocks; g – subvertical cleavage fractures on the top of the mountain, oriented in the meridional direction (N-S).

Lithological rock varieties

The main Toratau rocks are bioherm tubiphytes and bryozoan-tubiphytes limestones – boundstones and packstones according to the classification (Danhem, 1962). Among them, lenses of brachiopod shells, interlayers of bioclastic-crinoid packstones and grainstones are observed. Fine-grained mudstones and crinoidal wackestones compose the bodies of Neptunian dikes. Corals and fusulinids are rare in these limestones (Shamov, 1984). Shells of gastropods and nautiloids are often found (Fig. 15).

Limestones with small white vermicelli-like (worm-like) tubes of *Tubiphytes* are the most common in Toratau. It is believed that the first *Tubiphytes*-like organisms appeared at the end of the Moscovian time and existed in the in the Ural Ocean until the end of the Kungurian.

Reef-building organisms in Toratau also include bryozoans that form bryozoan boundstones. The bioherms composed by these organisms have a sheet form and form interbeds in granular varieties of limestones. In them, one can see the remains of primary cavities between the plates and branches of bryozoans, filled with geopetal microgranular (silt) cement, which retained the primary layered structure. The thickness of interlayers of bryozoan boundstones varies from a few centimeters to 1.5 m. The development of lamellar and bushy colonies of these organisms is noted. Characteristic is the development of incrustation cement between bryozoan branches, as well as oncolite fouling.

The layered structure of the rock mass is observed in separate blocks that have slipped in the upper part of the southwestern slope. Cavernous limestone interbeds enriched in leached brachiopod shells stand out among denser fine-grained bioclastic-crinoid limestones. In layered members, a gradational sorting of material is observed, which is typical for storm deposits.

Neptunian dikes intersecting the mass are filled with dark brownish-grey microgranular limestone with numerous white fragments of crinoids.

Bioherm limestones of the massif is characterized in the presence of primary sedimentation voids, the maximum dimensions of which are measured in tens of centimeters. These voids are completely or partially filled with carbonate silt, which is a geopetal material, often with preserved primary layering. The host rocks are intensely recrystallized. Cavities and fractures are encrusted with coarse-grained drusy calcite and also contain films of degraded bitumen. Notes the formation of light incrustation crusts of a concentric structure around the leaching cavities.

The community of organisms observed in the limestones of Toratau is very diverse and exceeds in the number of taxa the inhabitants of all other facies zones of that time. Foraminifera are represented by both “small” forms and rare fusulinids. Fragments of palaeoaplysins plates were found in coarse detrital limestones.

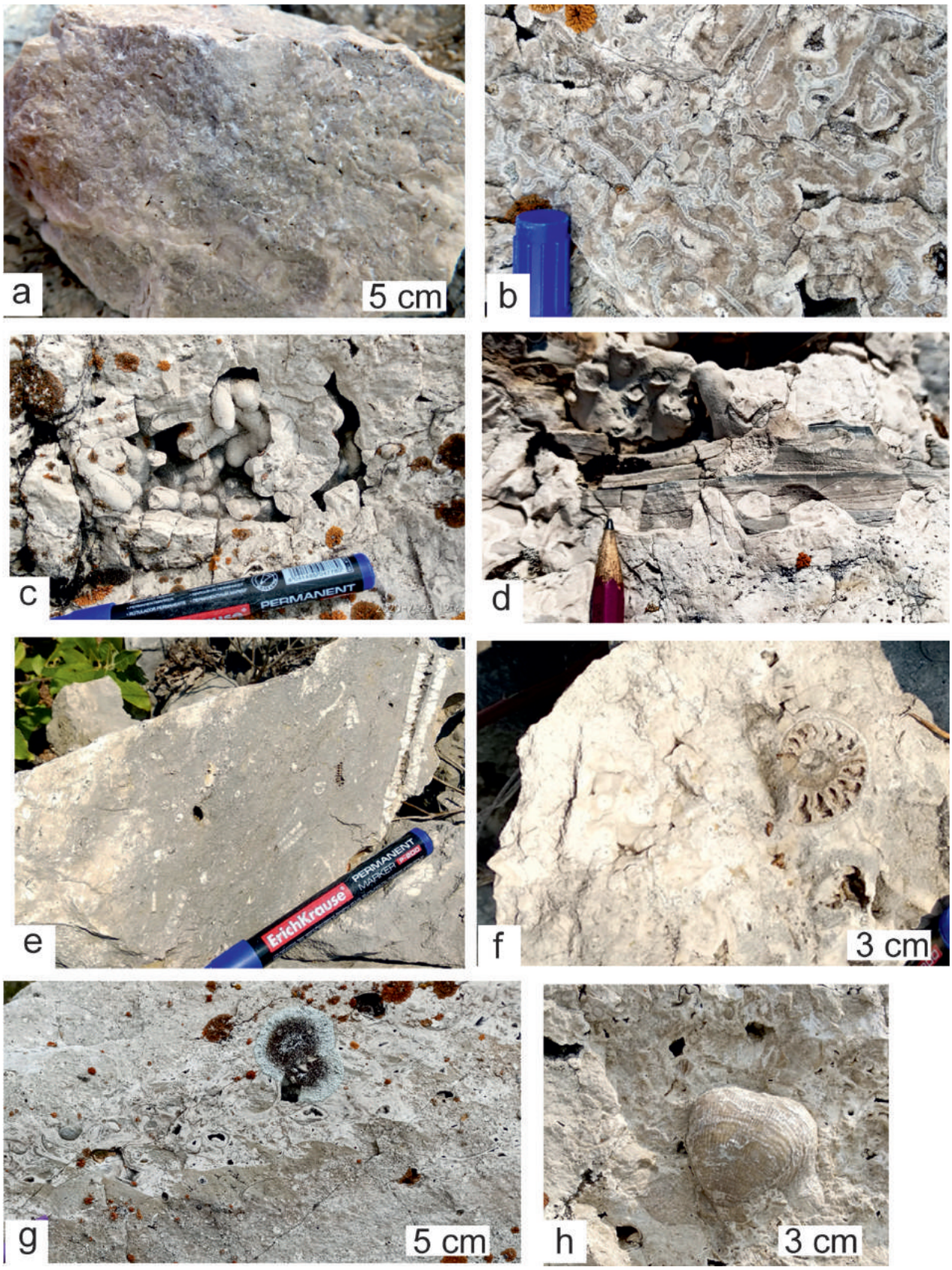


Fig. 15. Lithological types of limestones of Toratau.

a – *Tubiphytes* limestone with white "worms"; b – bryozoans patterned limestone with bryozoans twigs and incrustations; c – leaching cavern with travertine forms (microcave) in bryozoans limestone; d – residual cavity in light recrystallized bryozoans limestone filled with dark grey thinly bedded carbonate mud (water level); e – microgranular limestone with large stems of crinoids (sea lilies); f – ammonite shell in microgranular recrystallized limestone; g – uneven contact between a layer of light grey cavernous brachiopod shell rock and darker microgranular fine bioclastic limestone; h – large shell of a brachiopod in intravital (?) position.

2. Summary description of the Kushtau Shikhan

General georeferencing

The carbonate massif of Kushtau is located 4 km east of the northern outskirts of the city of Sterlitamak. There is the Belskoye village at its northern foot, and the Urniak village near the southeast foot (Fig. 16).

The mass in the form of the N-S ridge with two tops (374.5 m above sea level, relative height 257.9 m) rises on the right side of the Belaya River valley. The length of Kushtau is about 4000 m and the width is up to 1500 m. The area of the shihan projection is about 325 hectares. The western and southern slopes are steep, with sheer cliffs. Unlike other isolated mountains, this Shikhan is heavily forested.

Stratigraphy (Fig. 17, 18).

Outcrops of reef limestones are observed on the southern and western slopes of Kushtau. Its western part is composed of fusulinids, bryozoans, and palaeoaplysins of the Sakmarian Stage. Limestones of the southern and south-eastern slopes of the Asselian and Sakmarian Age contain abundant remains of brachiopods, bryozoans and various molluscs, as well as rare trilobites.

The Asselian Stage is composed of micritic, algal, foraminiferal (often fusulinid) and Tubiphytes limestones. The age is substantiated by fusulinids: the upper part of the Kholodnologian horizon is distinguished, which includes the Schwagerina moelleri – Globifusulina fecunda Zone and the Shikhanian horizon corresponding to the Sphaeroschwagerina sphaerica – Globifusulina firma zone. In addition to index species, *Anderssonites accurata* (Volozhanina), *Dunbarinella paragregaria* (Rauzer), as well as various species of *Rugosofusulinoides* were found here, among which *R. shaktauensis* (Suleimanov) is the most characteristic form of sediments in the upper zone of the Shikhanian and the lower zone of the Tastubian horizons and *Rugosofusulinoides intermedia* is common in the upper intervals of the Shikhanian horizon and throughout the lower zone of the Tastubian horizon (Rauzer-Chernousova, 1950). There is also a frequent presence of Schubertellida – *Schubertella paramelonica* (Suleimanov), *Sch. sphaerica* (Suleimanov), *Sch. kingi exilis* (Suleimanov) in this zone. The thickness of the Stage is over 100 m.

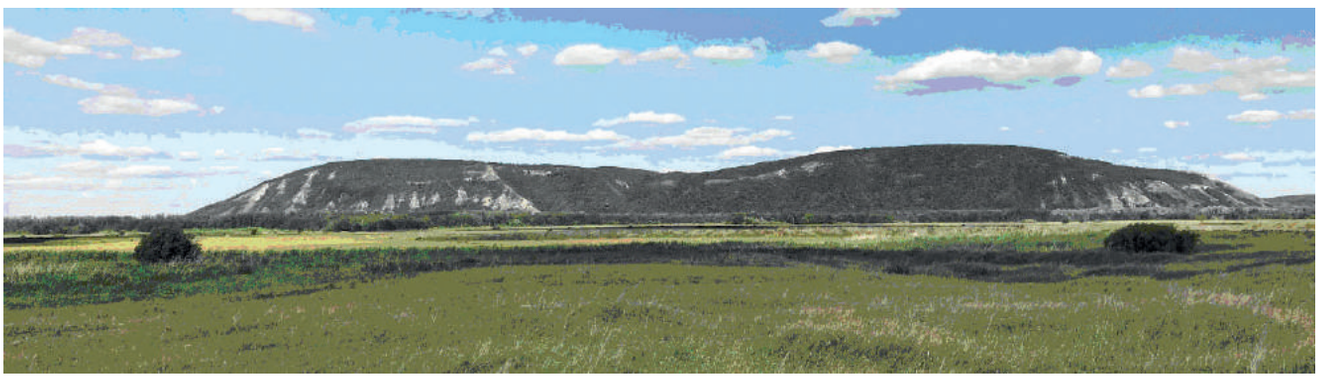
The Sakmarian Stage is represented by the Tastubian and Sterlitamakian horizons. It is composed of fusulinids, crinoids, bryozoans, palaeoaplysins, and algal limestones and contains numerous brachiopods and corals. The Tastubian horizon is represented by the

Sakmarella moelleri fusulinids zone. The Sterlitamakian horizon includes palaeoaplysins (Rauzer-Chernousova, 1949) and fusulinids limestones with corals (Shamov, 1957). *Fusiella excellsa* Suleimanov is among the representatives of the Schubertellida order. *Parastaffelloides* sp., *Reitlingerina* sp. from the Staffellida can be also observed. In limestones of I.V. Khvorova (1942), numerous palaeontological remains represented by bryozoans, brachiopods, palaeoaplysins, crinoids, goniatites, corals (including Amplexocoralla), and gastropods (Belerophon) are described. At the base of the mountain there is dense limestones with *Tubiphytes*, described as aphanitic grey limestones with small white worm-like formations. The thickness of the Stage is 100-150 m.

Outcrops of gypsum-bearing strata of the Kungurian Stage are observed near the Urniak village.

Fig. 16. The Kushtau Shikhan.

The Kushtau Shikhan on Google Earth.



Western slope. Photo by G.A. Danukalova.

North-eastern slope.
Photo by E.I. Kulagina.

Southern slope.
Photo by G.A. Danukalova.

Fig. 16. The Kushtau Shikhan.

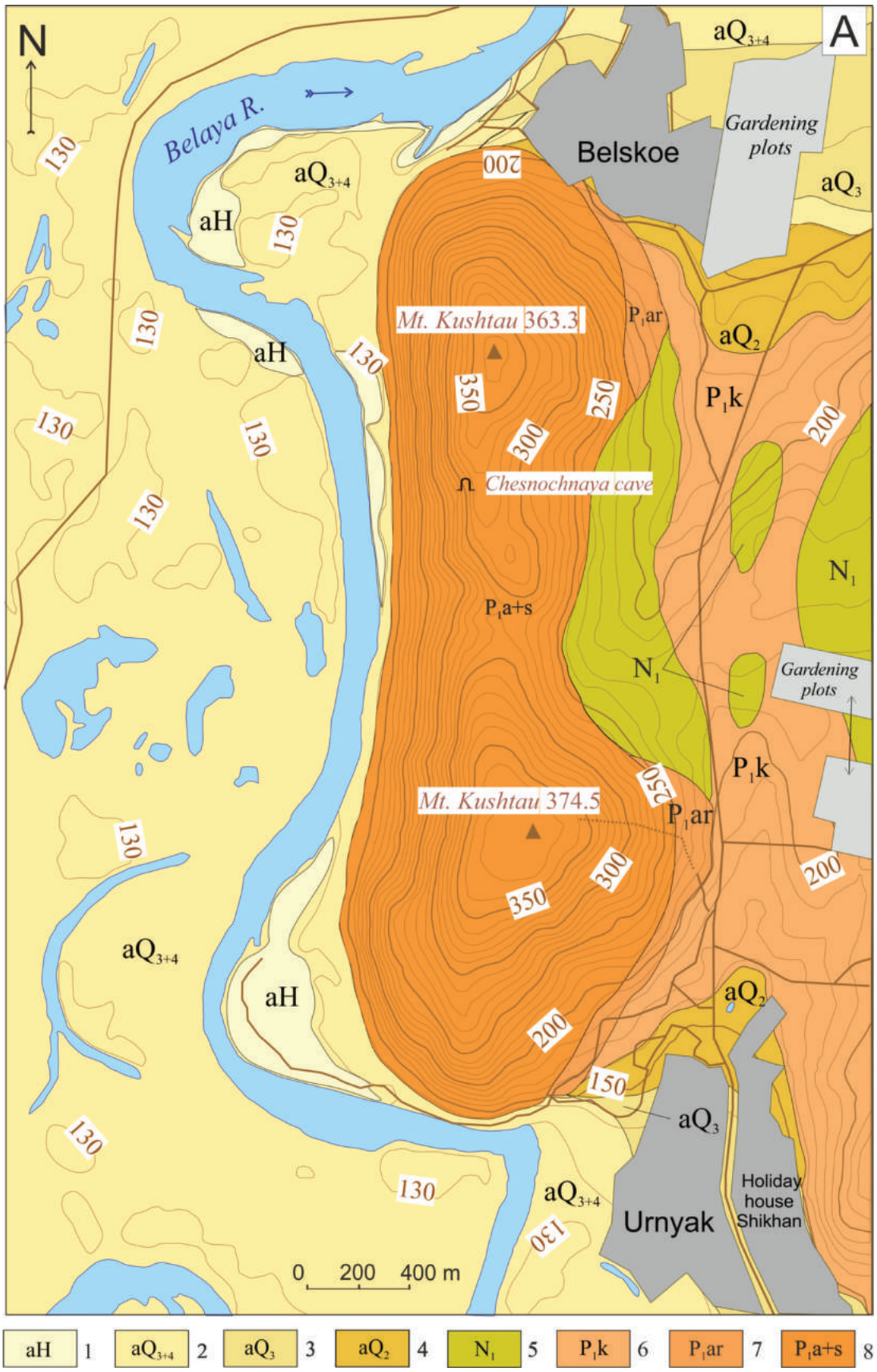


Fig. 17. Geological position of the Kushtau Shikhan.
(Smirnov, 2022, according to Sinitsyn, 1962; Imaev, 1963; Knyazev, 2020; Utaev, 2021).

Legend: 1 – Holocene (alluvium of the low floodplain of the Belaya River valley); 2 – Upper Neopleistocene – Holocene (alluvium of the floodplain and I above the floodplain terrace of the Belaya River valley); Neopleistocene: 3 – Upper (alluvium of II above the floodplain terrace of the Belaya River valley); 4 – Middle (alluvium of the III above the floodplain terrace of the Belaya River valley); 5 – Early Miocene. Cisuralian (Lower) Series of the Permian System; 6 – Kungurian Stage; 7 – Artinskian Stage; 8 – Asselian and Sakmarian Stages (not subdivided).

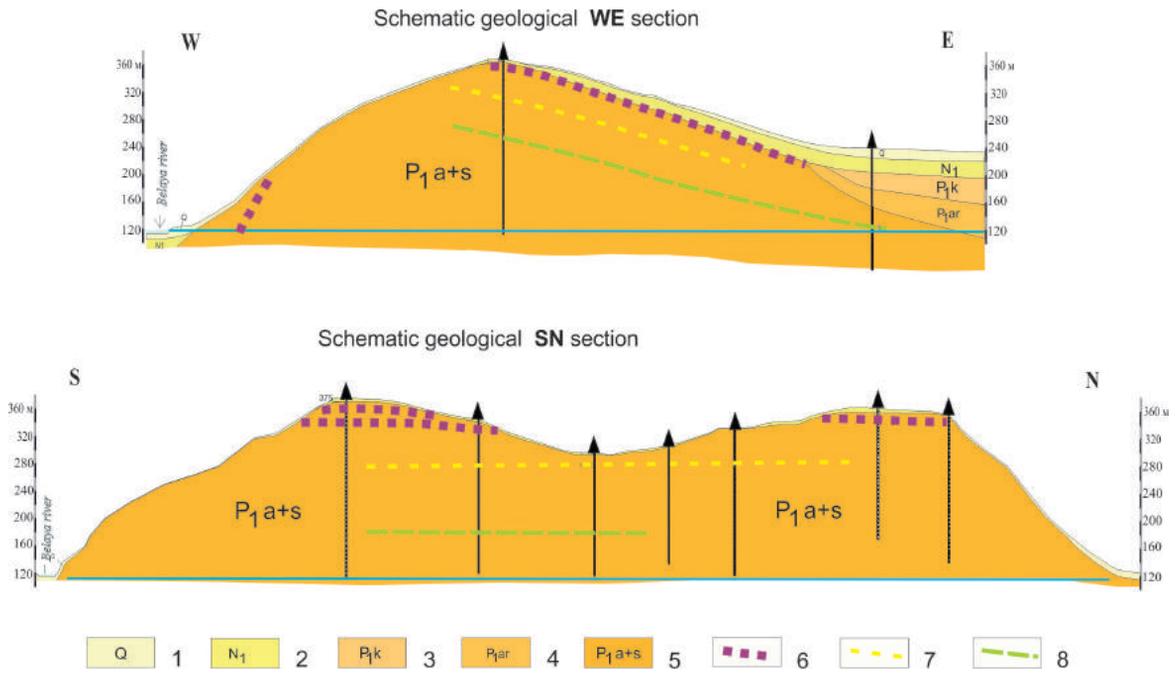


Fig. 18. Geologic cross-sections of the Kushtau Shikhan.

Legend: 1 – Quaternary deposits; 2 – Neogene deposits; 3 – Lower Permian reef limestones of the Asselian and Sakmarian Stages, combined; 4 – Lower Permian limestones of the Artinskian Stage; 5 – gypsum of the Kungurian Stage; 6–8 - marker horizons: 6 – *Palaeoaplysina* bioherm, 7 – layered limestones with colonial corals, 8 – *Tubiphytes* bioherm limestones.

Palaeontology (Fig. 19)

Fossils of eight animal types are currently known on the Kushtau Shikhan, namely sarcodes (foraminifers), sponges, cnidarians (corals, hydroids), arthropods (trilobites), molluscs (ammonoids, nautiloids, gastropods), bryozoans, brachiopods, echinoderms (crinoids). Plants are represented by algae.

The most remarkable find in Kushtau is a large codia alga *Calcipatera* sp. in the borehole core (Fig. 19 A). This algae was found in the Urals for the first time. The core of the Kushtau borehole also contained remains of microscopic calcareous green algae from the Siphonophyceaeclass (Fig. 19 B, C). There are 15 identified species from 11 genera.

In samples from boreholes drilled in Kushtau, as well as in a mine working on the south-eastern slope of the mountain, interlayers and lenses of fusulinids limestones can be observed (Fig. 19 F). Fusulinids play a very important role in the dating of rocks, since biozones are clearly distinguished using them. Representatives of the order Schwagerinida, genera *Anderssonites, Dunbarinella, Globifusulina, Grozdilovia,* several species of *Rugosofusulinoides* predominate. These genera are isolated from heterogeneous generic taxon *Pseudofusulina* s.l., to which they previously belonged. Foraminifera of the order Shubertellida are common. A total of 15 species of seven genera were found. Various small foraminifera are found in thin sections from borehole samples. They belong to the orders Hemigordiopsida, Archaediscida Endothyrida, Paleotextulariida, Lagenida. In total, 40 species of 20 genera were identified.

Of the corals, solitary *Amplexocarinia* and colonial rugosas have been found so far (Fig. 19 J). *Palaeoaplysina* formed bioherms. They were found in all boreholes and in a mine working in the upper part of the south-eastern slope.

Trilobites are represented by one species, as well as in Toratau and Yuraktau (Fig. 19 F).

Of the ammonoids, two species of two genera are known. Of non-ammonoid cephalopods, two species of two genera were also found (Fig. 19 K). 8 species from 7 genera of gastropods are known.

There are numerous brachiopods (Fig. 19 G, H). They belong to 39 species of 25 genera from the orders Terebratulida, Productida, Rhynchonellida, Athyridida, Spiriferinida, Spiriferida, Orthotetida, Orthida.

7 species from 6 genera of bryozoans were found. Bryozoans, together with algae and palaeoaplysins, were the main bioherm builders.

There are crinoidal limestones (Fig. 19 D).

So far, about 120 species from 80 genera of fossil organisms have been found in Kushtau. Small foraminifera and brachiopods are leaders in the number of species.

Structural features

The Kushtau mountain is composed of the rocks of Lower Permian limestones, the structure of which was little known, since there are no published data on the mountain. According to unpublished data by I.V. Khvorova, who mapped Kushtau in 1942, limestone layers form an asymmetric anticline fold with a steep western flank and a gentle eastern flank, which plunges under the alluvial deposits of the Belaya River (Bogdanov, 1947).

Field research conducted by V.M. Gorozhanin and E.N. Gorozhanina in 2022, brought new facts regarding the tectonic structure of Kushtau (Fig. 20 a–f). In the eastern, southern, southwestern, and western parts of the mountain, adjacent to the southern peak (374.5 m), the bedding has a gentle eastern dip (azimuths 90–100°) and small (25–20°) dip angles. At 53°71'N. and 56°07' E, on the western slope in the northern part of the massif (south of the Belskoye village), the bedding of bioherm (palaeoaplysins) limestones has a steep western dip (azimuth 280°, angle 65°). Despite the fact that the measurements were made on bedrock outcrops, taking into account the analysis of layering, determined by the location of palaeoaplysins plates in the rock, there is no complete confidence in the reliability of the western dip of the layers, since they can reflect the dip of the layers in a large, sloping block of rocks formed as a result of collapse or landslide. Apparently, the western dips in bedding obtained by I.V. Khvorova, were in this part of the Kushtau mountain. In any case, it can be stated that the tectonic structure of the entire mountain is a monocline, slightly inclined to the east, and in the north-western part we observe a block of rocks with a steep western dip. Such a picture reflects the general structure of Kushtau as a monoclinal stratum, disturbed in the zone of tectonic uplift-slip. Drilling data demonstrate oblique bedding in fusulinids and crinoid-bioclastic grainstones.

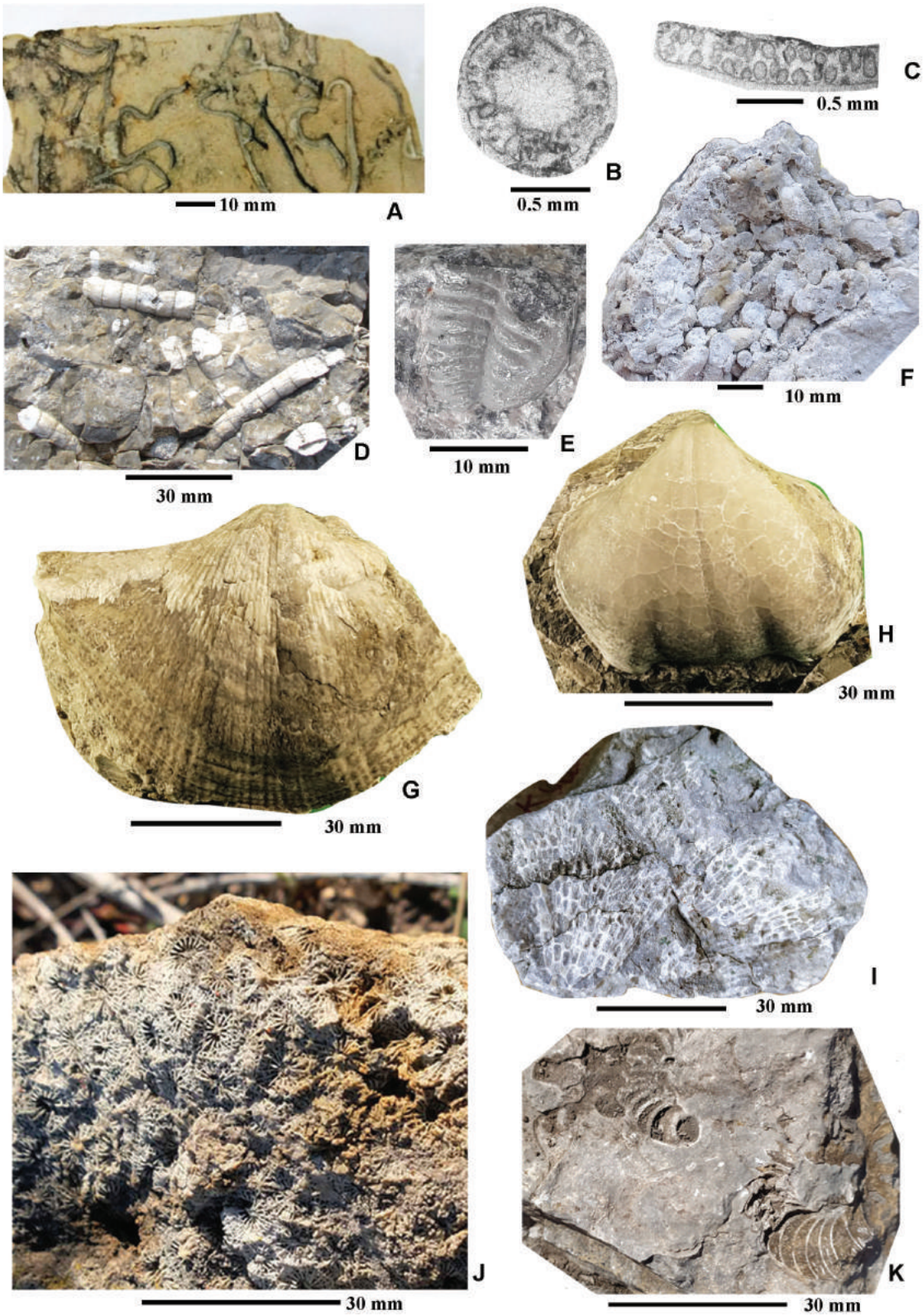


Fig. 19. Fossil remains of the Kushtau Shikhan.

Legend. Fig. 19. **A** – remains of the calcareous algae *Calcipatera* sp., borehole 21, Kushtau, depth 221 m. B, C – calcareous algae in thin sections: **B** – *Gyroporella clavata* Tchuvashov, 1974, cross section, borehole 30 Kushtau, 66.6 m; **C** – *Pseudoepimastopora likana* (Kochansky et Herak) H. Flügel, 1963, longitudinal section of the thallus, ibid. **D** – crinoid limestone with fragments of crinoid stems, south-eastern slope, sample T2. **E** – pygidium of *Paraphillipsia* sp. trilobite, Geological Museum of School 33, Sterlitamak. **F** – fusulinids limestone from the core of borehole 35 Kushtau, 185.3 m. G, H – ventral valves of brachiopods from the south-eastern slope: **G** – *Neospirifer cameratus* (Morton, 1836), **H** – *Meristorygma panduriformis* (Kutorga, 1844). **I** – fenestratic bryozoan *Manchineela* sp., south-eastern slope, sample T5-2. **J** – colonial rugoses, south-eastern slope, sample T 5. **K** – cephalopod remains in rock, south-eastern slope, sample T2-1. Photographers: A – Gorozhanin, 2019, fig. 6g; B, C, D – E.I. Kulagina; – E – G.A. Danukalova; F – N.D. Sagdeeva; G, H – A.E. Davydov; I, J, K – E.Yu. Bashlykova.

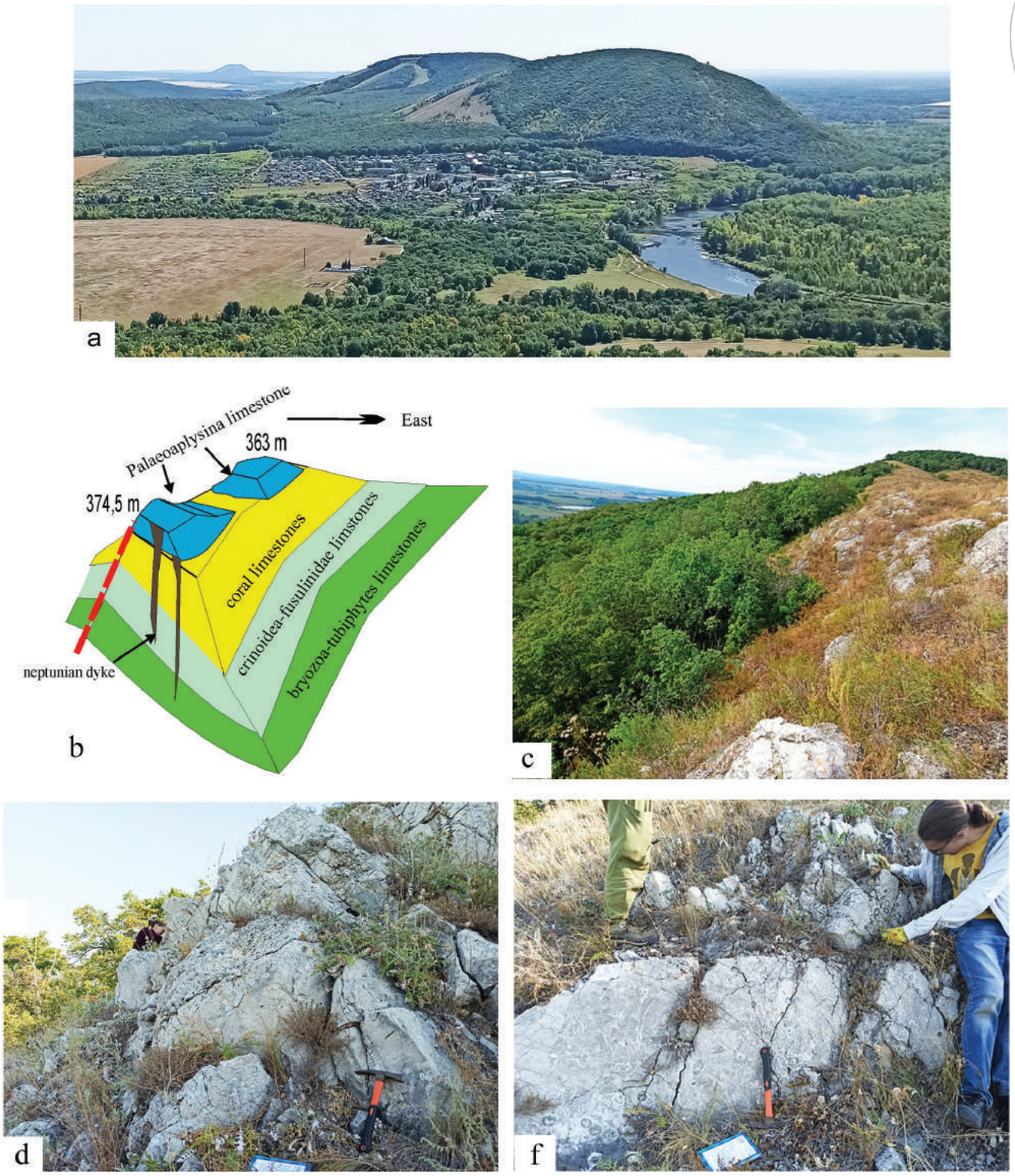


Fig. 20. The structure of the Kushtau Shikhan.

a – general view of the mountain from the north (photo by E.N. Gorozhanina); b – model of the Kushtau structure; c, d, e – bedrock outcrops of limestones: c – limestone beds in the near-top part of the mountain, gently inclined to the east, d – *Palaeoaplysina* limestones on the western slope of the northern extremity of Kushtau with a steep western dip in layering, e –fractures dividing limestones into rhomboid-shaped blocks (photo by V.M. Gorozhanin).

Lithological varieties of rocks

The rocks of the Kushtau massif are composed mainly of biohermal limestones formed by skeleton organisms such as bryozoans, *Tubiphytes*, corals, *Palaeoaplysina*, combined with various bioclastic (detrital) varieties.

The limestone lithology of Kushtau is described using the core of exploration boreholes with a depth of 130 to 250 m drilled by "Syrievaya Kompaniya" Joint Stock Company. The sections of the boreholes show that Kushtau is composed of a layered sequence of alternating biohermal and bioclastic limestones (Sagdeeva, 2022). A layered structure and steep occurrence of the layers are observed. From bottom to top, along the section, there is a gradual change of *Tubiphytes,* bryozoan-brachiopod, crinoid-polybioclastic, fusulinids, coral, and *Palaeoaplysina* (Fig. 21 a–g).

Tubiphytes (algae or *Shamovella*) limestone (Fig. 21 a), according to the classification (Danhem, 1962), belong to boundstones and packstones, and are represented by grey, fine-grained, massive limestones containing small white tubes ("worms") – relics of organisms of the problematic genesis, previously referred to as blue-green algae (Maslov, 1950). *Shamovella* limestones are one of the common rocks in the massif, especially at its base. Relics of organisms are cemented by fine-grained carbonate. Limestones of this type form layers up to 2 m thick. In bioclastic varieties, they occur together with fragments of bryozoans, foraminifer's shells, and fragments of crinoid stems.

Bryozoan limestone. Dark grey boundstones, form clearly defined uneven layers, usually with incrustation crusts (Fig. 21 b). Spot like interlayers with bryozoans 0.1–0.2 m thick are characterized by discontinuous occurrence among light grey fine-grained bioclastic limestones.

Palaeoaplysina **limestone.** Grey, fine-grained limestone containing fragments of plate-like palaeoaplysins, subvertical, predominantly sloping (Fig. 21 c). There are two varieties of palaeoaplysins plates – palaeoaplysins-detrital and palaeoaplysins-incrustation. Palaeoaplysins-detrital limestones are composed of numerous fragments of palaeoaplysins plates and fragments of other diverse fauna, such as brachiopods and crinoids. Organic residues are cemented with fine-grained grey cement. The thickness of the layers is up to 4 m. Palaeoaplysins-incrustation limestone variation is composed of up to 90% of the accumulations of fragments of inlaid palaeoaplysins plates, reaching up to 2 cm in thickness. The organic remains are cemented by grey, fine-grained carbonate. The thickness of the interlayers is up to 0.3 m. Palaeoaplysins bioherm was also described by I.V. Khvorova. She estimated the thickness (two packs of 30 m each) of biohermal limestones separated by detrital varieties. The total thickness of palaeoaplysins is a few meters, in some cases reaching a few tens of meters.

Corals limestone. Light grey, fine-grained bioclastic-foraminiferal limestone containing rare, large relics of solitary and colonial corals. Colonial corals occur mainly in their life position (Fig. 21 d). The diameter of the colonies is from 5 to 20 cm. Fragments of single corals in the bioclastic foraminiferal matrix were removed within the sedimentation basin as a result of active hydrodynamics.

Foraminifers limestone – grainstone (Fig. 21 e). Grey fine-grained limestone, more than 80% composed of clusters of fusulinid fossils. It is the most common type of massif rock. Rocks of this type form layers from 20 cm to 1.5 m thick, often interbedded with other types of limestone. There are mixed foraminiferal-tubiphytes or foraminiferal-crinoid limestones – packstones and grainstones with a lower content of foraminifers in the rock (from 20 to 50%). Whole shells are densely cemented with fine-grained carbonate, less often with fine detritus. A small amount of bioclastics is observed, i.e., fragments of bryozoans, crinoids, or shells of small brachiopods. A layered structure and a steep occurrence of interlayers with a thickness of 20 cm to 1.5 m are observed.

Crinoids-brachiopods limestone. Packstone consists of fragments of crinoid segments (Fig. 21 f) and brachiopod shells, and rarely, foraminifera fossils. The thickness of layers is from 0.3 to 2 m.

Fine bioclastic limestone. Grey fine-grained limestone, where more than 50% of the massif is composed of carbonate cement. Detritus is represented by small fragments with various combinations of different types of fauna. Interlayers among palaeoaplysins or bryozoan limestones have a continuous thickness of up to 1 m.

In the section of borehole 21, drilled in the central part of the massif, two distinct carbonate sequences can be distinguished from top to bottom: the upper sequence is composed of limestones with large palaeoaplysins fragments. These organisms, along with bryozoans and corals, are considered the main reef builders in the Early Permian Age. The thalli of these organisms are immersed in the carbonate groundmass of the aphanitic type and are probably in an intravital position. They compose two bioherm layers 20 m thick, which are separated by a small layer of granular carbonates – grainstones. The total thickness of two bioherm layers reaches 42 m. The bioherm layer overlies a carbonate sequence composed of layered limestones – crinoid-bioclastic grainstones. The lower sequence is characterized by organic fossils typical of the Upper Carboniferous-Lower Permian rocks of the western side of the Fore-Uralian Foredeep – bryozoans, fusulinids, brachiopods, and crinoids. Limestones of the lower sequence can be attributed to the facies of shallow-water granular-layered carbonate shelf deposits with active hydrodynamics (Gorozhanin and Gorozhanina, 2019). In the core of borehole 21, relicts of the calcipatera algae (*Calcipatera* sp.), previously found only in the Lower Permian limestones of the Prirazlomnoye uplift, an extension of the Varandey-Adzvinskaya zone in the Pechora Sea, were found (Gorozhanin and Gorozhanina, 2018). This is a large, macroscopically well-distinguished phylloid algae reaching 10–20 cm in length with a leaf thickness of 1–2 mm. Its presence indicates the existence of a carbonate shelf of significant extent.

In all the boreholes studied, Neptunian dikes are observed – specific vein-like bodies consisting of layered and detrital carbonate material (Fig. 21 g), which were formed at the sedimentation stage by filling open vertical fractures. Subvertical dikes filled with black carbonate material are observed in all boreholes. The thickness of the dikes varies from 3 mm to 40 cm. Large dikes often contain breccias with angular fragments of the host carbonate rock. The formation of this type is associated with the displacement of large limestone blocks.

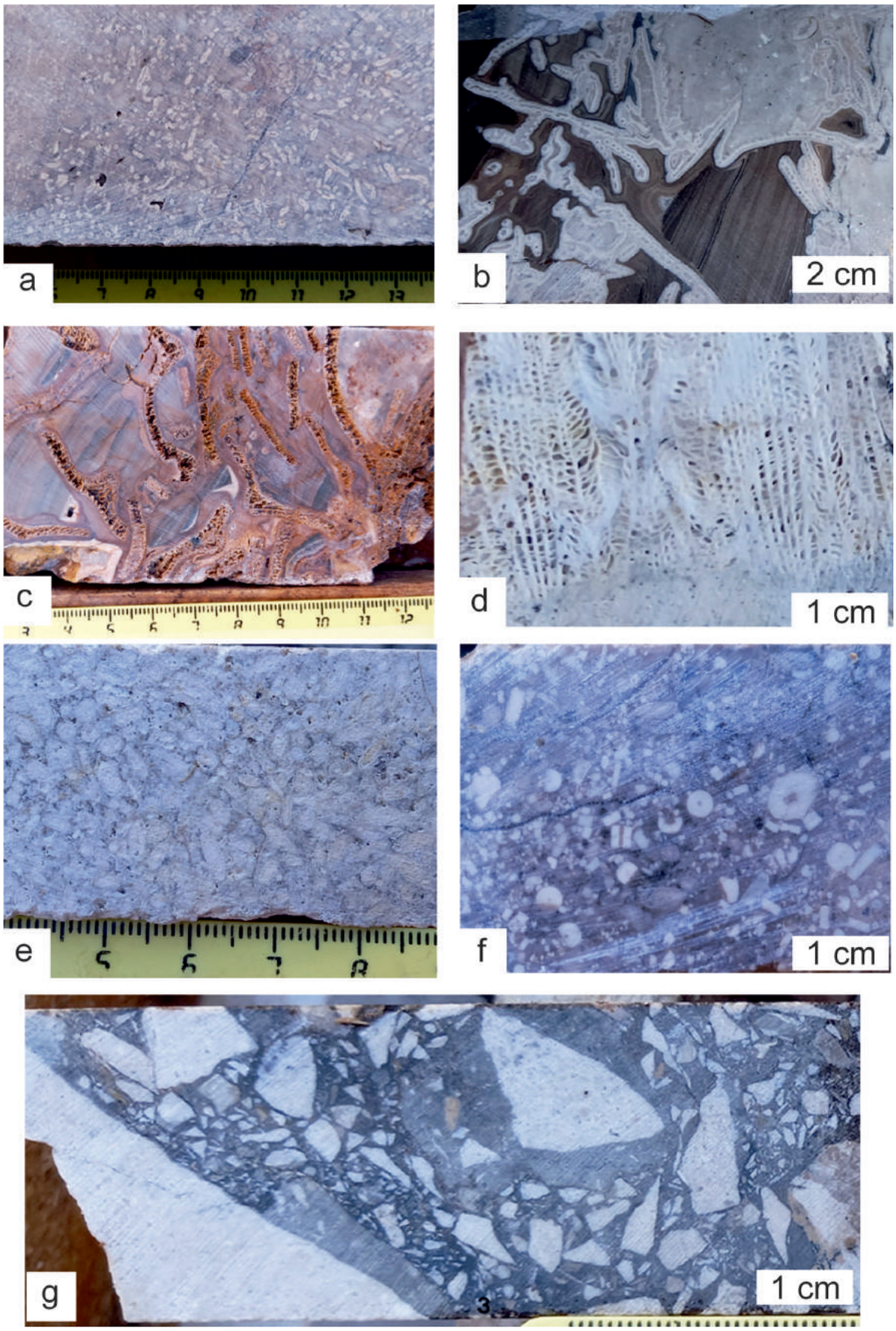


Fig. 21. Lithological varieties of limestones of the Kushtau Shikhan.

Legend. Fig. 21: a – *Tubiphytes* (algae) limestone – boundstone; b – bryozoans limestone – boundstone; c – Palaeoaplysins; d – corals limestone – framestone; e – fusulinides (foraminiferal) limestone – grainstone; f – crinoid limestone – packstone; g – Neptunian dike, filled with sharply angular limestone breccia with dark grey micrite matrix.

3. Summary description of the Yuraktau Shikhan

General georeferencing

The Yuraktau carbonate massif is located 1.4 km north of the Belskoye village and 1.25 km west of the Yuraktau village, on the right bank of the Belaya River (Fig. 22). It is the northernmost Shikhan from a chain of isolated mountains stretched from south to north east of Sterlitamak.

The Yuraktau Shikhan is a picturesque dome-shaped mountain rising among the floodplain of the Belaya River. Its height above the Belaya River valley is 221.8 m, and 338.4 m above sea level. Its length is 900 m and width – 850 m. The western slope of the isolated mountain is cut by a vertical cliff about 100 m high from the foot. The northern slope is forested. The southern and south-eastern slopes are open, steep, cut into ridges, along which one can climb up to the two-top ridge. The Yuraktau projection area is about 64 hectares. Within the boundaries of the buffer zone, under the eastern slope of the Shikhan, there is a unique sphagnum bog in a karst funnel; from the north-west, the Shikhan is washed by the Uleidel Lake, from the south – by the Ulekul Lake. Both lakes are oxbows of the Belaya River.

Stratigraphy (Fig. 23, 24).

The Yuraktau massif is composed of carbonates mainly of the Sakmarian Stage (Tastubian horizon). At the south-eastern foot of the mountain, there is a thick layer of reef shallows, composed of crinoidal, *Tubiphytes*, bryozoan patterned limestones with lenses of brachiopod banks and bioherms. When climbing to the top of the mountain, an alternation of *Tubiphytes* limestones and bryozoan bioherms is observed, which are replaced up the slope by *Palaeo-aplysina* bioherms. The presence of horizontal layers of micritic (non-reef) limestone with radiolarians and ammonoid embryonic shells was established. The presence of micritic layers testifies to frequent stops of reef formation processes in the final stage of the life of the structure and to the turbulent tectonic regime of the site (frequent change of uplift and submersion). One of the sights of Yuraktau is the coral path, which runs between the eastern and western tops of the mountain. It runs along the rocks of the Tastubian horizon of the Sakmarian Stage with massive Rugosa colonies. The southwestern part of the massif is disturbed by a tectonic fault, along which zones of crushing and secondary limestone dolomitization are developed. In the walls of karst voids and leaching caverns, relics of black bitumen, traces of the former presence of oil, are visible.

Algae, fusulinids, small foraminifers, corals, bryozoans, ammonoids, nautiloids, and brachiopods are known from fossil remains at Yuraktau.

On the ledge of the lower (first) quarry, bioherm bodies composed of *Tubiphytes* limestones are exposed. *Tubiphytes* are small problematic organisms, conventionally classified as waste products of algae. There are numerous banks of brachiopods, skeletal remains of corals, shells of nautiloids and ammonoids. The remains of bryozoans are numerous in thin sections of limestones.

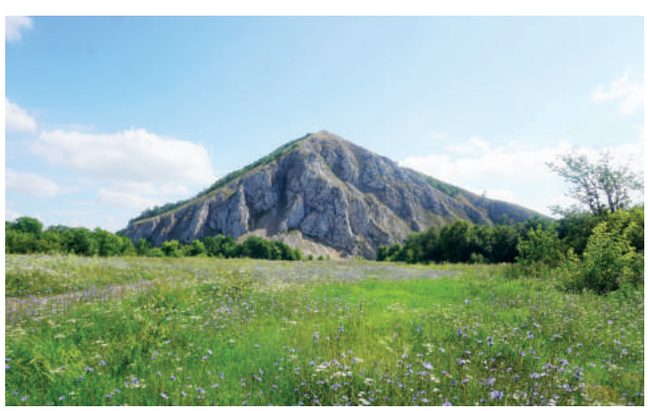
Fig. 22. The Yuraktau Shikhan.

The Yuraktau Shikhan on Google Earth.

Southern slope. Photo by E.I. Kulagina.

Eastern slope. Photo by G.A. Danukalova.

North-eastern slope. Photo by G.A. Danukalova.



Western slope. Photo by G.A. Danukalova.

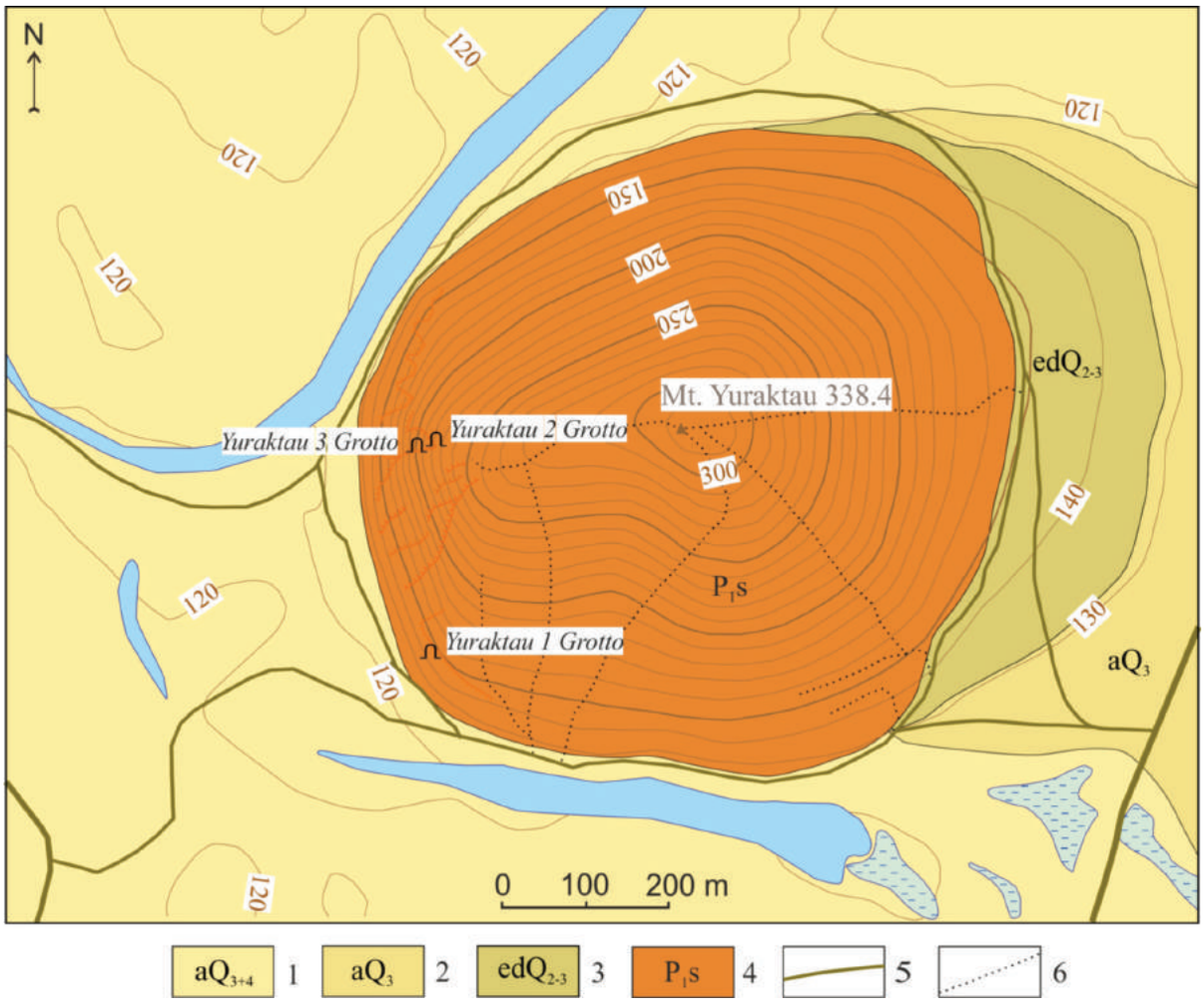


Fig. 23. Geological position of the Yuraktau Shikhan (with grottoes).
(Smirnov, 2022, according to Sinitsyn, 1962; Imaev, 1963; Knyazev, 2020; Utaev, 2021).

Legend. Stratigraphic subdivisions: 1– upper Neopleistocenepart – Holocene (alluvium of the floodplain and I above floodplain terrace of the Belaya River valley); Neopleistocene: 2– upper part (alluvium of the II above floodplain terrace of the Belaya River valley); 3– upper and middle parts, combined (eluvial-diluvial deposits at the foot of the Yuraktau Shikhan slope); 4– Sakmarian Stage of the Cisuralian (Early) Epoch of the Permian System. Communication routs: 5– roads; 6– hiking trails.

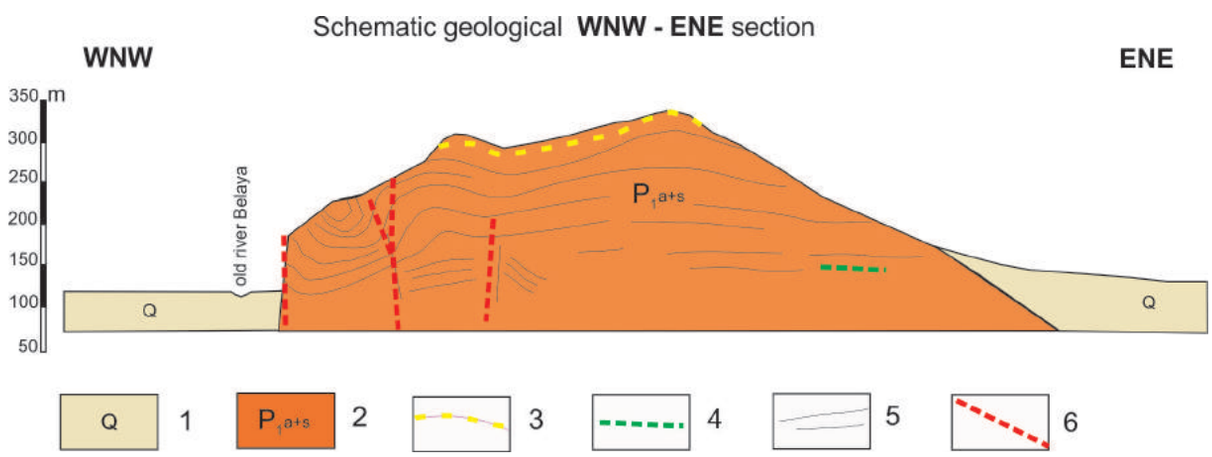


Fig. 24. Geologic cross-section of the Yuraktau Shikhan (according to V.M. Gorozhanin).

Legend: 1 – Quaternary deposits; 2 – Lower Permian reef limestones of the Asselian and Sakmarian Stages, combined; 3–4 – marker horizons: 3 – limestones with colonial corals, 4 – *Tubiphytes* bioherm limestones; 5 – layering; 6 – tectonic disturbances.

Palaeontology (Fig. 25)

Eight types of animals (fossils) were found in the Yuraktau Shikhan, namely sarcodes, sponges, cnidarians, arthropods, molluscs, bryozoans, brachiopods, and echinoderms. Of the plants, only microscopic tubephytes are known, which are conventionally attributed to algae (Fig. 25 A). They form small bioherms, which can be observed in the ledges on the southern slope. *Tubiphytes* are also found in different types of limestones on all slopes of the mountain.

Of the sarcodes, there are Foraminifera class, which belong to the order Fusulinida (Fig. 25 B, C) and small foraminifers of the orders Parathuramminida, Hemigordiopsida, Archaediscida Endothyrida, Paleotextulariida (Fig. 25 D), Lagenida. In total, 42 species of 24 genera were identified in Yuraktau, of which fusulinids are represented by 15 species of 7 genera, and small foraminifera by 27 species of 17 genera.

Corals are numerous in Yuraktau. Colonial rugoses form a ridge on Yuraktau, along which the trail passes (Fig. 25 L). Single rugoses are also found here (Fig. 25 I). Isolated corals belong to the genera *Timania* and *Amplexocarinia*, colonial corals belong to the genera *Protowentzelella, Kleopatrina* and *Protolonsdaleiastraea*. 21 species of 15 genera of corals were identified. Corals often form bioherms together with *Palaeoaplysina* (Fig. 25 K).

Trilobites are rather rare fossils for the Permian period; nevertheless, small pygidia are found in Yuraktau (Fig. 25 J).

Of the ammonoids in the Yuraktau massif, three species of three genera of the Asselian and Sakmarian complex are known. Remains of ammonoid shells can be observed on the first ledge of the quarry in the south-eastern part of the mountain (Fig. 25 H).

Of the non-ammonoid cephalopods, nautiloids and orthoceratoids were found, which are represented by four species of four genera.

Gastropods are commonly found as shell impressions of *Bellerophon* (Fig. 24 F), *Stegocoelia, Naticopsis, Ananias, Porcellia, Nemaspira, Eirlysia*. Their finds are attributed to brachiopod-bryozoan packstones with rare *Tubiphytes* on the southern slope of the Shikhan.

In terms of the number of brachiopod species (Fig. 25 G), the Yuraktau Shikhan surpasses all other Shikhans. The number of species reaches 72 and genera – 43. They are represented by nine orders: Terebratulida, Rhynchonellida, Productida, Spiriferida, Spiriferinida, Orthotetida, Orthida, Chonetida, Athyridida. Productida (30 species) and Spiriferida (18 species) predominate. Only in Yuraktau, 5 species of rhynchonellids were found, in contrast to other Shikhans, where only one species is known. *Camerisma sella* (Kut., 1844), *Brachythyris ufensis* (Tshern., 1902), *Orthotichia supracarbonica* (Tschern., 1902), *Marginifera (?) punctifera* Geras., 1929 were described with the data obtain from the Yuraktau Shikhan.

Of the limestones of the Yuraktau Shikhan, 18 species of bryozoans belonging to nine genera were described. Two holotypes originate from this Shikhan; the collection is kept at the Palaeontological Institute, Russian Academy of Sciences (Moscow). The tangential section of one of them is shown in Figure 25 E.

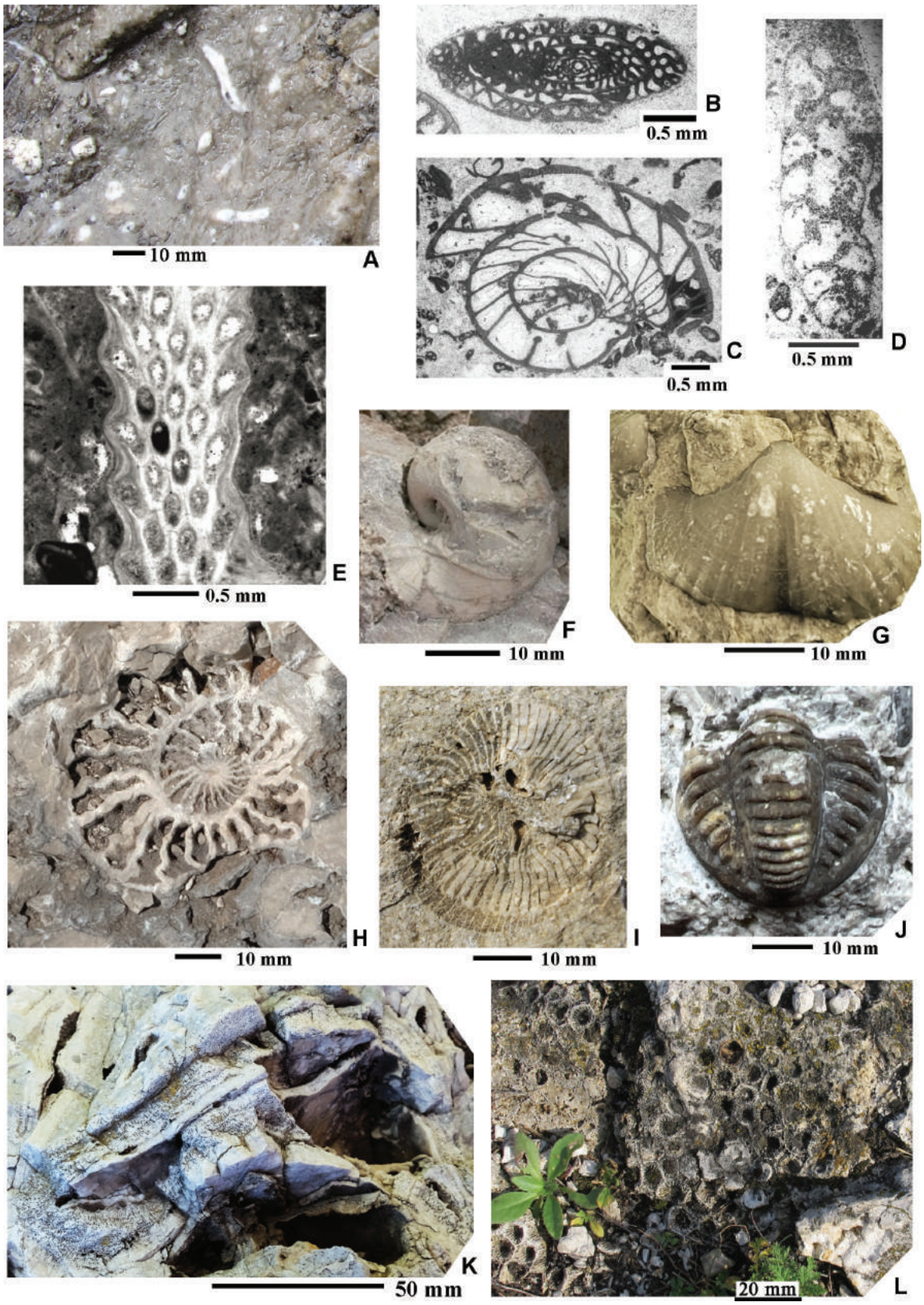


Fig. 25. Fossil remains from the Yuraktau Shikhan.

Legend. Fig. 25. **A** – Limestone with *tubiphytes*, lower ledge of the quarry. B – D – Foraminifers in thin sections: **B** – *Dunbarinella (= Pseudofusulina* s.l.*)* ex gr. *gregaria* (Lee), sample U01; **C** – *Schwagerina* sp., sample U01; **D** – D*eckerella media bashkirica* Morozova. **E** – *Shulgapora soshkinae* (Schulga-Nesterenko, 1952), holotype PI No. 613/1096, tangential section, Sakmarian Stage. **F** – Gastropoda *Bellerophon* sp., southwestern slope. **G** – Brachiopoda *Elinoria rectangula* (Kutorga, 1844), ventral valve, south-eastern slope. **H** – ammonoid shell cut, ledge of the first quarry. **I** – Solitary *Timania coral*, southwestern part, sample U01. **J** – Fragment of trilobite (pygidium) *Kaskia ? roemeri* (Moeller). **K** – bioherm limestone with Tabulatomorpha corals, Yuraktau, ledge 2 of the quarry. **L** – coral colonies on the coral path. Photographers: A, B, C, I, L – E.I. Kulagina, D – T.V. Filimonova, E – Z.A. Tolokonnikova, F, J – A.V. Mazaev, G – A.E. Davydov, H, K – E.Yu. Bashlykova.

In total, more than 160 fossils speciesbelonging to 105 genera were identified in Yuraktau. From this Shikhan, two species of corals and two species of bryozoans were described, the holotypes of which are kept at the Palaeontological Institute of the Russian Academy of Sciences, Moscow.

Structural features

According to the general opinion, the structure of the Yuraktau Shikhan is determined by the Lower Permian organogenic limestones occurring monoclinally (Bogdanov, 1947; Chuvashov et al., 2014). The structure of the sedimentary strata is quite complex. The published data on the structure of Yuraktau are ambiguous. Fuzzy layering, intense fracturing, tectonic fragmentation, uneven leaching and recrystallization, karst processes make it difficult to determine the primary relationships of reef facies.

V.M. Gorozhanin and E.N. Gorozhanina (Institute of Geology of the Ufa Federal Research Center of the Russian Academy of Sciences) measured the bedding elements in different parts of the massif (western, southern, northern). In the western part, the massif has a steep sheer cliff about 100 m high, divided by tectonic steeply dipping fractures (Fig. 26 a, b). The western dip of bedding (or rock jointing?) is only in the southwestern part of the mountain, where an angular unconformity is also observed (Fig. 26 c, d). By tracing a layer of fusulinids limestones, which contain numerous colonies of corals (coral path) in the near-top part of the mountain, one can also assume its western dip, disturbed by numerous undulations.

In the southwestern and southern parts of the massif, a gentle southern dip of limestone layers is observed (Fig. 26 f, g, h) with an average value of dip Azimuth of 180 and angle of 20–30. On the surface of the layers in the southwestern part (Fig. 26 g), there are rhomboid-shaped fractures indicating shear stresses (Fig. 26 e).

Fissures filled with a dark matrix and brecciated limestones stand out in particular, which are diagnosed as Neptunian dikes (Fig. 26 i). They were formed in the Late Artinskian time (Chuvashov, 2014) as a result of the fragmentation of the massif during syncollisional seismic processes (Gorozhanin and Gorozhanina, 2019).

In the post-Permian time, reef deposits were buried under a layer of sediments, and about 5 million years ago, the Shikhan block was brought to the surface of the Earth as a result of neotectonic stresses. There is a predominance of cleavage fractures of the near N-S strike (general Ural meridional cleavage) and diagonal fractures indicates the near E-W direction of compressive stress during the outcrop of the Shikhan block and its fragmentation into separate massifs by echelon fractures.

All of the above defines the general structure of Yuraktau as a monoclinal layer of reef deposits, disturbed in the zone of tectonic uplift-slip.

Lithological rock varieties

The uniqueness of the Yuraktau Shikhan is confirmed by the peculiarities of its geological structure, since a part of a huge reef system has been brought to the surface, where it is possible to observe and study reef biocenoses with various fauna. In accordance with the predominant type of faunal remains, limestones are subdivided into *Tubiphytes (Shamovella)*, bryozoans, brachiopods, crinoids, fusulinids-crinoids, hydractinoids (*Palaeoaplysina*), and coral varieties (data from E.D. Soshkina). Due to the complex structure of Yuraktau, their distribution in the section has not been precisely established and is considered irregular or patchy.

Various types of limestones are present in the scree at the foot of the western steep slope of the mountain. In terms of the nature of the faunal remains (bioclasts) and the host matrix ratio, according to the classification (Danhem, 1962), there are rudstones (coral, bryozoans and *Tubiphytes*), boundstones and framestones (coral and bryozoan frame limestones), grainstones (crinoid and fusulinids granular limestones) and bioclastic packstones and wackestones, which are fine-grained limestones consisting of small fragments of various fauna (Fig. 27 a–h).

The lower south-eastern part of the mountain is composed of carbonate rocks, represented by tubiphytes, bryozoan, and crinoid limestones, indistinctly layered packstones and wackestones (Fig. 27 e, f). Bedding is due to alternation of interlayers (5–15 cm each) with crinoid segments of different sizes (bioclastic-crinoid packstones), alternating with interlayers of bryozoan patterned limestones (with calcite incrustation rims around bryozoans – boundstones and packstones) and lenticular and irregular interlayers of cavernous limestones – brachiopod shells with leached shells (Fig. 27 b, c). The deposits were formed by waves and currents caused by storms (as evidenced by the rhythmic alternation and uneven boundaries of the layers).

The upper ledge of the quarry on the south-eastern slope of the mountain is composed of thick-platy limestones of the Tastuba horizon of the Sakmarian stage (according to Fusulinids, data by B.I. Chuvashov). Interlayers 10–30 cm thick are composed of cavernous brachiopod large-shell limestones with water levels inside brachiopod shells (Fig. 27 a) and microgranular limestones with scattered ammonoid and gastropod shells (Fig. 27 a, h). Up the slope, almost to the top, there are outcrops of brachiopod cavernous limestones, which lie gently (parallel to the slope) and dip to the south-southeast (Fig. 27 h). At the top of the mountain, limestones with large (0.5–0.8 m) spherical coral colonies are observed, crossed by near N-S cleavage fractures (Fig. 27 d). The so-called coral path, which goes along the ridge of the mountain, runs along the rocky outcrops of limestones.

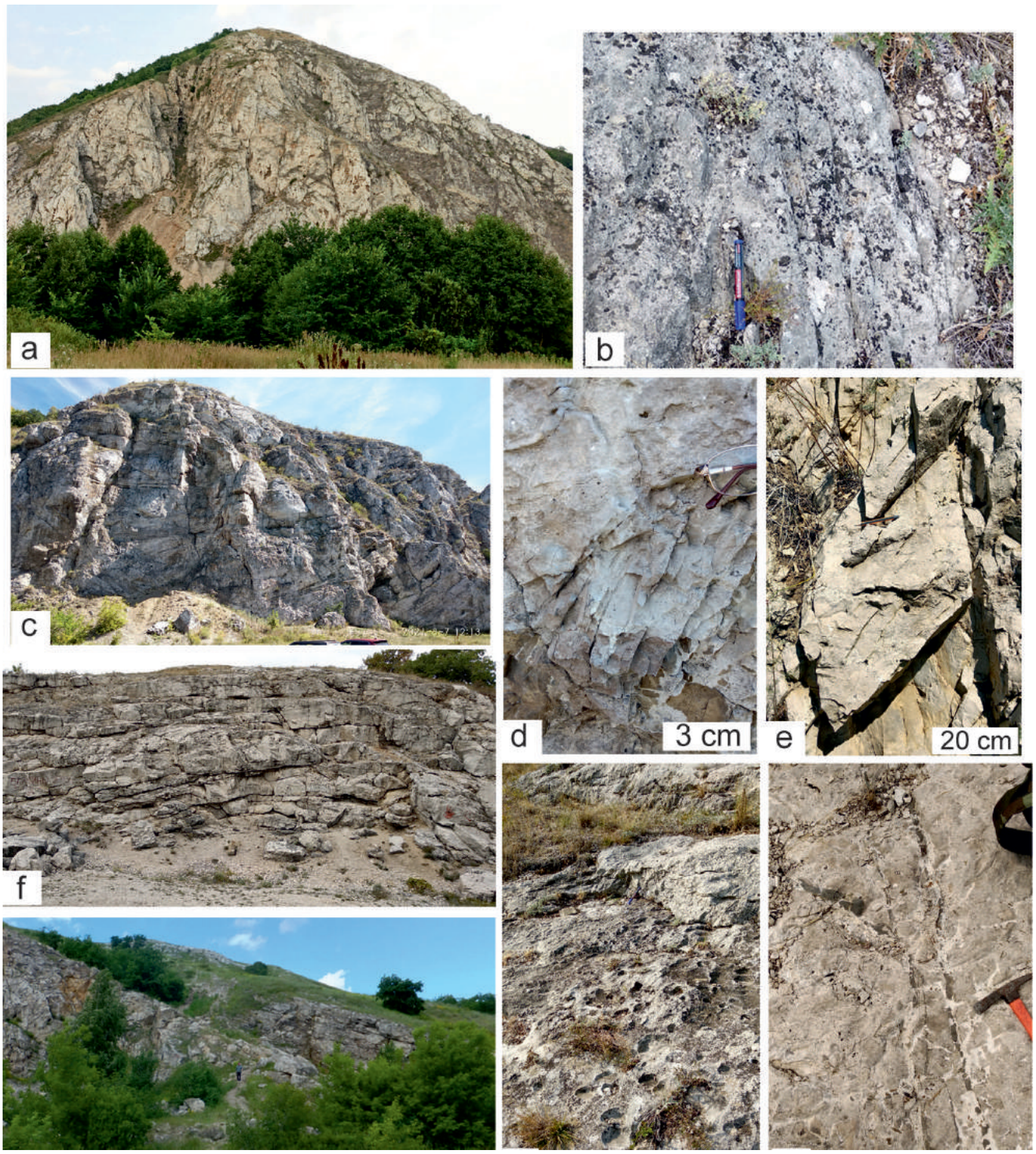


Fig. 26. The structure of the Yuraktau Shikhan.

Legend. a – view of the western steep slope with large subvertical fissures; b – subvertical close cleavage fractures in the limestones of the western slope; c – view of the southwestern slope with an angular disconformity between the upper limestone stratum with subhorizontal fracturing (by layering?) and the lower stratum with angled fracturing; d – angled radial fractures in limestones at the base of the southwestern slope; e – rhomboid fracturing on the surface of limestones of the southern slope; f – gently sloping subhorizontal limestone bedding in the open pit in the southeast at the foot of the mountain; g – gently sloping limestone beds on the southern slope of the mountain; h – gently sloping bedding of cellular brachiopod limestones and denser fine-grained limestones on the south-eastern slope of the mountain; I – a thin Neptunian dike with dark grey micritic material passing through limestones in the western near-top part of the mountain (photo by V.M. Gorozhanin).

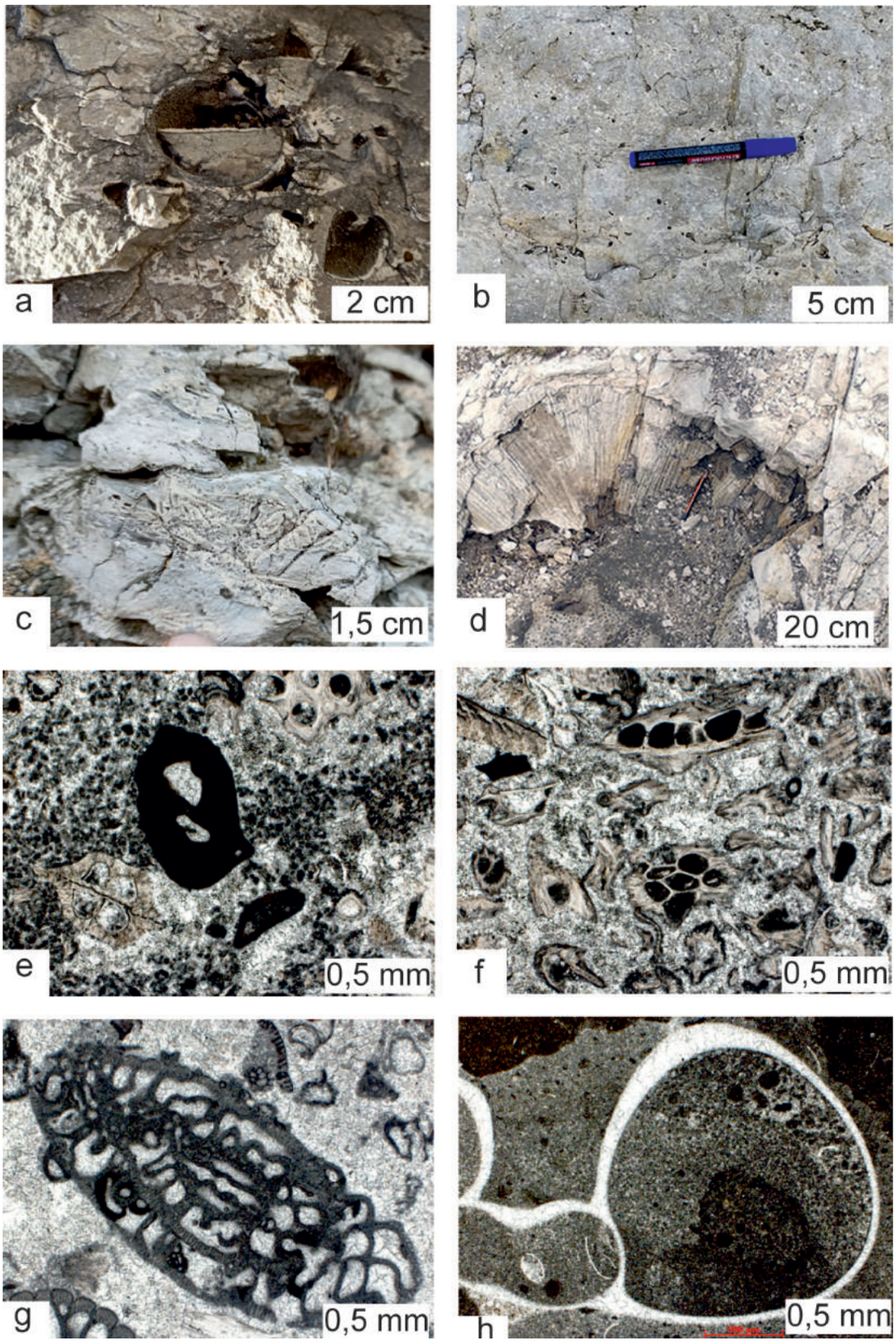


Fig. 27. Photos of different types of limestones in Yuraktau.

Legend. a – brachiopods limestone with large hollow brachiopod shells half filled with silt (water level); b – layered bioclastic limestone with alternating dense crinoids-bioclastic limestones (packstones) and cavernous layers composed of bioclastic-bryozoans limestones (packstones) with incrustations around caverns; c – accumulation of recrystallized bryozoans branches in bioclastic limestone; d – a large colony of corals in their natural position on the top of Yuraktau divided by subvertical cleavage fractures; e–h – micrographs of limestones (sections without an analyzer, ruler 0.5 mm): e – bryozoans-*Tubiphytes* limestone, black – a fragment of *Tubiphytes*; f – detrital bryozoans limestone (packstone, composed of fragments of bryozoans twigs cemented with calcite; g – fusulinides limestone with a large fusulinid shell; h – fragment of a gastropod shell in microgranular limestone (wackestone).

Thus, several biofacies and lithofacies types of limestones are distinguished in Yuraktau. From bottom to top along the section, there is a change of bioherm and granular *Tubiphytes*, bryozoans and bioclastic-crinoids limestones (wackestones and packstones) by large-shell brachiopod limestones with mudstone interlayers with ammonoids; closer to the top, fusulinids (Fig. 26 g) and crinoids-fusulinids limestones (grainstones), colonial corals, and some *Palaeoaplysina* are more common. More recent and relatively deeper mudstone and crinoidal wackestone facies compose the crosscutting Neptunian dikes. In Neptunian dikes, there are dark grey microgranular limestones with crinoids, fusulinids, and Artinskian fauna.

Features of alternation and mutual arrangement of biofacies types of limestones reflect the conditions of their accumulation. The influence of storms is manifested in the nature of bedding.

Isolation in the relief of the isolated mountains, composed of reef carbonate rocks, also determined the originality of the flora and fauna thereon. A unified natural and landscape complex was formed, confirming the uniqueness of the nominated property.

Climate

As the Bashkir Shikhans are situated practically in the center of the Eurasian continent, the climate here is strongly influenced by the continent, on the one hand, and by the Atlantic Ocean, on the other hand. The Atlantic Ocean brings here moisture air that smoothens the continental climate. At the same time, the territory is also affected by certain air masses from other regions of the northern hemisphere. Cold arctic air enters here from the northeast, north and northwest. Sometimes it enters from the southeast, passing through the territory of Western Siberia and rounding the Ural Mountains from the south. Tropical air usually comes from the south and southwest, and in summer and from the southeast, causing sharp warming, up to thaws in winter and hot, sometimes dry weather in summer. Sea air of middle latitudes comes from the Atlantic regions, bringing unstable weather with precipitation and causing some cooling in spring and summer and noticeable warming in autumn and winter. Cold continental air comes from Siberia in winter, resulting in cloudy frosty weather. Warm continental air of middle latitudes is formed only in the warm season. On the whole, western and southwestern air currents predominate, so the local climate is less continental than to the east of the Ural Mountains (Climate of Russia, 2001; Perevedentsev et al., 2011).

Climatic conditions for the Bashkir Shikhans are given on the basis of long-term observations at the Sterlitamak meteorological station that is 148 meters above mean sea level.

The annual average atmospheric pressure at sea level is 1018.6 hPa. The maximum values during the year fall on the winter period (1024.7 hPa in February), when the Siberian maximum has the greatest influence. The minimum pressure is observed in the summer period (1010.3 hPa in July), when the mainland is especially hot and the atmosphere is most unstable. Average wind speeds are negligible (2.4 m/s). The maximum wind speeds are observed in winter (3.0–3.3 m/s), the minimum – in summer (2.0–2.4 m/s).

Long-term average air temperature from 1961 to 2020 is 3.8°C. In the 30-year reference periods recommended by WMO, the values of the annual average temperature increase: 1961–1990 – 3.1 ° C, 1981–2010 – 4.1°C, 1991–2020 – 4.5°C. The coldest month is January, with an average monthly temperature of -13.4°C, air temperature rises steadily by July, which is characterized by its maximum value of 20.2°C (Fig. 28). The period with temperatures above zero remains for 215 days during the year.

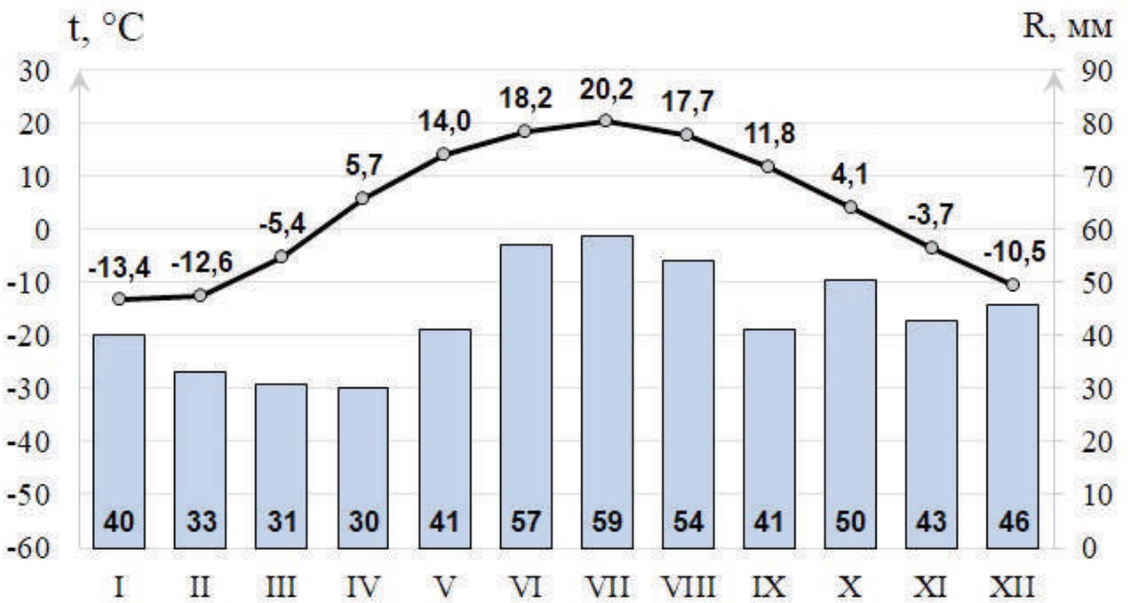


Fig. 28. The annual changes in air temperature and precipitation (1961–2020).

Since the mid 1970s, there has been a steady global transition to an anomaly in air temperature above 0°C relative to the WMO reference period of 1961–1990 (Perevedentsev et al., 2011). The average annual air temperature growth rate in the period from 1924 to 2021 is 0.27°C/10 years (Fig. 29). At the same time, during the WMO reference period, the temperature growth rate increases from 0.21°C/10 years in 1961–1990 to 0.51°C/10 years in 1981–2010 and 0.50°C/10 years in 1991–2020.

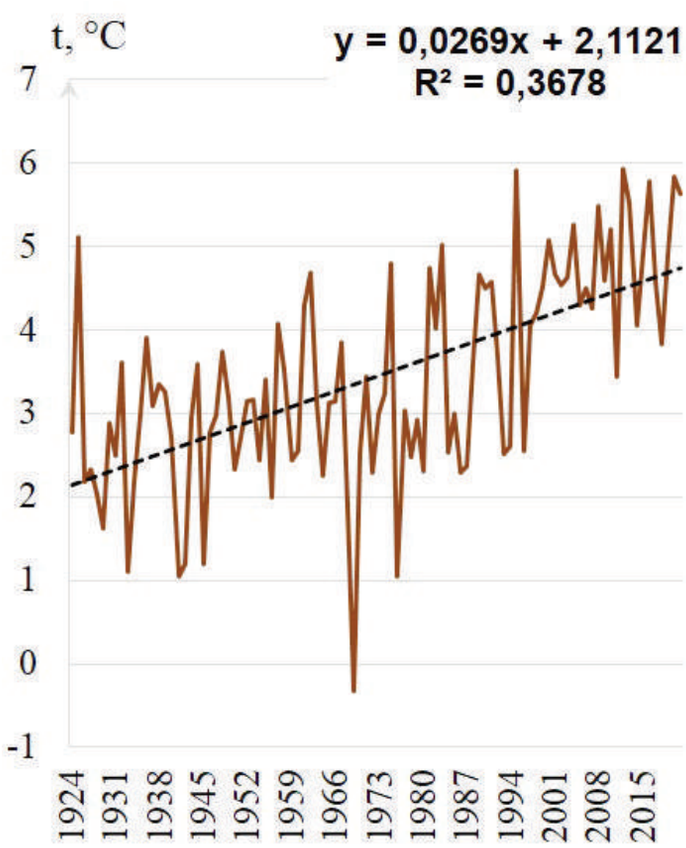


Fig. 29. Long-term changes in average annual air temperature (1924–2021).

The annual amount of atmospheric precipitation in the period from 1966 to 2020 is 523 mm; in the cold period – 191 mm (37%), in the warm period – 332 mm (63%). The maximum monthly precipitation occurs in July (59 mm) and June (57 mm). The minimum monthly precipitation is observed in March (31 mm) and February (33 m). The intra-annual distribution of precipitation is shown in fig. 28.

Perennial snow cover appears in the middle of November, while the loss of snow cover occurs in the first ten days of April, the average long-term duration of snow cover is 142 days. The maximum snow depth during the winter is in late February – early March (40 cm) on average. In the period from 1961 to 2020, there has been a significant increase in the average snow depth over the winter (2 cm/10 years).

Soil cover

The soil cover of the Toratau, Kushtau, and Yuraktau Shikhans was influenced by a slightly arid climate of the right-bank foothill agro-soil region of the Southern forest-steppe zone (Khaziev et al., 1985). It was also influenced by the geological structure of the Shikhans, relief with slopes from above average to very steep, soil-forming rocks represented by the residual deposits of limestones of the Lower Permian, natural vegetation and wildlife, human activity (grazing on the plumes of Shikhans and the lower slopes).

These natural conditions contributed to the development of the sod-forming process – the accumulation of humus reserves in the soil and biophilic elements, the formation of a water-resistant structure and chernozem soils. The Shikhans are characterized by a sharp change in soil varieties in the vertical direction, depending on the steepness of the slopes. On the plumes and the lower relatively gentle slopes, there are zonal subtypes of chernozems – leached and typical of medium thickness, higher along the slopes - typical thin and incompletely developed (lithogenic) chernozems. The latter are always carbonate, medium or strongly stony. On limestone outcrops and steep slopes, there are small depressions filled with soil – a kind of soil “pockets”.

According to the studies, the soils of the Shikhans can be considered as rare virgin soils of the forest-steppe zone, which have not been negatively affected by the Sterlitamak industrial center to the present (Unique..., 2014; Gabbasova et al., 2014).

Flora and vegetation

The Shikhans are among the most significant natural features in the South Ural region with the richest biodiversity. Their flora and vegetation differ significantly from the surrounding area. Today, the flora of Toratau includes 388 species of vascular plants (23% of the total number of vascular species of the Republic of Bashkortostan), Kushtau – 352 species, Yuraktau – 368 species. Considering that almost a quarter of the vascular flora of the Republic of Bashkortostan is found in such a small area, the flora of the Shikhans should be recognized as extremely rich (Muldashev and Martynenko, 2014). At the same time, the Shikhans are places of high concentration of rare species that need protection, as well as relics and endemics of the Uralian flora (Unique ..., 2014).

Despite the fact that the mountains are located at a relatively close distance from each other and have similar natural complexes, there are significant differences between them in terms of the floristic composition. Comparison of the flora of Yuraktau and Toratau made it possible to identify 326 common species. At the same time, 62 species grow on Toratau, which are not found on Yuraktau, and, on the contrary, 42 species from Yuraktau were not found on Toratau, and 30 species registered on Kushtau are absent on both Toratau and Yuraktau (Dedyukhin and Martynenko, 2019).

In total, more than 40 species grow on the Shikhans of Toratau and Yuraktau, which are classified as rare vascular plants of the Urals and Pre-Urals region (Gorchakovsky and Shurova, 1982; Kucherov et al., 1987). Of these, 18 species are included in the Red Data Book of the Republic of Bashkortostan (2021) and 9 species – in the Red Data Book of Russian Federation (2008), that is, they are protected by the state (Table 2).

The flora of the Shikhans has 13 relict species, of which 4 species are pre-glacial relicts of the Pliocene, and the remaining relics penetrated the South Urals in the Pleistocene and early stages of the Holocene. The Shikhans are rich in endemic species (21) as well. In addition, the local endemic from Toratau called *Pimpinella tomyophylla* was discovered and described (Shishkin, 1950; Tsvelev, 2004), which has not yet been found anywhere else in the world (Fig. 30).

Fig. 30. *Pimpinella tomiophylla* is a narrowly localized endemic, first found and described on Toratau. Photo by V.B. Martynenko.

Table 2. Rare Shikhans plant species in need of protection, listed in the Red Data Books of the Russian Federation and the Republic of Bashkortostan.

№	Species	Toratau	Yuraktau	Kushtau
	Species listed in the Red Data Books of the Russian Federation and the Republic of Bashkortostan			
1.	*Artemisia salsoloides*	+	-	-
2.	*Fritillaria ruthenica*	+	+	+
3.	*Hedysarum grandiflorum*	+	+	+
4.	*Koeleria sclerophylla*	+	+	+
5.	*Minuartia krascheninnikovii*	+	-	+
6.	*Stipa pennata*	+	+	+
7.	*Stipa pulcherrima*	+	+	+
8.	*Stipa zalesskii*	-	+	-
9.	*Thymus cimicinus*	+	+	+
	Species listed in the Red Data Book of the Republic of Bashkortostan			
10.	*Astragalus helmii*	+	+	+
11.	*Dictamnus gymnostylis*	+	-	-
12.	*Linum uralense*	+	+	+
13.	*Oxytropis baschkiriensis*	+	-	-
14.	*Pimpinella tomiophylla*	+	-	-
15.	*Stipa korshinskyi*	+	-	+
16.	*Stipa Sareptana*	+	-	
17.	*Tulipa biebersteiniana*	+	+	+
18.	*Hericium coralloides*	-	-	+

Fig. 31-33. Plants listed in the Red Data Book of Russian Federation and the Republic of Bashkortostan. Photo by V.B. Martynenko.

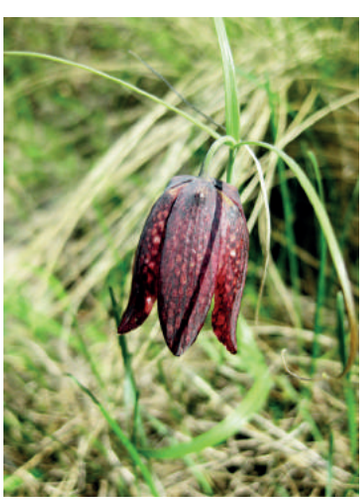


Fig. 31. *Fritillaria ruthenica.*

Fig. 32. *Hedysarum grandiflorum.*

Fig. 33. *Minuartia krascheninnikovii.*

The vegetation cover of the Shikhans differs significantly from the vegetation of the Urshaksko-Belsky physical and geographical region (Physical and geographical..., 1964). It has a very mosaic pattern, which is due to the pronounced nature of the relief, different exposure of slopes and the degree of soil development.

The plant cover of Shikhans is dominated by various steppes and meadow-steppes (Fig. 34), also, the vegetation of rocky outcrops and screes is common. On steep slopes with limestone outcrops and on undeveloped soils, hyper-petrophytic steppes are common (Fig. 35), which are unique and endemic plant communities (Yamalov et al., 2011).

Fig. 34. Meadow steppes of *Festucion valesiacae* alliance – a rare type of vegetation. Photo by V.B. Martynenko.

Shrub steppes predominate in the lower parts of the mountain slopes, where they are bordered with xerophytic, and meso-xerophytic and mesophytic broadleaved forests located on more developed and moistened soils. Forest communities are located along the northern (and eastern, Toratau) slopes of the Shikhans and reach almost to the peaks (Unique ..., 2014). Rare types of forest communities include small areas of steppe oak forests (Fig. 36), the main areas of which in Europe have been severely damaged by anthropogenic impact over the past 200 years.

Fig. 35.
Unique endemic communities of hyper-petrophytic steppes of the association *Trinio muricatae – Centauretum sibiricae* on Toratau.
Photo by V.B. Martynenko..

Fig. 36.
Steppe oak forests – a rare type of vegetation in the South Ural region.
Photo by V.B. Martynenko.

On the Kushtau Shikhan, most of the slopes are gentler and have more developed soils, and therefore the main part of it is covered with broadleaved forests typical for the Pre-Urals. However, there fairly large areas (especially on the slopes of the southern and eastern exposures), there are also stony steppes (Muldashev and Martynenko, 2014; Unique ..., 2014).

The vegetation of the Shikhans and their buffer zones is very different. In protected zones, it is mainly represented by disturbed meadow-steppe, meadow-forest, meadow and floodplain communities, which experience a large anthropogenic impact in the form of periodic grazing and recreation.

Fauna

The fauna of the Shikhans is also rich and varied, as is the flora, due to the diversity of vegetation. In addition, the Shikhans are located in the ecotone contact zone between the forest and steppe vegetation zones, which also adds to the biodiversity. The Shikhans fauna is represented by Molluscs (*Mollusca*), Arthropods (*Arthropoda*) and Chordata (*Chordata*), which, in turn, are represented by seven classes: Gastropods (*Gastropoda*), Arachnids (*Arachnida*), Insects (*Insecta*), Amphibians (*Amphibia*), Reptiles (*Reptilia*), Birds (*Aves*) and Mammals (*Mammalia*).

About 500 species of insects, 118 species of birds, 28 species of mammals, 4 species of amphibians and 7 species of reptiles have been found on the Shikhans and in their buffer zone. On Shikhans, 426 species of herbivorous beetles (from the superfamilies *Chrysomeloidea* and *Curculionoidea*) were revealed, which is 35% of the fauna of these groups recorded for the forest-steppe zone of the east of the Russian Plain and Fore-Urals (Dedyukhin and Martynenko, 2020). In addition, several as yet undescribed beetle species and a significant number of species whose populations are located away from the boundaries of their main ranges have been found.

The Shikhans are rich in rare species of animals that need protection. 19 animal species are listed in the Red Data Book of the Republic of Bashkortostan (2014), of which 11 are listed in the Red Data Book of the Russian Federation (List ..., 2020) and are subject to protection at the federal level (Table 3).

Table 3. Rare and protected animal species from Shikhans, listed in the Red Data Books of the Russian Federation and the Republic of Bashkortostan

№	Species	Toratau	Yuraktau	Kushtau
	Species listed in the Red Data Books of the Russian Federation and the Republic of Bashkortostan			
1.	*Bombus armeniacus*	-	-	+
2.	*Xylocopa valga*	-	+	+
3.	*Parnassius mnemosyne*	+	+	+
4.	*Parnassius apollo*	+	-	+
5.	*Osmoderma eremita*	+	+	+
6.	*Rosalia alpina*	+	-	+
7.	*Lucanus cervus*	-	+	+
8.	*Protaetia speciosissima*	-	+	+
9.	*Saga pedo*	+	+	-
10.	*Circus macrourus*	-	-	+
11.	*Aquila heliacal*	-	-	+
	SSpecies listed in the Red Data Book of the Republic of Bashkortostan			
12.	*Sympetrum pedemontanum*	+	+	-
13.	*Mantis religiosa*	+	+	-
14.	*Anguis fragilis*	-	+	+
15.	*Pernis apivorus*	-	-	+
16.	*Myotis daubentonii*	-	+	+
17.	*Myotis dasycneme*	-	+	+
18.	*Pipistrellus nathusii*	+	+	+
19.	*Plecotus auratus*	+	+	+

In the territory of the Shikhans there are 14 species of animals from the IUCN Red List of threatened species (Table 4, Fig. 37-39) with protection categories higher than LC (species of least concern). Of these, 9 species have the category NT (near threatened), 3 species have the category VU (vulnerable), 1 species (*Bombus armeniacus*) is classified as EN (endangered – with a high risk of extinction), and 1 species *Bombus cullumanus (=serris-quama)* is classified as CR (critically endangered).

Photo by V.B. Martynenko.

Fig. 37. *Rosalia alpina.*

Fig. 38. *Parnassius apollo.*

Fig. 39. *Lucanus cervus.*

Table 4. . Rare species of the Shikhans listed in the IUCN Red List

№	View	IUCN Red list
1.	*Bombbus armeniacus* Radoszkowski, 1877	EN
2.	*Bombus cullumanus* (Kirby, 1802) (=serrisquama F. Morawitz, 1888)	CR
3.	*Formica polyctena* Forster, 1850	NT
4.	*Formica pratensis* Retzius, 1783	NT
5.	*Parnassius apollo* Linnaeus, 1758	NT
6.	*Parnassius mnemosyne* Linnaeus, 1758	NT
7.	*Saga pedo* Pallas 1771	VU
8.	*Lucanus cervus* Linnaeus, 1758	NT
9.	*Osmoderma eremita* Scopoli, 1763	NT
10.	*Protaetia specialismsima* Adams, 1817	NT
11.	*Rosalia alpina* Linnaeus, 1758	VU
12.	*Alcedo atthis* Linnaeus, 1758	VU
13.	*Circus macrourus* S. G. Gmelin, 1770	NT
14.	*Myotis dasycneme* Boie, 1825	NT

Landscapes

The landscapes of the Bashkir Shikhans are very diverse and are highly mosaic. The main part of the landscapes is characterized by various subtypes of chernozem soils.

Slopes of northern exposure of the Toratau and Yuraktau Shikhans is represented mainly by forest landscapes: the lower and middle parts are occupied by broadleaved maple-linden forests (Fig. 40, 41), outliers of oak-maple-elm forests (Fig. 41), extending to the upper slopes; the middle and upper parts are meadow and fescue-forb steppes. The lower and middle parts of the slopes are also represented by various steppe landscapes: meadow, fescue-forb and shrubs.

The lower parts of the slopes of the southern exposure of the Toratau and Yuraktau Shikhans are occupied by meadow and bushy steppes, the middle parts of the slopes are bare and are represented by degraded petrophytic steppes, the upper parts are occupied by bushy steppes.

Kushtau is distinguished by the predominance of forest landscapes, which are represented by linden-maple-oak forests, mesophytic linden-maple-elm forests; exposed areas are covered with real and petrophytic steppes bordering on bushy steppes in the middle part of the slopes.

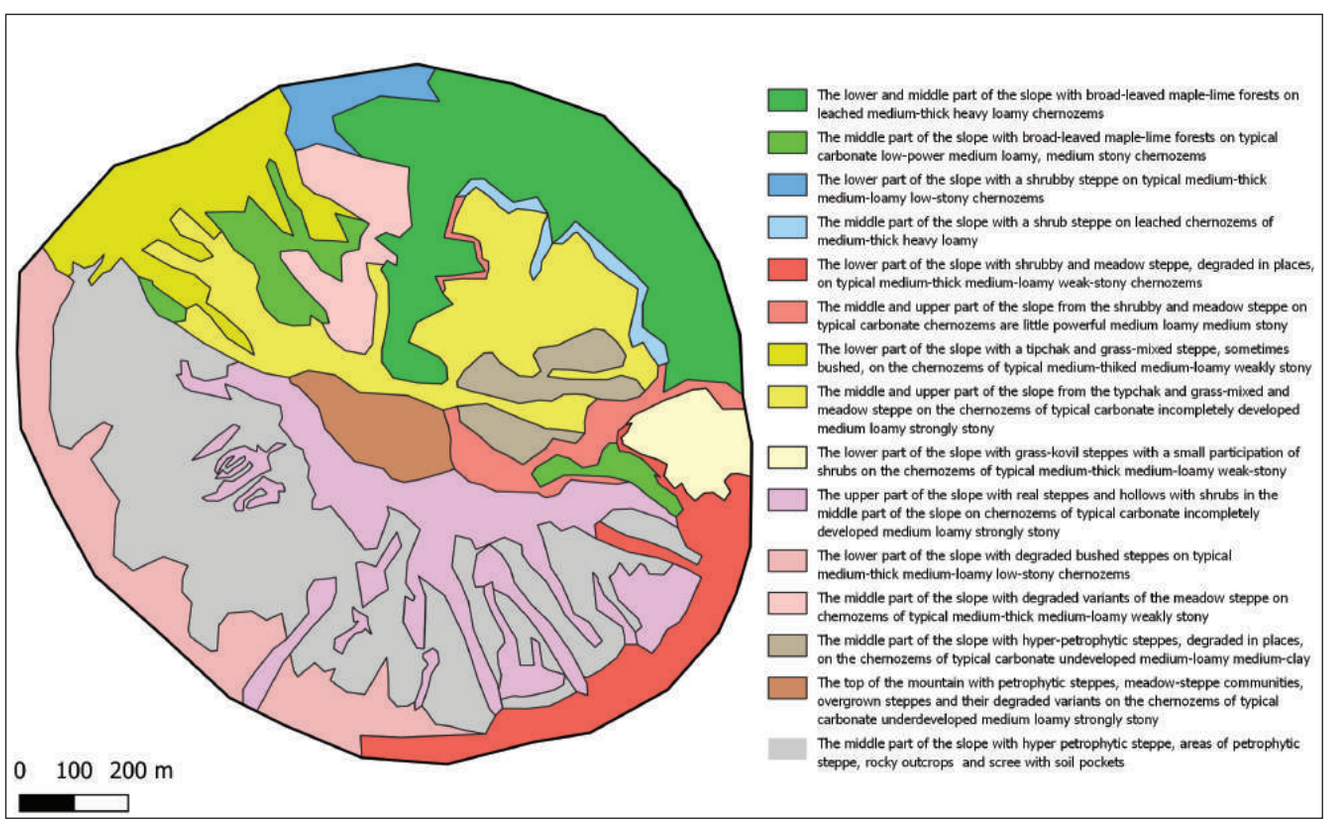


Fig. 40. Landscapes of the Toratau Shikhan.

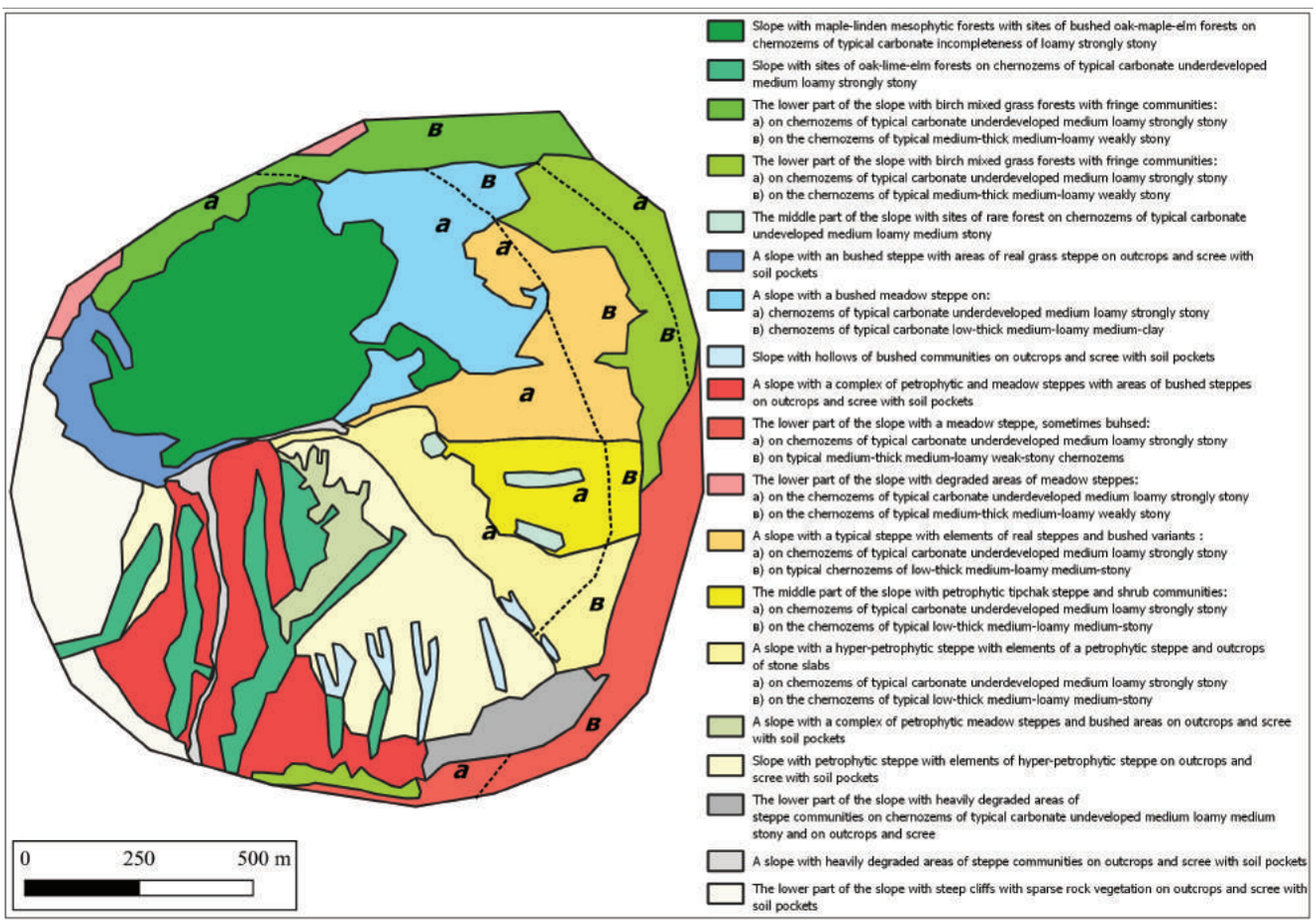


Fig. 41. Landscapes of the Yuraktau Shikhan.

2.b History and Development

History of geological development

The geological structure of the territory where the nominated property, the Bashkir Shikhans, is located is determined by the presence of two main structural complexes typical of the eastern part of the East European Platform – a crystalline basement and a sedimentary cover overlying it.

In general, the history of the geological development of the territory is shown in Fig. 42 and in Table 5.

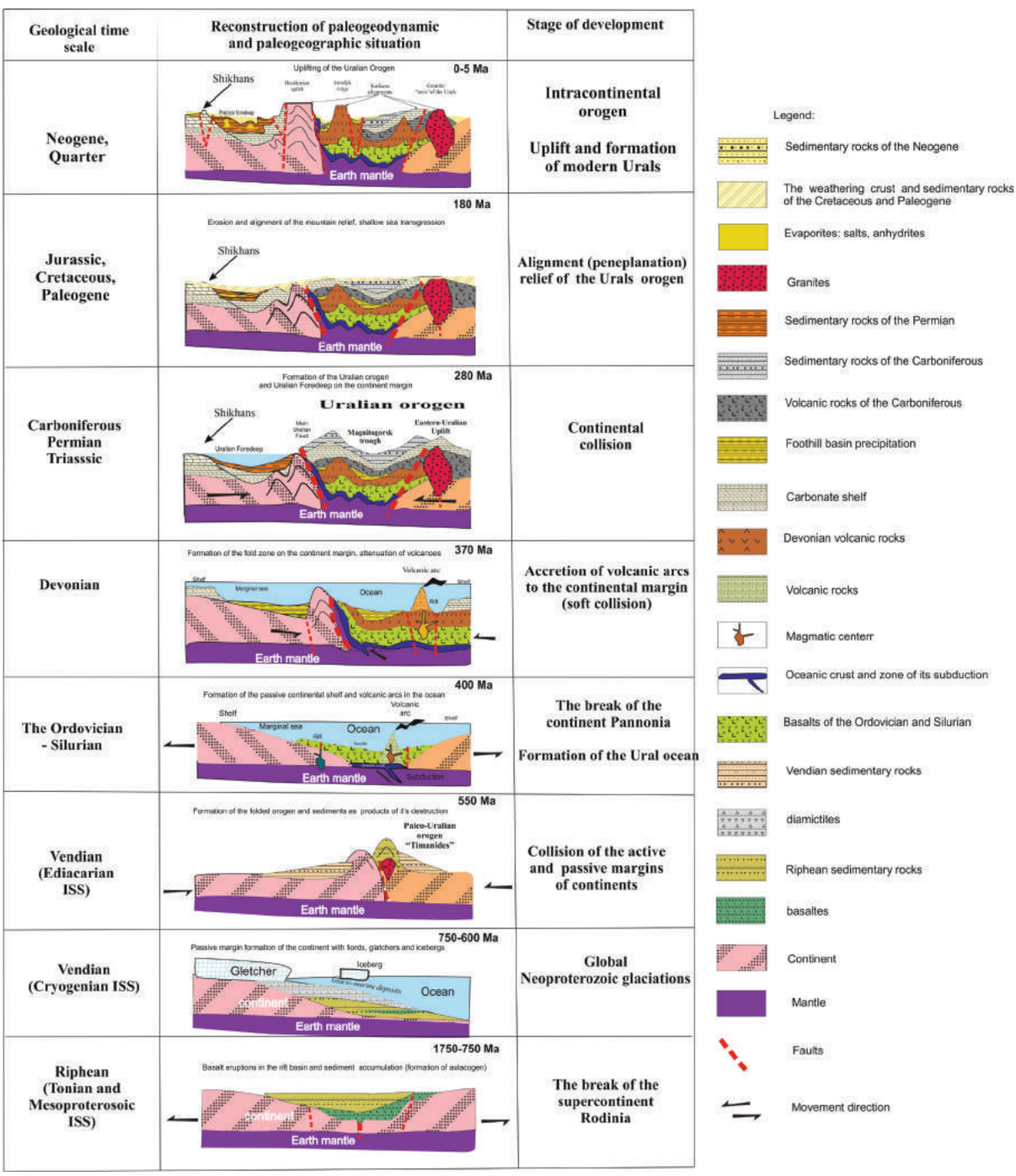


Fig. 42. History of the geological development of the territory – the east of the East-European platform and the adjacent part of the Southern Urals.

Table 5. Global geodynamic events in the sedimentary record of the territory of the southeast of the East-European Platform and the adjacent part of the folded Urals in the time range of 1750–0.1 million years

Global geodynamic event	Period in the International Geochronological Scale (million years, Ma)	Period in the Russian geochronological scale (local suites*)	Regional manifestation of the event	Characteristic sedimentary complex and lithological features in the territory of the Bashkir Shikhans
The split of the ancient continent Volga- Uralia (?)	Mesoproterozoic 1750–1200 Ma	1) leveling surfaces (peneplanization) Early Riphean (Ai, Satka and Bakal formations). 2) Middle Riphean (Zigalga, Mashak, Zigazin-Komarov and Avzyan suites).	1) Formation of the Kama-Belaya rift basin on the margin of the continent; subalkali terrestrial volcanism. 2) Establishment of the Mashaksky rift with rhyolite-basalt volcanism.	n/a
The split of the ancient continent Rodinia	Neoproterozoic (Tonian) 1200–750 Ma	Late Riphean (Zilmerdak, Katav, Inzer and Minyar suites)	Formation of the Kama-Belaya rift basin on the margin of the continent. Intrusive subalkali magmatism.	Marine shallow water sediments: sandy complexes filling the rift basin.
The era of ancient glaciations	Neoproterozoic (Cryogenian) 750–650 Ma	The lower part of the Ashan Group (Tolparovo, Suirovo, Bakeevo and Uryuk suites).	Formation of erosion depressions – fjords on the passive margin of the ancient Proto-Baltic continent.	Glacial-marine sediments (diamictites – sandy and boulder conglomerates).
Collision of the ancient Proto-Baltic continent with other proto-continents (Gondwana, etc.)	Neoproterozoic (Ediacaran) 650–540 Ma	Upper part of the Ashinskian Group: (Basa, Kukkarauk and Zigan suites).	Formation of the Proto-Ural-Timan Fold Belt with a piedmont depression.	The molasse complex of sediments of the piedmont foredeep is represented by products of mountain destruction (sandstones and conglomerates).

The split of the Laurussia palaeocontinent- with the formation of separate continents of Laurentia (North America) and Baltic (East European Platform – EEP) and the opening of the Palaeouralian ocean	Cambrian (540 million years) Ordovician (450 million years) Silurian (420 Ma)		Continental perturbation	n/a
Formation of a system of island volcanic arcs (of the Kuril type) in the Palaeouralian ocean	Silurian – Early and Middle Devonian 420–383 Ma	Early and Middle Devonian. Takata sandstone suite. Biya and other carbonate suites.	Formation of terrigenous and carbonate shelf on the passive margin of the Baltic continent from the side of the Palaeouralian ocean.	Shallow coastal marine sand and carbonate deposits.
Collision of the Baltic continent with the Magnitogorsk island volcanic arc, the initial stage of the closure of the Palaeouralian ocean	Late Devonian – Early Carboniferous 383–323 Ma	Frasnian and Famennian Ages (Stages) (Domanik, Mendym, Askyn and other stages).	The formation of the Aktanysh-Chishminsky foredeep and the Kama-Kinel through system of foredeeps in the east of the platform on the continental margin is synchronous with the collision of the island arcs of the Palaeouralian ocean with the Baltic continent, and the build-up of the continental shelf.	Complex of carbonate and oil source deposits of the shallow water shelf.

Ural collision. The beginning of the collision of the margin of the EEP and the volcanic arcs attached to it with the Kazakhstan continent. The beginning of the formation of the Pangea supercontinent	Carboniferous Period. Pennsylvanian, Missisipian Epochs, 323–307 Ma	Bashkirian and Moskovian Ages.	The initial stage of the formation of the folded Urals.	Complex of carbonate deposits of the passive margin shelf.
Ural collision. Maximum collision of the margin of the EEP and volcanic arcs attached to it with the Kazakhstan continent	Late Carboniferous – Early Permian 310–275 Ma	Gzhelian Age (Stage) of the Late Carboniferous – Asselian, Sakmarian, Artinskian Ages (Stages) of the Early Permian Period	Formation of the Ural Fold Belt and Fore-Uralian Foredeep on the margin of the EEP. The transformation of the Ural Ocean into a strait	Complex of sediments in three foredeep zones 1) western – carbonate shelf with reef massifs – analogues of the Australian barrier reef zone; 2) central deep-water zone; 3) eastern – filling of the foredeep with sandy-shale sediments (flysch) with interlayers of landslide conglobreccias from the Ural uplift
Ural collision (late stage). Kungurian salinity crisis (analogous to the Messinian event in the Mediterranean).	Early Permian 275–270 Ma	Early Permian, Cisuralian Epoch, Kungurian Age	Separation of the Ural Strait from the world ocean, its transformation into an evaporite basin and filling with salts	Salt basin sediment complex – gypsum, salts

Ural collision. Completion of collision of the continents. Completion of the formation of a single Pangea supercontinent.	Middle Permian 270–251 Ma	Late Permian. Ufimian, Kazanian and Tatarian Ages	Filling of the Fore-Uralian Foredeep with molasse – destruction products of the Ural Orogen	Continental shallow water deposits; red-colored gravel – sandy sediments (molasse)
The breakup of the Pangea supercontinent. Opening of the Jurassic palaeo Tethys Ocean	Triassic – ur assic 251–145 Ma		Continental stage – destruction and rinoidea (peneplanization) of the ancient Ural Mountains during their continental exposure	Complex of continental foothill alluvial fans (red-colored conglomerates, sandstones)
Sea level rise. Epicontinental seas and straits on the Eurasian continent	Cretaceous 145–66 Ma	Late Cretaceous, Santonian Age	Continental stage. Peneplanization (rinoidea) of the territory and flooding by shallow sea	Complex of coastal-marine sand deposits
	Paleogene 66–23 Ma			Complex of sandy deposits of continental genesis (lake type)
Collision of Africa, Hindustan and Arabia with the Eurasian continent (Alpine folding), closing of the palaeo Tethys ocean	Neogene – Quaternary 23–0.1 Ma		Formation of the inland mountain structure (modern uplift of the Urals) in the western part of the ancient Ural folded belt and activation of the adjacent part of the platform. The beginning of activation of the karst process	Complex of sandy and clayey deposits filling coal-bearing grabens in Fore-Uralian Foredeep. Cave deposits

Notes: *Formation is a complex of similar sedimentary deposits.

Early Permian Epoch

In a more detailed Early Permian geological epoch of the development of the territory where the Shikhans are situated, several successive stages have been reconstructed (Chuvashov et al., 1996; Puchkov, 2010).

1. Initial stage. Reef inception (Asselian Age)

This stage (Fig. 43, stage 1) is associated with the emergence of the Fore-Urals foredeep, a deep-water basin (1000 m) of north-south strike superimposed on the shelf of the East European continent due to the growth of the Ural Fold Belt. The formation of the mountain-folded Urals was caused by a global phenomenon, namely the collision of lithospheric plates, one of which was the East European continent (Puchkov, 2000). Sediments from the rising Ural Mountain structure were carried into the Fore-Uralian Foredeep, and the western part, adjoining the continent, experienced an uplift. There was formed a ledge, which upper part was in the photic zone (i.e., at relatively shallow depths where sunlight could penetrate) and the first scattered algal-bacterial bioherms could form there, composed of *Tubiphytes* –algae, "sealed" by bacterial films.

2. Middle stage. Reef growth (Sakmarian Age)

At this stage (Fig. 43, stage 2), in addition to *Tubiphytes* bioherms, settlements of bryozoans also arose, which became the main builders of bioherms. The bryozoan bioherms were not large in size (tens of centimeters), but their frequent occurrence in the section of the Sakmarian deposits indicates the mass formation of small accumulations, which interspersed with detrital carbonate sediments. Most of the carbonate sediments were composed of small shells of the simplest organisms, fusulinids. An aggregate of carbonate sediments, consisting of accumulations of bryozoans, fusulinid sand and shells of other benthic organisms – brachiopods, solitary corals, formed a shallow shelf, where massive settlements of colonial corals – Rugosa periodically arose, forming calyptras – small colonial structures, periodically covered with carbonate-shell sand. The shallow-water sediments accumulated like a "layered cake" by the end of the Sakmarian Age culminated in a more homogeneous and extended bioherm, consisting of palaeoaplysins, hydroid-type stratal organism, which preserved well due to the rapid replacement of the organic residue by carbonate minerals after their burial. The palaeoaplysins structure had a sheet form, covering all the sediments like a blanket ("biostrome"). The maximum thickness of the palaeoaplysins bioherm was established in the southern part of the Kushtau Mountain, 46 m thick (here it consists of two biostrome layers separated by a layer of carbonate granular deposits of the reservoir). On the Toratau and Yuraktau mountains, palaeoaplysins biostromes were destroyed by late erosion and were not preserved in the section.

The stage culminated in the formation of a reef zone, which at times may have been brought to sea level and subjected to karst. Traces of this process are captured in the form of breccia, resembling the karst one, in one of the wells in Kushtau. This is also evidenced by numerous incrustations of carbonate mineral crusts observed on many organic remains, especially bryozoans and palaeoaplysins. Isotope studies of these crusts established the influence of atmospheric precipitation (Zempolich et al., 2002). It is known that fragments of petrified wood replaced by calcium carbonate were found

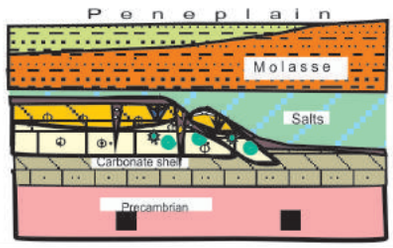
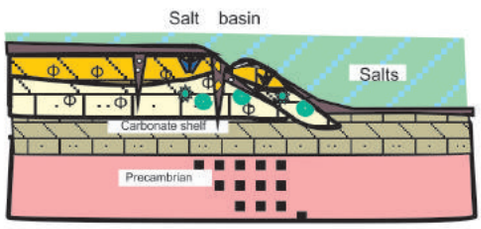
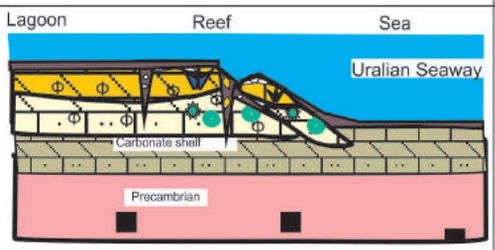
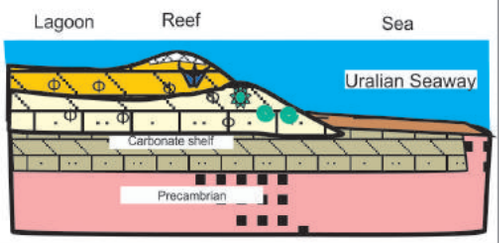
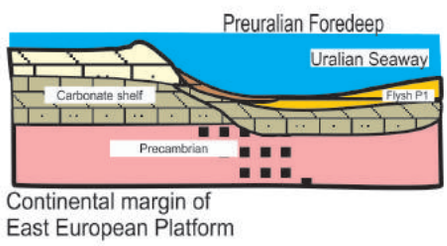
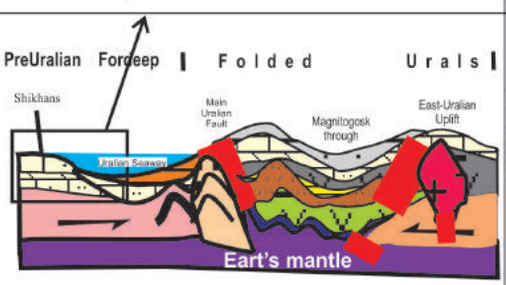
Stage number	Geological time	Reconstruction of the paleogeodynamic and paleogeographic conditions	Stage, geodynamic events
5	Upper Permian - Mesozoic		**Destruction Uralian Orogene** Salts are covered by products of destruction Uralian Orogene
4	Kungurian		**Uralian collision (the end)** Conversion the Uralian Seaway to isolated salt basin. Salts and gypsum accumulation
3	Artinskian		Distruction of the reef buildings by earthquakes and their submergence
2	Sakmarian		Reef and shelfal lagoon formation at the shelf border at the western part of Uralian seaway
1	Asselian		**"Uralian collision"** Uralian Orogen's Uplift and Uralian seaway The start of the reef formation at the western part of Uralian seaway
	299 Ma Asselian		Ocean closure, Urals folded orogene and Preuralian Foredeep formation at the margin of the continent

Fig. 43. Development of the territory during Late Carboniferous – Early Permian (according to V.M. Gorozhanin and E.N. Gorozhanina).

in the Shakhtau quarry (Kulagina et al., 2015). These finds, however, do not have a clear stratigraphic reference, so it cannot be reliably stated whether these trees grew on reef islands. Obviously, they could also be brought from other places and flooded as a result of storm activity.

In addition to storm activity, seismotectonic activity was also recorded in carbonate complexes, expressed in the formation of cracks caused by earthquakes, which were filled from above by overlying sediments. Such bodies, which intersect sediment layers, called Neptunian dikes, most clearly manifested themselves a little later, in the Artinskian Age (Gorozhanin and Gorozhanina, 2022). The first dikes, as established by palaeontological dating, began to form at the end of the Sakmarian Age (Chuvashov et al., 1996; Vennin, 2007).

3. Late stage. Flooding and formation of Neptunian dikes (Artinskian Age)

In the Artinskian Age, the reef edge of the shelf was flooded and covered with layered clay-carbonate sediments containing small tube-like corals *Cladochonus*.

The collision of the continents, which caused the formation of the Ural mountain structure, was also reflected in the marginal part of the platform, where reef structures were formed. During the Artinskian Age, they were subjected to cracking and partial collapse due to earthquakes (Fig. 43, stage 3). Massive Neptunian dikes (tectonic cracks filled by sediments) have been identified in all carbonate massifs (Chuvashov et al., 1996; Vennin, 2006; Gorozhanin and Gorozhanina, 2022), including those described in boreholes on Kushtau.

4th stage. Overlapping of reefs by evaporite sediments (Kungurian Age)

After the reef formations were covered by deep-sea sediments of the Artinskian Age, the Fore-Urals Foredeep, which on the surface was expressed by the Ural Sea Strait, was separated by the growing mountain structure of the Urals from the world ocean and, under the conditions of the near-equatorial climate, began to quickly turn into an isolated salt basin (Fig. 43, stage 4). This phenomenon, which took place in the Kungurian time (283–273 million years), was similar to the event that occurred 5.9–5.3 million years ago in the Mediterranean, known as the Messinian salinity crisis (Chumakov, 1982). As a result, the Asselian-Sakmarian reefs and the Artinskian strata were covered with evaporite sediments such as gypsum and salts of great thickness.

The Fore-Urals Foredeep, together with the Caspian depression, which, in the Kungurian time, represented a single salt basin, is one of the world's largest places of salt accumulation.

In the Late Permian, the Kungurian evaporite sequence was overlain by red-colored terrigenous sediments formed during the destruction of the Ural folded structure (Fig. 43, stage 5). These deposits are called "molasse" by analogy with the thickness of the red-colored deposits formed during the destruction of the Alpine mountains. The molasse complex was formed during a short period of time when the Ural Mountains were young and high – during the Late Permian and Triassic period.

The Kungurian evaporites and the overlying molasses are the last sedimentary deposits from which the geological history of the Shikhans is reconstructed. Younger deposits corresponding to the Jurassic and Cretaceous periods of the Mesozoic and the Paleogene

period of the Cenozoic have not been preserved in the Shikhans section; in the Fore-Urals, they are fragmentary and are represented by terrigenous sediments of continental genesis, which indicates that during this period of time the territory of the Shikhans had continental conditions, a smoothed relief and weathering crusts were formed, united by the general concept of peneplain (Fig. 43, stage 5).

On the surface of the Lower Permian limestones on the Yuraktau Mountain, the presence of pebbles of the alluvial (river) type, represented by quartz and flint, was established. Similar pebbles were found in a borehole on a karst limestone surface on the top of the Kushtau Mountain. They may be the remains of deposits of the Ufimian Stage, which were carried by foothill streams from the Ural Mountains in the Late Permian and subsequently eroded, or the remains of a terrace of a river that flowed in this place before neotectonic activation in the Neogene. Relics of this Meso-Cenozoic denudation plain are found on rinoide watershed spaces in the form of placers of sand and pebble material (Zinyakhina, 1988).

Neogene-Quarternary

5. Final stage. Neotectonic uplift of the Shikhan block of the earth's crust.

This stage, the youngest in the geological history of the Shikhans, began in the Neogene in connection with the completion of global geodynamic processes in the Alpine-Himalayan Fold Belt caused by the collision of Eurasia with the Arabian Shield and Hindustan. The Ural folded structure, which was almost flattened by the end of the Mesozoic, also became active, and the modern inland Uralian Orogen rose in place of the former orogen (Fig. 44).

The activation of tectonic processes is reconstructed based on the elements of the preserved palaeorelief – the planation surfaces on the Toratau and Kushtau Mountains (Fig. 45 a, b), and other indirect signs. At this stage, the Shikhan block of the earth's crust was uplifted along east-west tectonic faults; in about 5 million years, it was dissected by weathering processes and acquired a modern of isolated single mountains. The amplitude of the uplift of the Shikhan block was about 1000 m. It was determined from the position of the top of the limestones of the Sakmarian Stage on the Toratau Mountain at an absolute mark of +400 m above sea level, and in the neighboring Ishimbai massif, where these limestones are submerged to a depth of more than 500 m. If we estimate the amplitude vertical movements on a larger scale, then for the Volga–Ural anteclise as a whole it reached 5 km, since on the border with Kazakhstan the surface of the Lower Permian reefs in the Fore-Urals Foredeep subsided to a depth of 4.5 km (Gorozhanin, 2010).

During this stage, the Kungurian salt strata underwent tectonic deformations and experienced a significant redistribution: from a single layer of sheet-like form, vertical salt columns were formed – diapirs, reaching a height of 4–5 km in the south of the

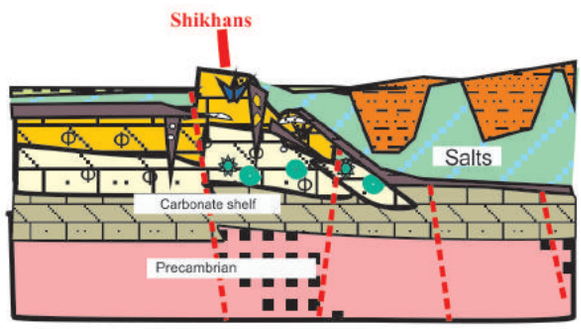
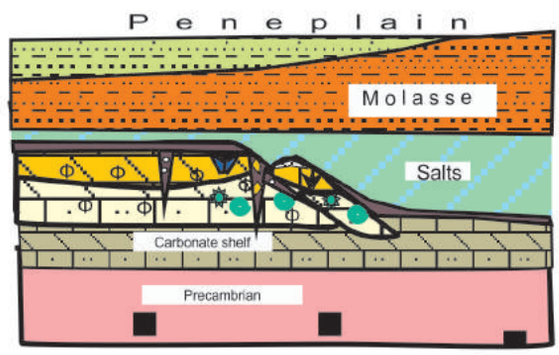
Stage number	Geological time	Reconstruction of the paleogeodynamic and paleogeographic conditions	Stage, geodynamic events
2	Neogene Quarternary		"Neo-tectonical activization" Uplift and formation of the modern Intracontinental Uralian orogen
1	Late Permian - Mesozoic		Uralian Orogene Destruction Salts are covered by products of Uralian Orogene Destruction

Fig. 44. Development of the territory during Neogene and Quaternary.

Fore-Urals Foredeep, and the gaps between them – intersalt foredeeps, composed of deposits of the Upper Permian and Mesozoic, overlapping the Kungurian salt. Salt diapirs on the Shikhan uplifted block destroyed by modern erosion, and only the gypsum layer, which formed the basis of the Kungurian salts, has survived. This sequence, with traces of tectonic deformations typical of salt dome areas, can be observed in the immediate vicinity of the Shikhans in the section along the Seleuk River. To the south, on the lowered Ishimbai block, evaporites are already observed in the form of diapirs (Magash mountain).

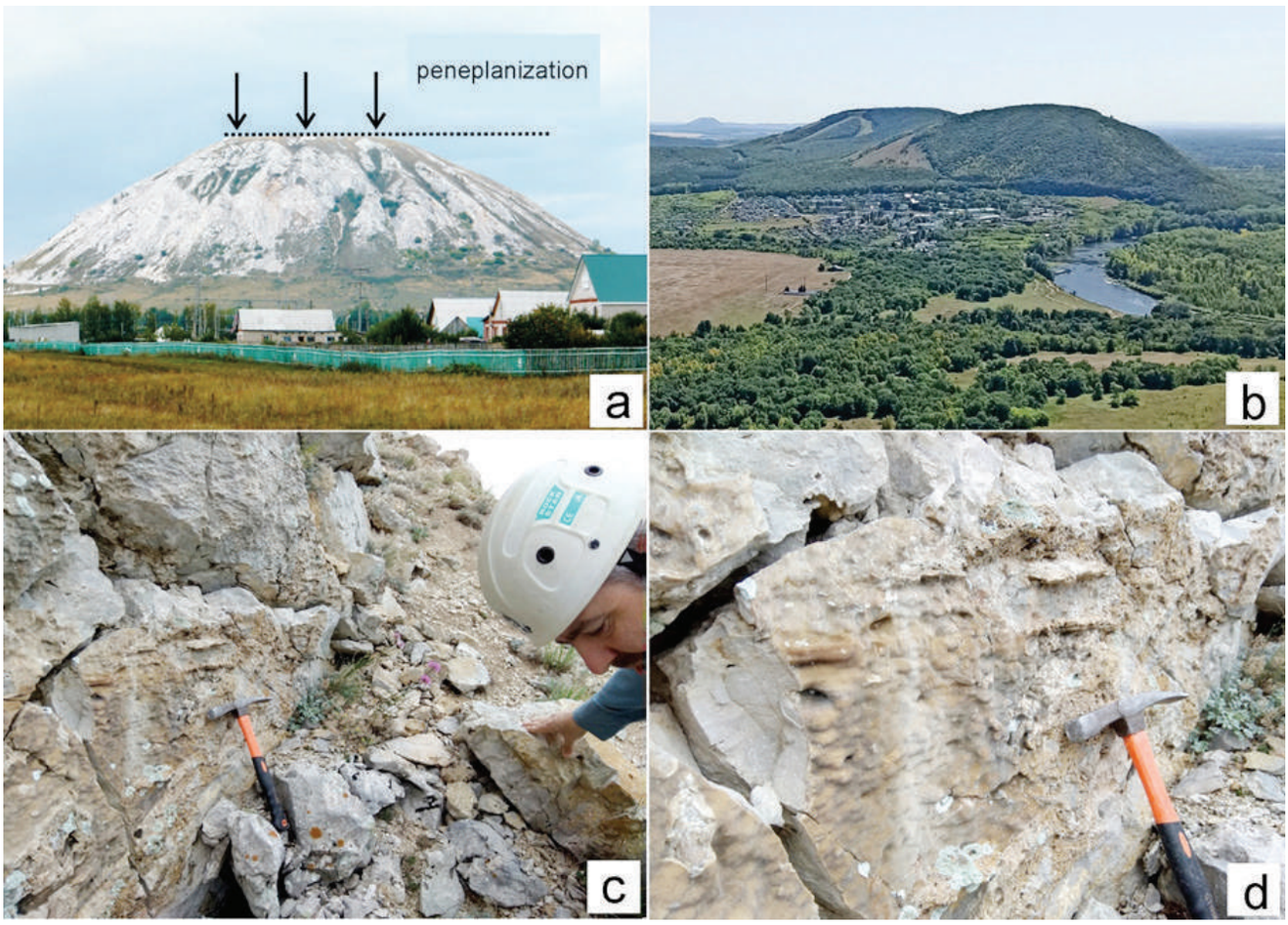


Fig. 45. Evidence of neotectonic activation of the territory of the Shikhans in the Neogene.

A–b –Crinoidea surfaces (peneplanization) on the tops of the Toratau and Kushtau Mountains; c–d – calcite crusts on the surface of cracks in limestone – traces of the karst process in the near-top part of Toratau.
Photo by V.M. Gorozhanin.

Neotectonic uplift of the Shikhan block is confirmed by the presence of relics from the sinks and other phenomena found on the tops of the Kushtau and Toratau Mountains. In the near-top part of Toratau, in the wall of the ruined cave, calcite outgrowths and incrustations in the form of horizontal bands were found. They show the former stands or groundwater levels, which produced a karsting effect on the enclosing limestones (Fig. 45 c, d). For sure, this process could occur only when the entire carbonate massif was under the surface of the earth at the level of groundwater. The tectonic rise of the block caused a sharp drop in the erosion base level, activation of karst and landslide processes. It can be concluded that these karst phenomena on mountain tops do not belong to the modern, but to an older, probably Neogene period of geological history, corresponding to the beginning of tectonic activation.

Thus, two stages of karst formation are expressed in the Shikhans, namely the Neogene and modern. The Neogene left only individual relics in the form of near-top caves and carbonate incrustations, the modern one is mostly represented by the sulfate type.

History of economic development and protection

Even in the Late Palaeolithic (12–40 thousand years ago), the entire territory of the Urals and adjacent territories was inhabited by humans, as evidenced by archaeological excavations. The first people were engaged in hunting, fishing, and plantings. The people of the Mesolithic era belonged to the Romanov-Ilmurzin culture and were engaged in hunting, fishing and gathering. In the Neolithic, humans began to master new types of activities, namely cattle breeding. In the Bronze Age, the Abashev tribes settled here. They built ground pillar-frame structures and were engaged in smelting and processing of copper and bronze. In the 6th – 4th centuries BC, early nomads appeared here. The Prokhorov culture was formed. A few centuries later, the Hunno-Sarmatian culture prevailed in this territory, and the process of settling of newcomer nomadic tribes began. During the Migration Period (IV – V centuries AD), Turbasli tribes lived here, as evidenced by archaeological sites (Kush-Tau, Urnyak II). There is also information about the presence of archaeological finds indicating the active development of the territory of the Shikhans in the Iron Age (Tura-Tau settlement and mound, Kushtau Yuzhnoe colony, 1000 AD). During archaeological excavations in the vicinity of the Shikhans, burials of approximately the 14th–15th centuries were discovered. Before the entry of the Bashkir lands into the Russian Empire, the territory of the Shikhan was quite developed.

Today, in the immediate vicinity of Toratau, there are Urman-Bishkadak and Shikhan villages. Since the founding of the Urman-Bishkadak village in 1757, local residents have been engaged in agriculture and cattle breeding. They bred horses, cows, sheep and goats. Beekeeping played an important role too. Agriculture was poorly developed. Only small areas were sown with spring and winter crops, mostly for people's own use.

At the foot of Kushtau there are two settlements: Urnyak and Shikhans.

Yuraktau and Nikolaevka are rural settlements near Yuraktau. The Yuraktau village was founded in the 18th century. Its inhabitants were engaged in agriculture and cattle breeding, and there was a forge, a zemstvo school, and shops.

In the 30s of the last century, large reserves of limestone were explored in the Bashkir Shikhans. The presence of raw materials and the proximity of the Yar-Bishkadak rock salt deposit were key factors in the construction of the soda plant in Sterlitamak.

In late 40s and mid 50s of the XX century, at the foot of Toratau, there was a special camp for prisoners. They extracted and burnt limestone near Toratau. Limestone was used in the construction of industrial facilities in nearby cities. On the southwestern side of Toratau, three skeletons of barracks have been preserved.

Currently, more than 2 thousand people live in the immediate vicinity of the Shikhans. The main part of the inhabitants is engaged in agriculture at peasant farms and farm households. In farm households, residents are engaged in poultry farming, cattle breeding, and often beekeeping. Part of the male population works on a rotational basis in the regions of the Far North of Russia.

The Bashkir Shikhans attract a large number of tourists. At the foot of Toratau there is a visitor center of the Toratau geopark with the parking zone. On Kushtau, there are ski slopes up to 800 m long. The slopes of the Kush-Tau ski resort operate all year round. Mountain biking and roller skating are organized in summer. In the immediate vicinity of the Kush-Tau ski resort there is the Shikhans rest house, which can simultaneously accommodate up to 100 people. An active family holiday on Kushtau is organized by Ptitsa-Gora Company. The territory of the Shikhans is a popular holiday destination, especially for residents of Sterlitamak, Salavat, Ishimbai and nearby villages. Thus, the Shikhans are of great recreational importance.

The history of protection begins with the creation of the Toratau Mountain natural monument in the Ishimbai region of the Republic of Bashkortostan. The conservation status was assigned to it by the Decree of the Council of Ministers of the Bashkir ASSR dated August 17, 1965 No. 465 "On the protection of natural monuments of the Bashkir ASSR". Yuraktau Mountain (Sterlitamak region) was assigned the conservation status 20 years later. On December 26, 1985, Resolution of the Council of Ministers of the Bashkir ASSR No. 212 "On the protection of wild plants in the territory of the Bashkir ASSR" was issued, approving the list of valuable natural objects, including Yuraktau, which were subject to protection. At the same time, these documents did not include information on geographic coordinates, boundaries, area and protection regime and, in fact, were only a list of valuable natural objects.

On February 26, 1999, Decree of the Cabinet of Ministers of the Republic of Bashkortostan "On approval of the Regulations on specially protected natural areas in the Republic of Bashkortostan" No. 48 was issued, which approved the general protection regime for all natural monuments. The wording of the protection regime was general and only banned any activity that violated the conservation of natural monuments.

The need to approve a protection regime corresponding to the characteristics of the natural complex, the nature of vulnerability and current risks and threats, as well as the need to fix the boundaries and areas of the natural objects was reflected in the papers on inventory taking of specially protected natural areas of the Republic of Bashkortostan prepared by local biologists and geographers. The results of their studies were reflected in the Registers of specially protected natural areas of the Republic of Bashkortostan, published in 2006, 2010, 2016 and 2020. These documents were not of a legislative nature but were used as they contained expert assessment of the value and vulnerability of the Toratau and Yuraktau Mountains and were approved by law in 2018.

Decree of the Government of the Republic of Bashkortostan dated April 11, 2018 No. 162 "On amendment of some decisions of the Council of Ministers of the Bashkir Autonomous Soviet Socialist Republic, the Cabinet of Ministers of the Republic of Bashkortostan and the Government of the Republic of Bashkortostan" approved the area, description of the boundaries, geographical coordinates and the protection regime of the Yuraktau Mountain. In accordance with this document, the area of the natural monument is 64.1 hectares.

Decree of the Government of the Republic of Bashkortostan dated April 11, 2018 No. 163 "On Amendments to Decree of the Council of Ministers of the BASSR dated August 17, 1965 N 465 "On the Protection of Natural Monuments of the Bashkir ASSR" approved the area, description of the boundaries, geographical coordinates and the protection regime of the Toratau Mountain. In accordance with this document, the area of the natural monument is 47.7 hectares.

Thanks to the initiative of locals, as well as biologists and geologists of the Republic of Bashkortostan, in 2020, the Kushtau Mountain natural monument was created in the Sterlitamak and Ishimbai regions of the Republic of Bashkortostan. The protected status was approved by Decree of the Government of the Republic of Bashkortostan dated September 2, 2020 No. 529 "On the creation of a specially protected natural area of republican significance in the Ishimbai and Sterlitamak Districts of the Republic of Bashkortostan". In accordance with this document, the area of the natural monument is 325.3 hectares.

The creation of Toratau Geopark, which is currently nominated for inclusion in the UNESCO Global Network of Geoparks, is an important moment in the history of the conservation of the Bashkir Shikhans. The geopark was created by Decree of the Head of the Republic of Bashkortostan No. УГ-308 dated December 12, 2018, "On the Toratau Geopark". The boundaries of the geopark were approved by Decree of the Government of the Republic of Bashkortostan dated November 5, 2020 No. 688 "On approval of the boundaries of the Toratau Geopark". The governing body of the Geopark is a non-profit organization and it has no supervisory authority. However, the participation of the geopark in the sustainable management of the territory, the organization of the appropriate infrastructure, the control over the tourist flow, the conduct of environmental, educational, educational activities and various environmental actions also contribute to the preservation of the Bashkir Shikhans.

To prevent adverse anthropogenic impacts on the natural complexes of the Bashkir Shikhans, Decree of the Head of the Republic of Bashkortostan No. UG-375 dated 22 July 2021 approved the following protected areas: 250.65 hectares (Kushtau), 129.221 hectares (Toratau), 68 .0774 ha (Yuraktau).

Besides, the Toratau and Yuraktau Mountains, since valuable archaeological and historical objects were found on them, are classified as cultural heritage and are protected by federal laws. Turatau Settlement Site (object in the federal register No. 0310037000) refers to monuments of federal significance (Decree of the Council of Ministers of the RSFSR dated August 30, 1960, No. 1327), and the Yurak-Tausskoe Sanctuary (object in the federal register No. 0300974000) refers to monuments of regional importance (Resolution of the Council of Ministers of the BASSR No. 599 dated December 31, 1970).

Regulatory legal acts are presented in Annexes B1 – B8.

3 JUSTIFICATION FOR INSCRIPTION

Fossils of the Toratau Shikhan in the walls of the Toratau cave 2. Photo by G.A. Danukalova.




3. JUSTIFICATION FOR INSCRIPTION

3.1.a Brief synthesis

The Bashkir Shikhans are isolated hills in the Fore-Urals, located in a 20-kilometer chain along the right bank of the Belaya River in the territory of the Republic of Bashkortostan of the Russian Federation. The absolute height of the Toratau Shikhan is 406.4 m, the length is about 1000 m, the width is about 800 m, and the projection area of the mountain is about 42 ha. The height of the Kushtau Shikhan is 374.5 m, the length is about 4000 m, the width is up to 1500 m, and the projection area is about 325 ha. The height of the Yuraktau Shikhan is 338.4 m, the length is 900 m, the width is 850 m, and the projection area is about 64 ha.

The Shikhans are the remains of a grandiose barrier reef formed in the warm sea of the Early Permian (299–283 Ma) and stretching from the Northern Caspian Sea to the Polar Urals. All three Shikhans have a conservation status of complex natural monuments.

The Bashkir Shikhans represent an outstanding landscape illustrating an important stage in the geological history of the Earth. The nominated property reflects the history of the ancient Ural Ocean and the formation of Pangea, the development of the organic world of the Early Permian and the reef palaeocommunities and structures on a planetary scale. The Bashkir Shikhans are a unique natural phenomenon due to the amazing combination of ancient and modern forms of the earth's surface, and the good exposure of this geological object turns it into a wonderful natural museum. It is the Bashkir Shikhans that have the best exposure, are accessible for study and are beautifully expressed in relief.

3.1.b Criteria under which inscription is proposed

The serial natural object "the Bashkir Shikhans" is nominated according to criterion viii. It fits the main categories of criterion viii (according to Dingwall et al., 2005) and includes the following attributes:

a) stages of the development of the Earth, namely:

- Reflects the final stage of development of the Palaeouralian ocean, associated with the collision of the continents of Laurussia (the edge of the East European Platform), Siberia and Kazakhstan and the growth of the Ural Mountains. The Bashkir Shikhans reflect the convergence of the continents and the formation of reef structures during Earth's development lasting more than 18 Ma (Fig. 46).

- The deposits of the nominated property are represented by the bioherm facies of the Asselian, Sakmarian Stages and the lower part of the Artinskian Stage of the Ural part of the Permian System with a total thickness of about 500 m. The Toratau Shikhan is a stratotype of the regional Shikhanian horizon of the Asselian Stage. 40 km north of the

Shikhans, there is the Usolka geological section, GSSP of the Sakmarian Stage, where deep-water carbonate-terrigenous deposits formed within the Fore-Urals Foredeep are exposed. This amazing combination of observable geological sections in one area makes it possible to compare the reef complex with the deep-sea complex of the same age.

Fig. 46. Early Permian Stage of the Earth's development, 300 million years ago. (Scotese, www.scotese.com / newpage5.htm).

b) palaeontological data:

- the nominated Bashkir Shikhans of Toratau, Kushtau and Yuraktau are of palaeontological and palaeoecological value, since all types of fossil fauna are concentrated in a small area, as well as cyanobacteria and algae, characteristic of the Early Permian, which existed together (Fig. 47). At present, fossils of nine types of fauna are known on the Shikhans, namely sarcodes, sponges, cnidarians, arthropods, molluscs, bryozoans, brachiopods, echinoderms, chordates. Algae are known from the Regnum Phyta. The ancient fauna of the Bashkir Shikhans has a number of features: new species of foraminifera, ostracods, cephalopods, bryozoans, brachiopods, including endemic genera and species, have been described from this territory. At the same time, a mixed composition of communities of many groups of fauna is noted, containing species from the northern and southern water areas, which indicates the existence of links between the Early Permian biotas of the Ural Palaeobasin and the biotas of the Tethyan and Arctic regions.

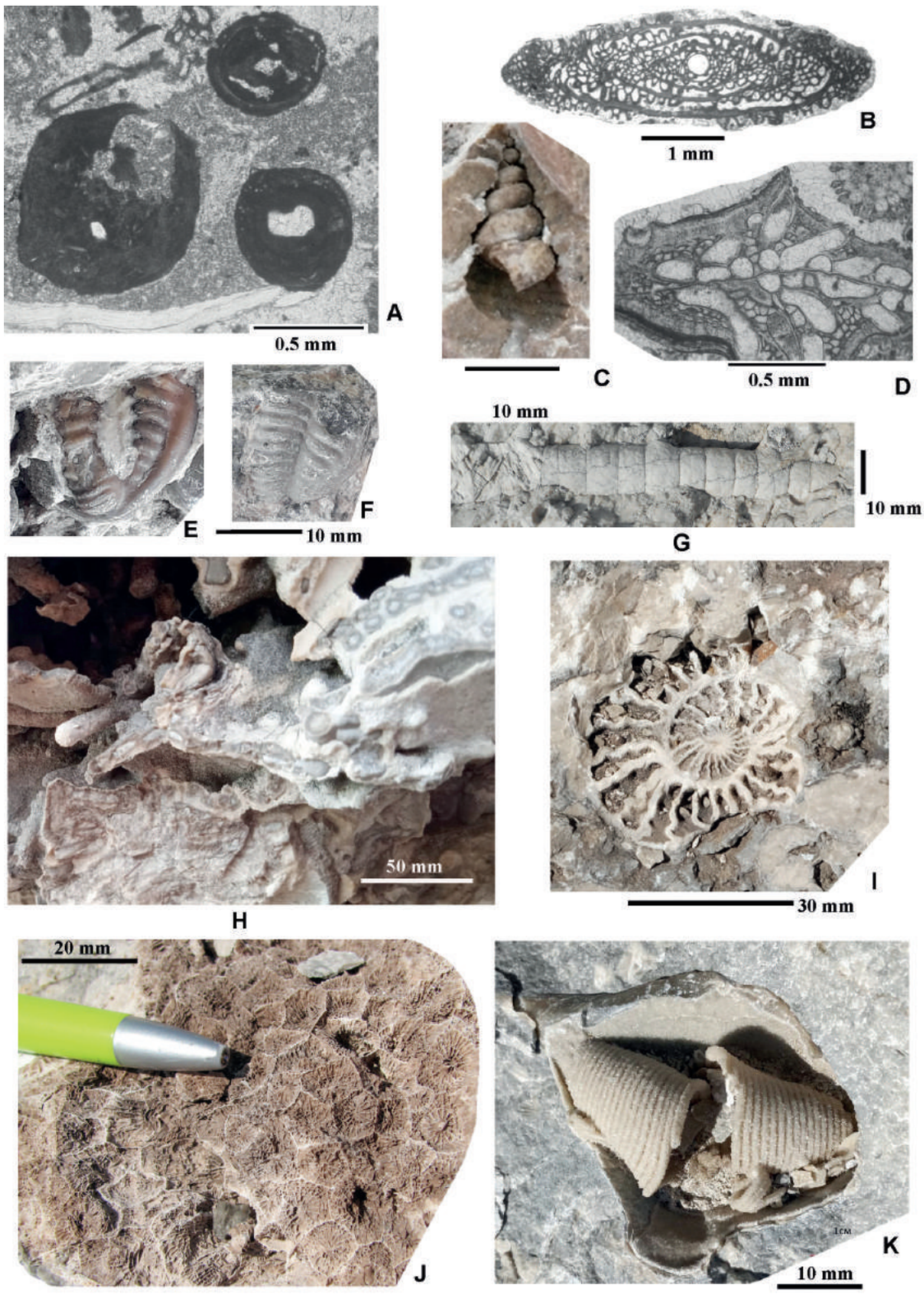


Fig. 47. Fossils from Toratau, Kushtau and Yuraktau.

A – thin section of limestone with remains of *Tubiphytes*, Yuraktau. B – section of the fusulinid *Grozdilovia ischimbajevi*, Yuraktau. C – gastropod *Stegocoelia quinque costata*, Yuraktau. D – fragments of bryozoans in thin section, Yuraktau. E,F – trilobite pygidia, Kushtau. G – fragment of a crinoidea stem, Toratau 2 Cave. H – *Palaeoaplysina* limestone, Toratau. I – section of the ammonoid shell, Yuraktau. J – colonial Rugosa, Yuraktau. K – brachiopod, Yuraktau.

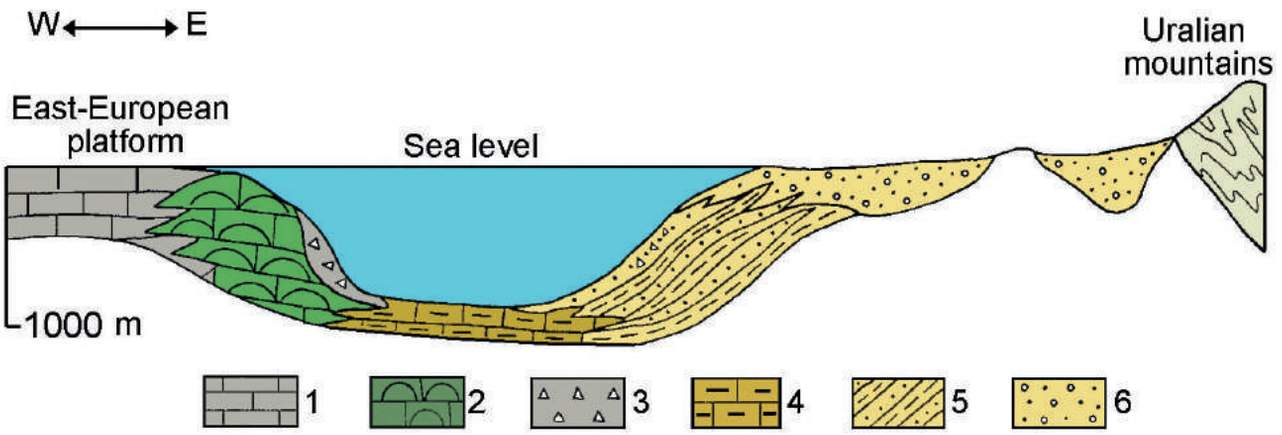


Fig. 48. Structure of the Fore-Uralian Foredeep at the beginning of the Permian (cross intersection) (Puchkov, 1997).

1 – shallow-water layered limestones; 2 – reefs; 3 – clastic carbonate deposits (reef apron); 4 – deep-water clay deposits; 5 – debris flow; 6 – thick sequence of terrigenous deposits formed as a result of the destruction of the Ural Mountains.

d) landscapes and landforms, including reefs, atolls and oceanic islands.

- The Bashkir Shikhans represent a structural element of the ancient (Early Permian) relief of the seabed, namely, a fragment of a fossil barrier reef, consisted of a series of facially and morphologically differentiated meridionally elongated bioherm buildups. The reefs were formed in the zone of transition from the shallow sea basin of the eastern margin of the East European Platform to the deeper basin of the Fore-Uralian Foredeep (Fig. 48). When the shelf regions of Laurussia and the Kazakhstan continent collided, the edge of the East European Platform gradually bended. Natural conditions were extremely favorable for marine communities, and the rate of platform bending contributed to the growth of reefs. A chain of biohermal buildups run along the single shelf of the ancient continent of Laurussia (the edge of the East-European Platform). However, only the Bashkir Shikhans have the best exposure, are accessible for study, and are well expressed in relief.

3.1.c Statement of Integrity

The nominated serial object "the Bashkir Shikhans" is an integral natural system where the natural geological formations have been preserved in a fairly stable state for a long time. The Toratau, Kushtau and Yuraktau Shikhans (three separate areas of the nomination), raised to the surface as a result of tectonic movements in the Neogene and facetted by weathering processes in the Quaternary. They represent an integral natural complex, the main components of which are inextricably linked by a common origin and dynamics of natural development.

The nominated property is a specially protected natural area, a complex natural monument of the Republic of Bashkortostan. The Toratau Shikhan was declared a natural monument in 1965, the Yuraktau Shikhan – in 1985, and the Kushtau Shikhan – in 2020. Thus, the nominated objects are protected by the laws of the Russian Federation and the Republic of Bashkortostan, as well as resolutions of the Government of the Republic of Bashkortostan.

Despite the fact that the Shikhans are located in the populated territory of the Ishimbai district of the Republic of Bashkortostan, they are not damaged, retain their geological and palaeontological integrity and form an amazing bright landscape, which additionally represents an aesthetic appeal. In addition, the population of the Republic considers the Shikhans to be the objects of national pride. Locals worship the Shikhans and praise them in folk songs and legends.

3.1.e Protection and management requirements

Currently, the Bashkir Shikhans of Toratau, Kushtau and Yuraktau have the status of complex (geological, stratigraphical, palaeontological, palaeogeographical, geomorphological, botanical, historical) regional natural monuments, which guarantees them safety. Resolutions on the creation of the Toratau Mountain, Kushtau Mountain, and Yuraktau Mountain natural monuments are contained in Annexes B5-B7.

The protection regime of the nominated property is established by Federal Law of the Russian Federation "On Specially Protected Natural Areas" No. 33 dated March 14, 1995, Regulations on Natural Monuments in the Republic of Bashkortostan, approved by Resolution of the Cabinet of Ministers of the Republic of Bashkortostan dated February 26, 1999 No. 48, as well Decree of the Government of the Republic of Bashkortostan dated April 11, 2018 No. 163 "On Amendments to Decree of the Council of Ministers of the BASSR dated August 17, 1965 No. 465 "On the Protection of Natural Monuments of the Bashkir ASSR".

The nominated serial object is also part of the Toratau Geopark, which is currently being prepared for inclusion in the UNESCO Global Geopark, which provides it with additional guarantees of safety and integrity.

Control over compliance with the regime of protection of natural monuments and their buffer zones is carried out by the territorial committees of the Ministry of Nature Management and Ecology of the Republic of Bashkortostan annually. An independent

assessment of the state of protected areas is carried out by a third-party scientific organization that performs an inventory of specially protected natural areas when maintaining the cadaster of protected areas. Such an assessment is carried out every four years for each protected area.

Additionally, Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization, which is a management company, together with its partners and local communities, provides all possible support to the government in maintaining order in the territories where the Shikhans are located. Joint cleaning campaigns are regularly held. Thanks to joint efforts, a mounted patrol was established to protect the objects. The patrol monitors the general order in the territory, protects natural monuments from unauthorized use by tourists.

Natural monuments and their protected zones are marked with warning and information signs along the perimeter of their boundaries. All natural monuments and their protected zones (if any) are necessarily taken into account when creating plans and prospects for economic and social development, territorial integrated schemes, land management schemes and district plans. On the territories of natural monuments and their protected zones, any activity that entails any violation of their safety is prohibited. Thus, in the territory of natural monuments, the following activities are prohibited: mining, grazing, planting or deforestation, collecting plants, herbarization, collecting insects and other animals, construction activities, geological exploration, hunting, holding mass events, any activity that may lead to violation of the integrity of monuments or the loss of their aesthetic appearance, as well as the deterioration of conditions for growth of vegetation. Thus, in the territory of the Toratau, Kushtau and Yuraktau Shikhans the territorial and functional integrity of the entire complex of monuments is achieved.

To implement strategic projects aimed at solving the complex tasks of the nominated territory and creating a meaningful context for its development, a medium-term management plan for the period 2024-2028 has been developed (see Annex B9).

All Special Protected Natural Areas (SPNA), the sections of the nominated territory, have sufficient financial and administrative resources for long-term preservation of the declared Outstanding Universal Value.

A potential threat to the safety of the Shikhans (primarily the Kushtau Shikhan) is the threat of limestone mining by Joint Stock Company “Bashkir Soda Company”, Sterlitamak. The company was offered an alternative source of raw materials, the Khudolaz quarry, which does not have a high nature-value.

The UNESCO World Heritage status will strengthen the guarantees of safety for the Bashkir Shikhans, protect them against possible threats from human economic activity.

3.2 Comparative Analysis

The Bashkir Shikhans are a natural complex that is of value from several points of view (for example, in terms of biology, history, culture, aesthetics). However, their geological significance is, without a doubt, a priority, and it is this that brings the object under study to the world level. Therefore, the comparative analysis below is based on the search for possible analogues among geological monuments located in different parts of the world. These analogues can be found not only in the UNESCO lists (main and tentative), but also beyond, e.g. on the lists of specially protected natural areas of different status.

According to the latest data (as of July 1, 2023), 93 properties are included in the UNESCO World Heritage List (List) according to criterion viii, and 233 properties are included in the Tentative List. At the same time, many geological monuments meet several aspects of value or categories of criterion viii at once. For example, geological sections contain palaeontological remains, or one can observe geological processes and their results in the object.

The study of the basic characteristics of these properties showed the following distribution according to the categories of criterion viii:

- category a) the main stages of the development of the Earth – 17 properties on the List and 49 on the Tentative List;
- category b) palaeontological data – 21 properties on the List and 41 on the Tentative List;
- category c) geological processes – 13 properties on the List and 20 on the Tentative List;
- category d) landscapes and landforms – 43 properties on the List and 123 on the Tentative List.

Despite the fact that the geological processes of the past and present (category “c”) perfectly complement the palaeontological and geological data of the Shikhans, the nominated property “the Bashkir Shikhans” within the criterion viii is closest to categories a) “main stages of the development of the Earth”, b) “palaeontological data” and partly d) “landscapes and landforms”. To prove the uniqueness of the nominated property and the absence of its obvious analogues in the UNESCO Lists, a comparative analysis was carried out using these three aspects.

3.2.1. Comparison with geological objects reflecting the main stages of the development of the Earth

The UNESCO Lists contain unique natural monuments that reflect the main stages of the development of the Earth. For example, Precambrian and Phanerozoic deposits are presented in 11 geological sites from the List and 24 geological sites from the Tentative List.

Analysis of sites showed that one has Precambrian deposits, four sites have Cambrian deposits, no sites have Ordovician and Silurian deposits, two sites have Devonian deposits, two sites have Carboniferous deposits, two sites have Permian deposits, one site has Triassic deposits and another one – Jurassic deposits, five sites have Cretaceous deposits, six sites have Paleogene deposits, one has Neogene deposits, and another one – Quaternary deposits.

We included only similar objects of the Permian system in the comparative analysis since the conditions for the existence of organisms in basins similar in terms of sedimentation features, although the objects are in different climatic zones and differed significantly at different geological times.

The analysis showed that, although the Lower Permian deposits are widely distributed both in continental and marine facies, only a few sections of marine deposits of the Asselian – Artinskian interval are known in the world, where lithological, structural-tectonic (and other) features were studied in detail.

Among all geological monuments on the List, Permian deposits (Middle Series, or Guadalupian) are sufficiently reflected in the case of the Carlsbad Caverns National Park, USA. In the Tentative List, there is another property, Le Permien marin de Jebel Tebaga, Tunisia, with the deposits of the Permian System (Upper Series, or Lopingian) (Fig. 50). Four more Permian objects were found outside the UNESCO Lists (Table 6, Fig. 49).

Table 6. Comparison of the Bashkir Shikhans with geological sections of the world in category a) stages of the development of the Earth

Name of the site / area, ha/ conservation status	World Heritage List /Criterion	Stratigraphic unit / (million years, Ma)	Degree of manifestation	Deposits thickness	Tectonic disturbances	Regional stratigraphic unit
Bashkir Shikhans (Russia) Kushtau 575.95 ha Toratau 176.921 ha Yuraktau 132.1774 ha Total 885.0484 ha Three separate protected areas	Claimed under viii criterion	Lower Permian, Asselian and Sakmarian Stages (298.9–290.1 Ma)	Well-manifested separate mountains, stretching in a chain from north to south, representing the Early Permian barrier reef	500–600 m	Shikhans were brought to the surface with a tectonic block. They are complicated by tensile cracks, seam cracks, slickensides and crushing zones.	Shikhansky and Tastubsky horizons
Closest Lower Permian (Cisuralian) site, but not part of the Permian barrier reef						
Dovžanova Soteska, Karavanka Mts. (Slovenia) Area – no data Natural monument of Slovenia	Not on the UNESCO Lists	Lower Permian, Asselian, Sakmarian Stages (298.9–290.1 Ma)	Canyon and hill in Karavanka Mts	Born Formation (20 m), Dovžanova Soteska Formation limestones (35 m)	The rocks of the Eastern and Southern Alps, the Dinarids and the Pannonian Basin belong to the Adriatic lithospheric microplate, which broke away from the African Plate in the Mesozoic and collided with the Eurasian Plate during the Alpine Orogeny in the Neogene.	Born Formation, Dovzanova Soteska Formation limestones

Similar objects of the Lower Permian (Cisuralian), but in deep water facies						
Usolka site (Russia) 0.3 ha Protected area	Not on the UNESCO Lists	Carboniferous (Pennsylvanian) – Lower Permian (Cisuralian), Asselian, Sakmarian Stages (323.2–290.1 Ma)	Outcrop of the right slope of the Usolka River in a roadside excavation	Over 125 m	Continuous condensed relatively deep section with monoclinal bedding	Kerzhakovian, Azantashskian, Martukskian horizons of the Upper Carboniferous; Shikhanian and Tastubian horizons of the Permian
Dalniy Tyulkas site (Russia) 1.926 ha Protected area	Not on the UNESCO Lists	Lower Permian (Uralian), Sakmarian, Artinskian stages (293.52–283.5 million years)	Outcrops along the right slope of the Dalniy Tyulkas creek	About 40 m	Southern extremity of the Usolskaya anticline, monoclinal occurrence of layers	Kurort suite, Sterlitamakian horizon of the Sakmarian Stage; Bursevskian and Irginskian horizons, Tyulkas suite, Artinskian Stage
Close objects of the Permian system, but the middle (Guadalupian) and upper (Lopingian) stages						
Carlsbad Caverns National Park (USA) 18.926 ha National park	World Heritage List vii, viii criteria	Middle Permian (Guadalupian) (273.01–259.51 Ma)	Capitan formation limestone forms Capitan reef (Guadalupe mountains and El Capitan rock)	Total Capitan Formation thickness is,300-610 m	The reef has an arcuate structure, the rocks that make up the reef complex are divided in places by faults	Capitan reef complex (Formation) include the Goat Seep Limestone, Capitan Limestone, and Carlsbad Limestone (Hiss, 1975)

Guadalupe Mountains National Park 34951 ha National park	Out of the UNESCO lists	Middle Perm (Guadalupian) (273.01–259.51 Ma)	Capitan Formation Limestone forms Capitan reef (Guadalupe mountains and El Capitan rock)	Total Capitan Formation thickness is 300–610 m	The reef has an arcuate structure, the rocks that make up the reef complex are dissected in places by faults	Capitan reef complex (Formation) include the Goat Seep Limestone, Capitan Limestone, and Carlsbad Limestone (Hiss, 1975)
Le Permien marin de jebel Tebaga (Tunisia) Area – no data Natural monument	Tentative World Heritage List vii,viii criteria	Middle (Wordian,Capitanian Stages)–Upper (Wuchiapingian Stage) Permian (Guadalupian – Lopingian) (266.9–254.14 Ma)	A group of hills bordering the Jeffara Plain	About 450 m	Series of monoclinal outcrops	Murghabian sequence (Lethiers et al., 1989) Wordian and Capitanian Stages of the Middle (Guadalupian) to mid-Upper Permian

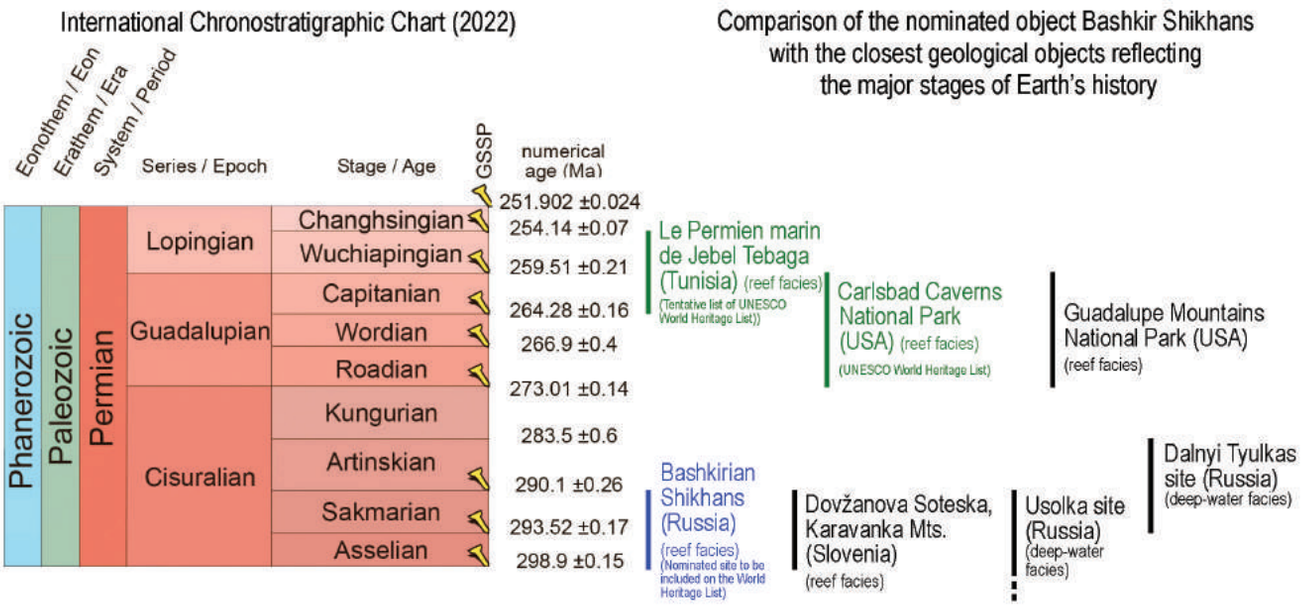
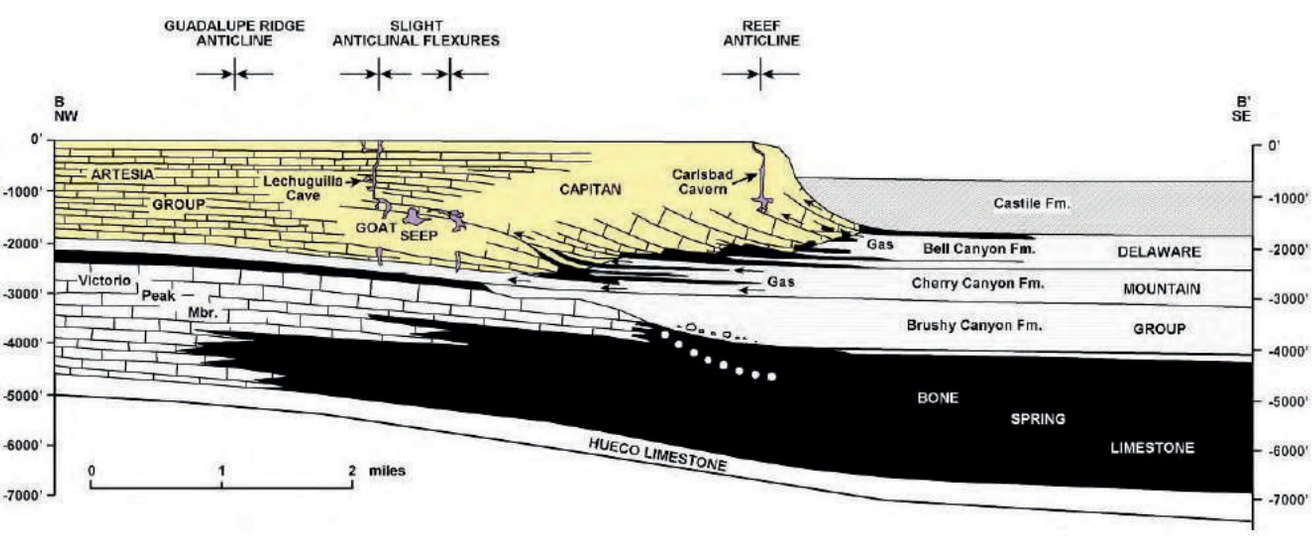


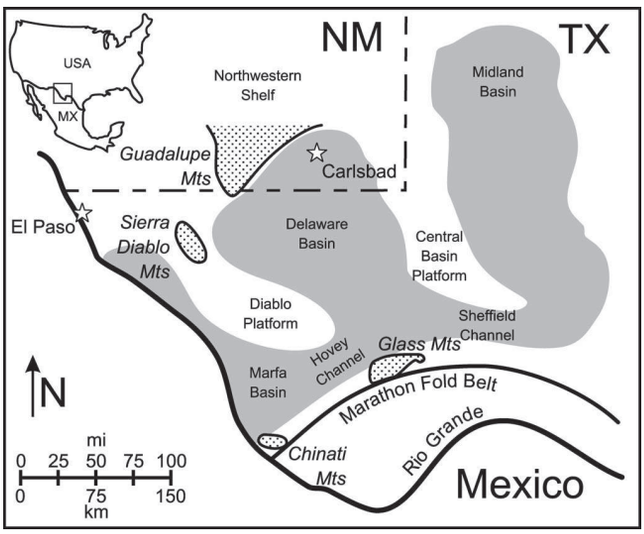
Fig. 49. Comparison of the nominated property the Bashkir Shikhans with the closest geological properties, reflecting the main stages of the Earth's history.



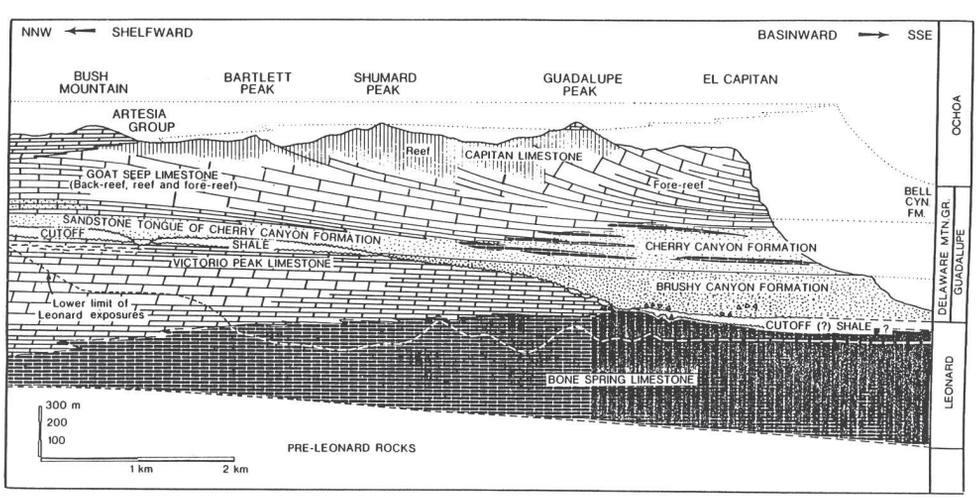
Section showing the position of the speleological system relative to the stratigraphic units of the Permian system (Budney, 2010).

Fig . 50. Captain Reef Complex in Carlsbad Caverns National Park, USA.

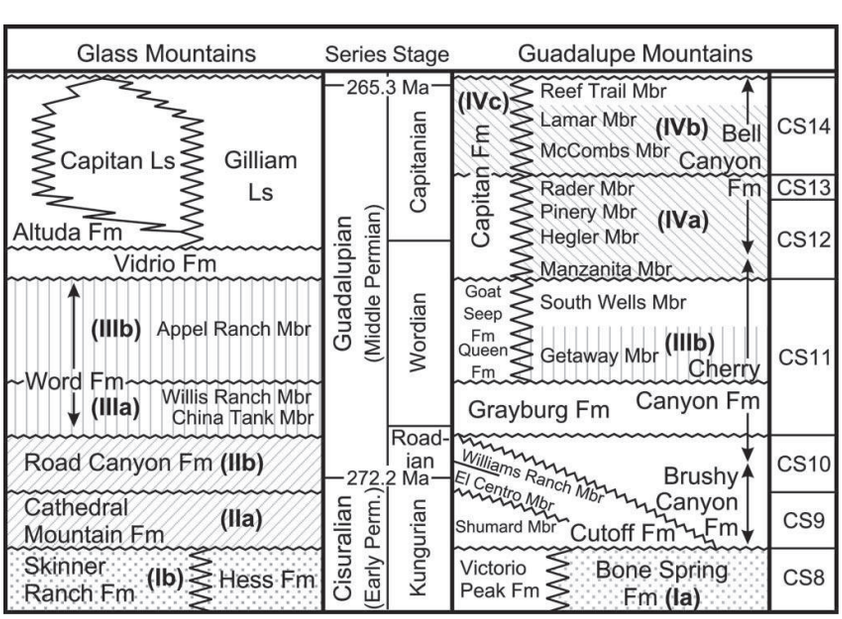
View of the Capitan Reef Complex in Carlsbad Caverns National Park, USA, Texas–New Mexico (P. Scholle, https://geoinfo.nmt.edu/tour/federal/parks/PermianReef/images/McKit1.jpg).



Schematic of the Permian Basin. Deep-water part of the basin is marked with grey color; modern mountain systems are dotted (according to Cooper, Grant 1972; Olszewski, Erwin,2009).



Schematic section of the Western Cliff (King, 1948) showing the stratigraphy at the transition from shelf to basin. Note the dotted lines above indicating the pre-erosion configuration of the Capitan Reef Margin (Harris, 2004).



Stratigraphic units of the Permian Basin (Olszewski, Erwin, 2009).

Fig. 50. Captain Reef Complex in Carlsbad Caverns National Park, USA.

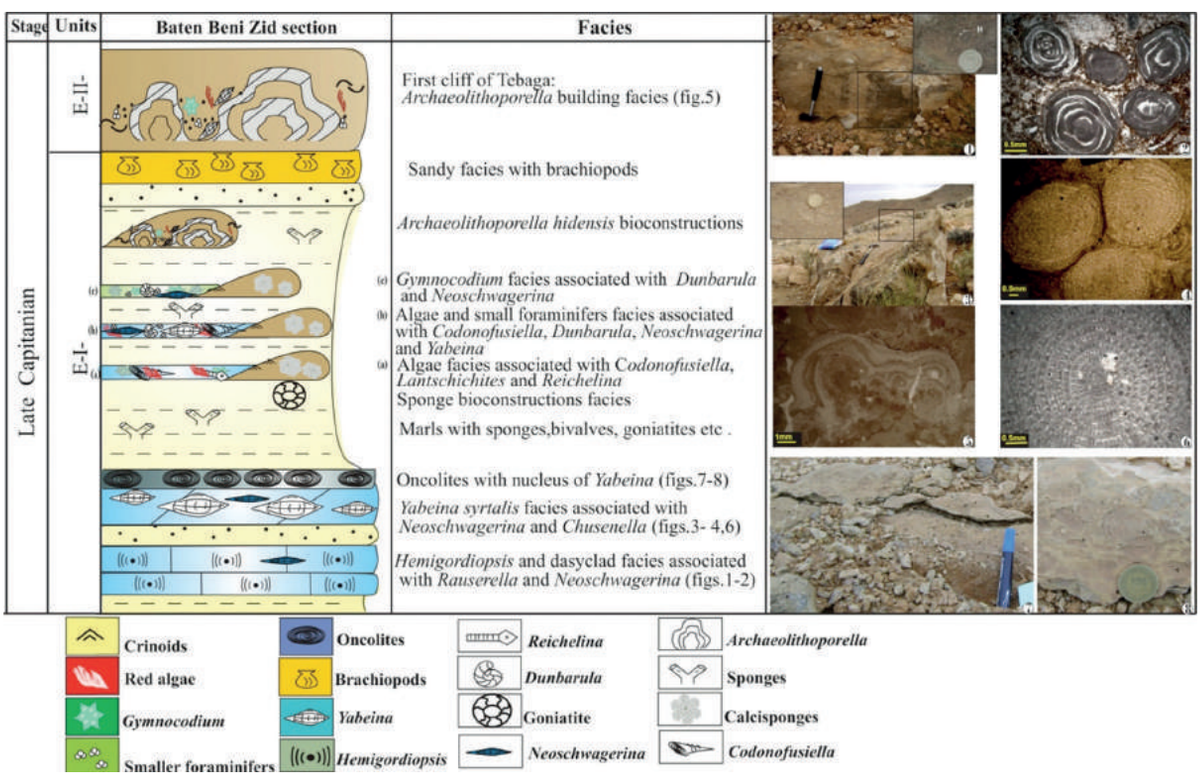
Carlsbad Caverns National Park, USA are presented under category d) Landscapes and landforms. The property is mainly famous for caves and karst, unique dripstones. The carbonate rocks belong to the Capitan Formation of the Guadalupian Series of the Permian System. They were and accumulated as a result of the vital activity of the organisms of the Middle Permian reef (Fig. 50). The rocks of the Capitan Formation are represented by carbonate deposits with a total thickness of 300–610 m. The rocks of the Capitan reef, in which the Carlsbad caves are formed, and the rocks that form the Bashkir Shikhans are similar. They are represented by carbonate shallow reef facies at the transition of the shelf to the continental slope. Their main difference is in the time of sedimentation. The first one was accumulated during the Middle Permian (Guadalupian), and the second one – during the Early Permian (Cisuralian). Unfortunately, little attention has been given to the fossil reef and the Capitan Formation at the Carlsbad Caverns site, with all visitors' attention focused on the unique caves. The geological section in the territory of the Guadalupe Mountains National Park is similar in all aspects (lithology, age of rocks) to the Middle Permian geological section of the Carlsbad Caverns National Park. Both properties are essentially part of the same Capitan reef.

Le Permien marin de Jebel Tebaga, Tunisia, is formed by carbonate and terrigenous-clastic deposits, which, according to studies (Lethiers et al., 1989) belongs to the Murghabian sequence, correlated from the Wordian and Capitanian Stages of the Middle (Guadalupian) Series to the middle of the Upper Series of the Permian System (Fig. 51). Previously, these deposits were compared only with the Upper Series of the Permian System (Douvillé, 1934). The composite Le Permien marin de Jebel Tebaga section is represented by the alternation of tidal cross-bedded sandstones from bottom to top (unit I, thickness 57 m), clastic bioherm limestones (unit II, thickness 58 m), marl and isolated sponge reefs (unit III, thickness 175 m), detrital bioherm limestones (unit IV, thickness 75 m), ferruginous bioclastic limestones with a layer of dolomites with oncolites on top (unit V, thickness 20 m), a series of sandstones and tidal clays (unit VI, thickness 65 m). The total thickness of the section is 450 m. This sequence with bioherms reflects vertical growth and lateral progradation during episodes of sea deepening, and then a suspension of reef formation during the regressive phase of the Late Permian. They correspond to the barrier reef built on the edge of the platform (Razgallah et al., 1989).

Thus, Le Permien marin de Jebel Tebaga, Tunisia, is fundamentally different from the Bashkir Shikhans in terms of conditions (tidal zone, alternation of sandstones and bioherm carbonate rocks) and accumulation time (Middle – Late Epochs of the Permian Period) of rocks (Fig. 49) but also in terms of taxonomic composition and thickness of biohermal facies. The nature of sediments indicates unstable conditions for the formation of reef buildups, compared with the Bashkir Shikhans.

Studied geological objects		Chronostratigraphy		Tunisian biozones
Cheguimi sandstome			Lopingian	No foraminifers
Tebaga outcrops	"Ensemble supérieur"	CAPITANIAN	Late late Capitanian	Highest zone with *Dunbarula mathieui* and smaller foraminifers
				Highest zone of *Yabeina syrtalis*
			Middle late Capitanian	Middle zone of *Dunbarula mathieui* and smaller foraminifers
				Highest zone with *Codonofusiella* and *Reichelina*
				Middle zone of *Yabeina syrtalis*
			Early late Capitanian	Lowest zone with *Dunbarula mathieui* and smaller foraminifers
				Lowest zone with *Codonofusiella* and *Reichelina*
				Lowest zone of *Yabeina syrtalis*
	"Ensemble moyen"		Late early Capitanian	*Rauserella*, *Kahlerina* and *Neoschwagerina* interval zone
Tebaga borehole			Early early Capitanian	Gap? of *Yabeina archaica* zone
		WORDIAN	Latest Wordian	*Afghanella robbinsae* (= ? *Afghanella sumatrinaeformis*), *Sumatrina*, *Dunbarula* and *Kahlerina* lowest zone
			Late Wordian	*Afghanella schencki* zone
	"Ensemble inférieur"		Early Wordian	*Eopolydiexodina* ex gr. *persica* zone
			Roadian	*Parafusulina* spp. zone
Other Tunisian boreholes			Early Permian	Gap? (or only staffellids)
			Late Pennsylvanian	*Triticites*, *Likharevites*, *Darvasoschwagerina* zone
			Pennsylvanian Mississippian	Ghazzay et al., (Submitted)

Summary table showing the Carboniferous-Permian biozones of Tunisia, both in outcrops and boreholes, and their stratigraphy (Ghazzay, Vachard, 2015).



Facies and microfacies of the lithostratigraphic units E-I and E-II of Baten Beni Zid with lithostratigraphic column (left) (Ghazzay and Vachard, 2015).

Fig. 51. Le Permien marin de Jebel Tebaga, Tunisia natural monument.

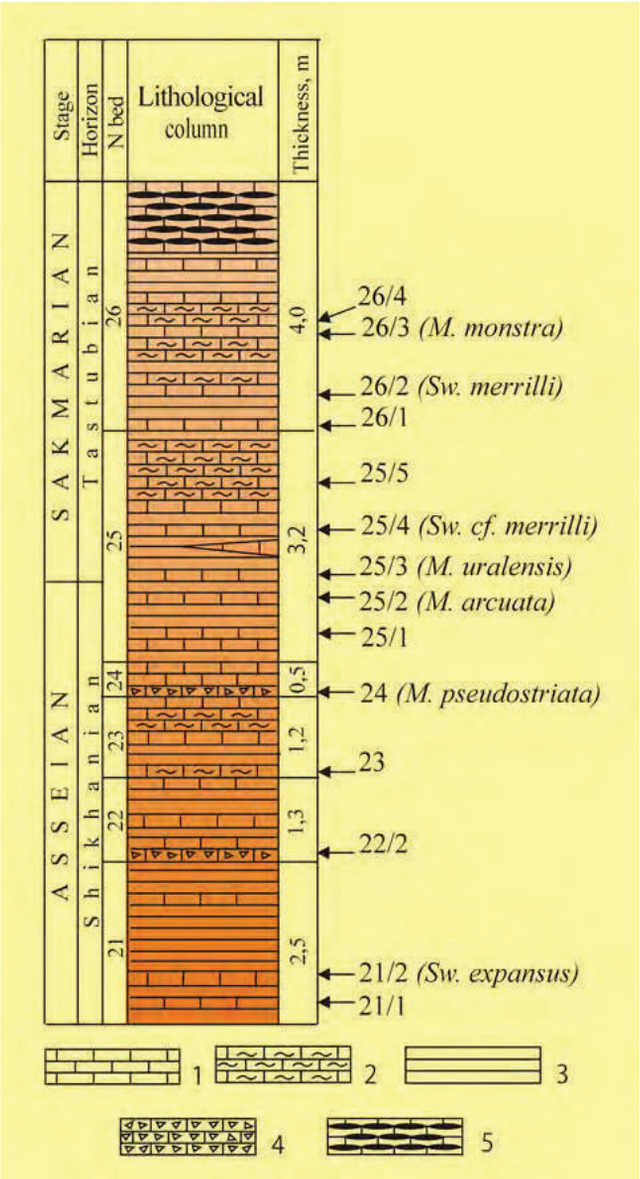
Close sites exist, but they are not on the UNESCO Lists.

The sections of the Usolka site and the Dalniy Tyulkas site (Bashkir Fore-Urals, Russia) are represented by Lower Permian rocks in deep-water terrigenous-carbonate facies, which significantly distinguishes them from the Bashkir Shikhans, which contain shallow-water reef deposits (Chernykh et al., 2015) (Fig. 52). As it is known, reef carbonate facies are formed on the shelf when it is bent towards the continental slope. Deep-water facies are formed at depth, at the foot of the continental slope and on the ocean floor, and are represented by interbedding of terrigenous and carbonate rocks. Thus, both the Usolka Site (Asselian – Sakmarian Stages) and the Dalniy Tyulkas Site (Sakmarian – Artinskian Stages) are not reefs, but similar age interval of sedimentary rock accumulation brings them closer to the Bashkir Shikhans.

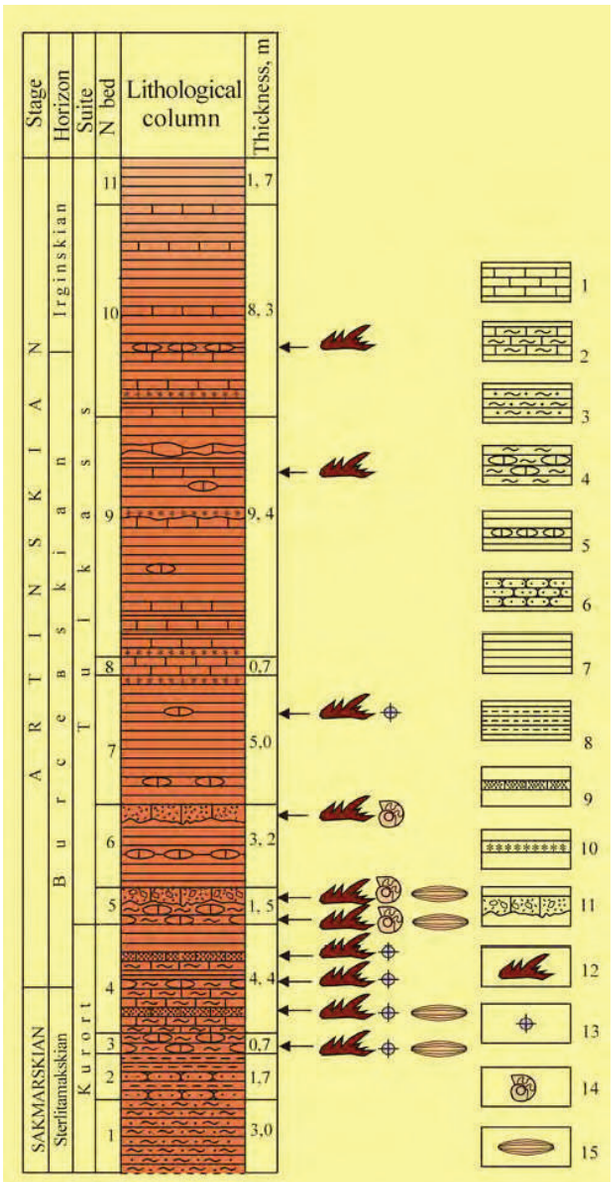
Usolka section. Asselian /Sakmarian deposits (Chernykh et al., 2015).

Dalniy Tyulkas section. Artinskian Stage. Irginskian horizon (Chernykh et al., 2015).

Fig. 52. Usolka site and Dalniy Tyulkas site (Bashkir Fore-Urals, Russia) (not on the UNESCO Lists).



Usolka section. Stratigraphic column with conodont samples in the Usolka section (Chernykh et al., 2015).

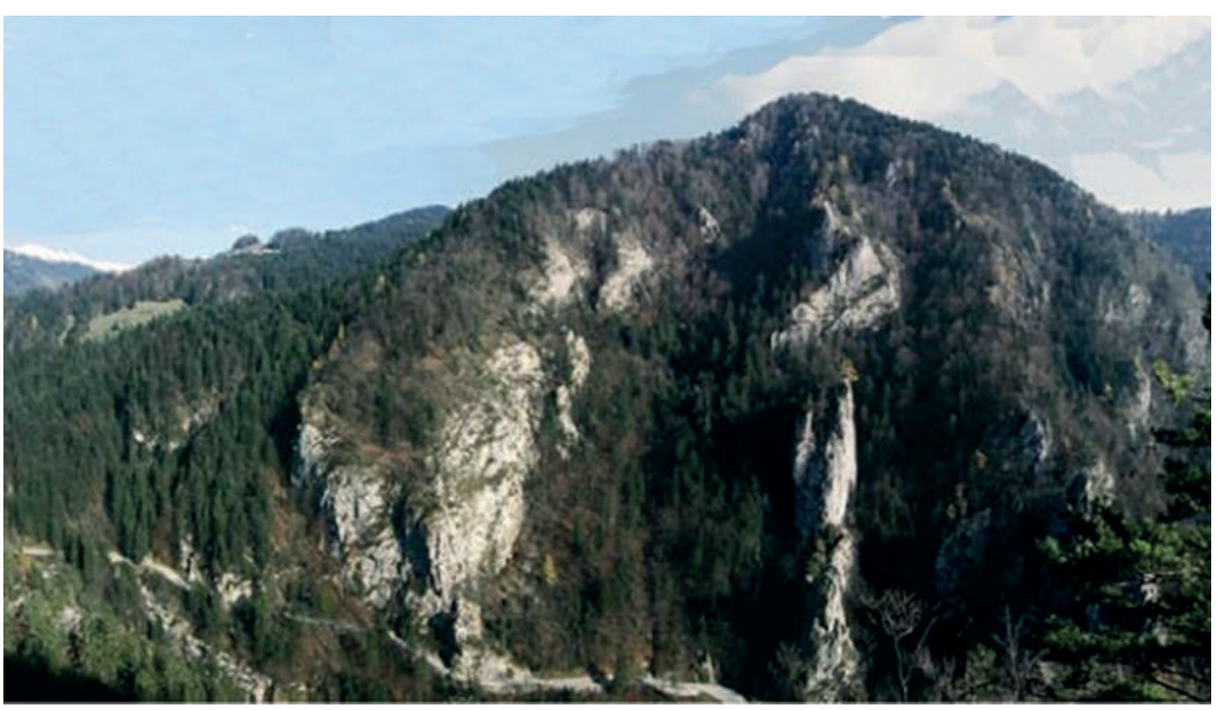


Dalniy Tyulkas section. Stratigraphic column showing the distribution of samples with conodonts, fusulinids, radiolarians and ammonoids (Chernykh et al., 2015).

Fig. 52. Usolka site and Dalniy Tyulkas site (Bashkir Fore-Urals, Russia) (not on the UNESCO Lists).

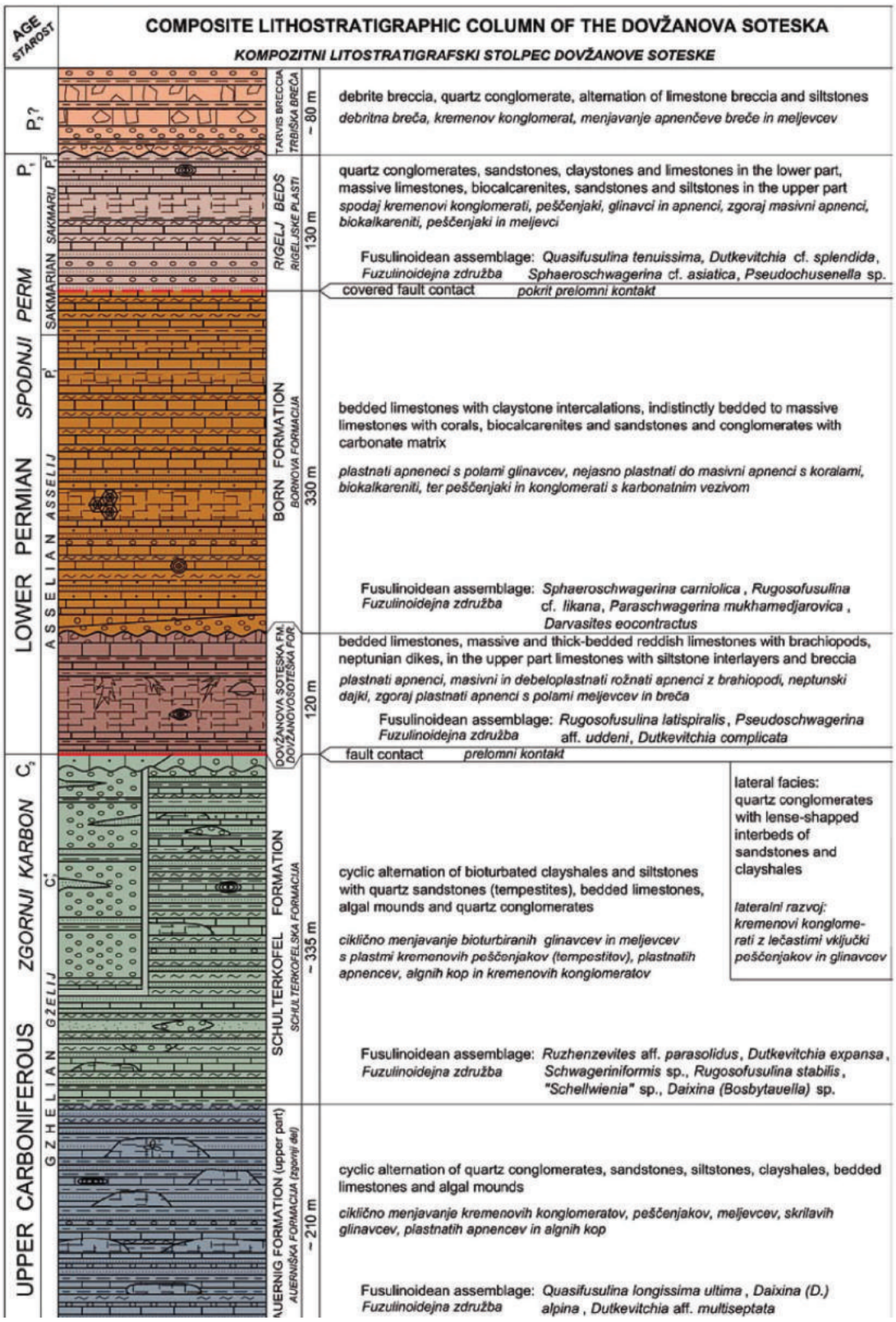
Almost similar to the Bashkir Shikhans are the carbonate buildups of the Dovzhansky Canyon, located in the Karavanka Mts (Slovenia) (Dovžanova Soteska, Karavanka Mts., Slovenia) that are not included in the List and do not currently qualify. This property has the same geological age, contains a similar composition of carbonate rock facies as the Bashkir Shikhans (Novak et al., 2019; Kossovaya et al., 2020) (Fig. 53). The difference is in the fact that in the Dovzhansky Canyon, among the Lower Permian rocks, the Assellian deposits (330 m) are better represented than the Sakmarian ones. In addition, in the Assellian deposits, among the layered limestones of the Born Formation, there are interlayers of mudstones, sandstones, and conglomerates, and in the Sakmarian deposits, in the Rigelj Beds, there are conglomerates, sandstones, mudstones, and limestones in the basal part, massive limestones, sandstones, and mudstones in the upper part. The nature of the sediments indicates unstable conditions for the formation of reef buildups in comparison with the Bashkir Shikhans. Dovžanova Soteska formation reflects distinct transgressive-regressive cycles of basin development and various stages of reef growth, with stops during regressions when the reefs were above sea level (Novak, 2007).

Thus, the sites described above, even having some similar properties, cannot in any way be regarded as complete analogues of the Bashkir Shikhans. Indeed, the site in Bashkiria fundamentally differ from them in the time of formation of the barrier reef during the Asselian and Sakmarian Ages of the Early Permian.



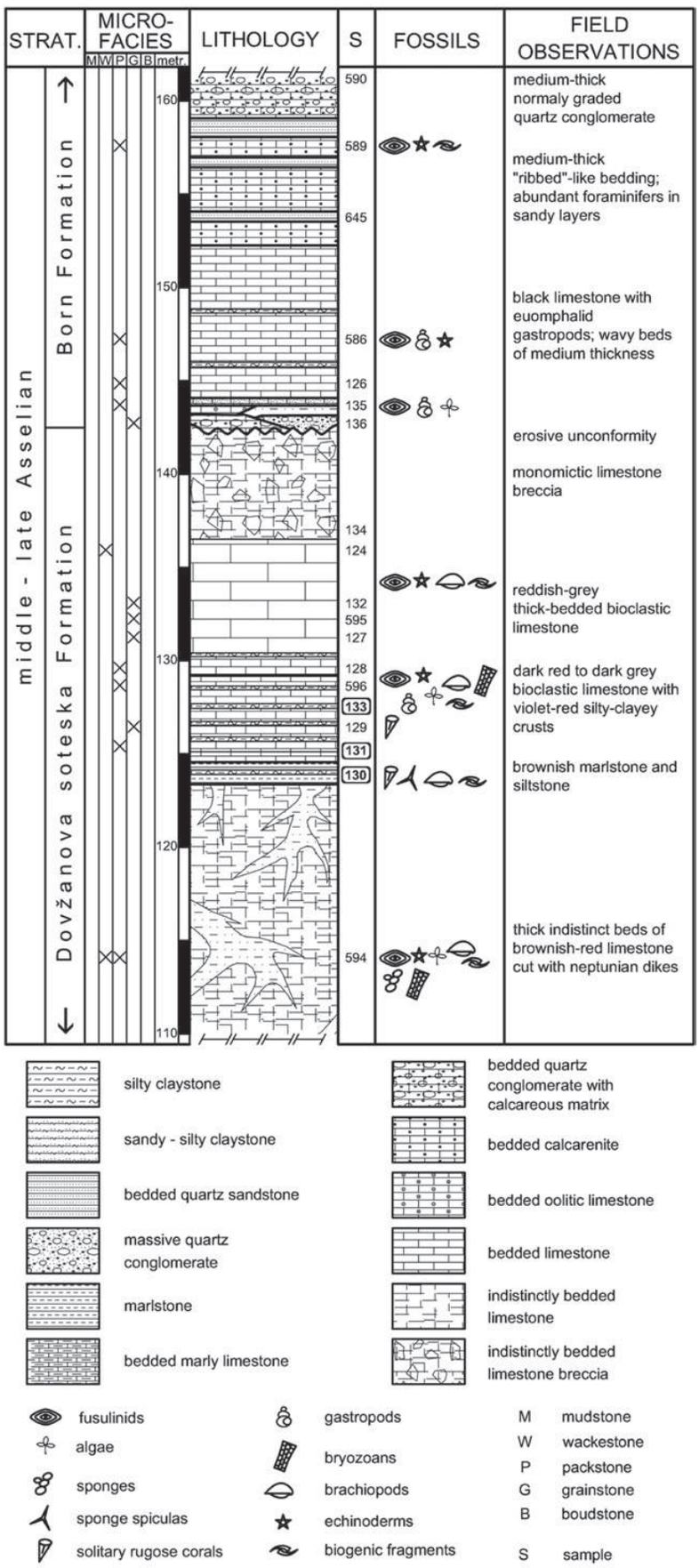
The western slope of the Vratni Mountain above the Dovzhansky Canyon with a wide ridge of reddish limestone and the rocky pyramids of Kushpegar (Novak, 2007).

Fig. 53. Geological section of Carboniferous and Permian rocks of the Dovzhansky Canyon, Karavanka Mts (Slovenia) (not on the UNESCO Lists).



Consolidated lithostratigraphic column of Carboniferous and Permian rocks of the Dovzhansky Canyon (Novak, 2007).

Fig. 53. Geological section of Carboniferous and Permian rocks of the Dovzhansky Canyon, Karavanka Mts (Slovenia) (not on the UNESCO Lists).



Detailed rocks of the Dovžanova Soteska and Born formations of the medium to late Assellian and places of fossil finds (Dovzhansky Canyon, Slovenia) (Kossovaya et al., 2012).

Fig. 53. Geological section of Carboniferous and Permian rocks of the Dovzhansky Canyon, Karavanka Mts (Slovenia) (not on the UNESCO Lists).

3.2.2. Comparison with palaeontological objects

Palaeontology is another aspect that reveals the global significance of the Bashkir Shikhans according to the geological criterion viii.

Deposits with palaeontological remains can be found in 21 sites from the List and 41 sites from the Tentative List (total 62 sites).

The analysis of sites showed that Precambrian fossils are present in eight sites, Cambrian fossils are present in three sites, Ordovician, Silurian, Devonian, Carboniferous fossils in one site each, Permian – in two sites, Triassic – in eight sites, Jurassic – in three sites, Cretaceous – in nine sites, Paleogene – in ten sites, Neogene – in five and Quaternary – in ten sites.

Thus, the representation of fossils of the Permian in the modern World Heritage List can be assessed as very poor. At the same time, no Early Permian sites are represented.

The analysis of the sites showed that land fossils are known in 24 sites on the modern List, fossils of organisms that lived in the aquatic environment (normal marine basins) – in 30, sites, mixed fossils (both marine and land) – in 7 sites. The oldest signs of life on Earth and ancient multicellular organisms without skeletons and problematic fossils (Incertae Regnum) are protected in 10 sites. Phanerozoic invertebrates are known in 34 sites. The remains of chordates, including the oldest chordates, as well as primates, are present in 38 world-famous sites. Remains of lower (algae) and higher plants are present in 30 sites. Problematic fossils are present in 11 sites.

Fossils in the nominated property “The Bashkir Shikhans” are represented by marine cyanobionts (stromatolites), invertebrates, chordates (fish, conodonts), algae, and fragments of plant stems washed out from land (Table 7). Therefore, the comparison was made only with similar sites of the Permian period.

Among the geological monuments appearing on the List and the Tentative List, Permian fossils (described in the literature) are represented in two cases, namely in case of Carlsbad Caverns National Park in the USA and the Marine Permian of Le Permien marin de Jebel Tebaga, Tunisia.

Table 7. Comparison of the Bashkir Shikhans with geological phenomena of the world containing fossils (palaeontological remains) in category b) Palaeontological data

Name of the site / area, ha	World Heritage List /Criterion	Predominant rock	Geological age, million years, Ma	The most numerous fossil organisms, their preservation and diversity
Bashkir Shikhans (Russia) Kushtau 575.95 ha Toratau 176.921 ha Yuraktau 132.1774 ha Total 885.0484 ha	Claimed under viii criterion	Carbonate rocks	Early Permian, Assellian and Sakmarian Ages (298.9–290.1 Ma)	Stromatolites, Plants: algae (*Tubiphytes*), trees Sarcodina: foraminifera (fusulinids) Cnidaria: Hydrozoa (*Palaeoaplysina*), Anthozoa (Rugosa, colonial, solitary), Mollusca: gastropods, bivalves, cephalopods (nautilids, ammonoids) Arthropods: trilobites, ostracods Bryozoa: Gymnolaemata Brachiopoda: Articulata Echinodermata: Crinoidea Chordata: conodonts, Condrichthyes (Helicoprion) Outstanding preservation Outstanding variety
Closest objects by age				
Dovžanova Soteska, Karavanka Mts. (Slovenia) Area – no data	Not on the UNESCO Lists	Carbonate rocks	Early Permian, Assellian and Sakmarian (298.9–290.1 Ma)	Algae (*Tubiphytes*) Sarcodina: foraminifera (fusulinids) Cnidaria: Anthozoa Echinodermata: Echinoidea, Crinoidea Bryozoa Chordata: conodonts Good preservation Good variety

Closest Lower Permian (Preuralian) sites, but in deep water facies				
Usolka site (Russia) 0.3 ha	Not on the UNESCO Lists	Middle Carboniferous limestone. Upper Carboniferous–Lower Permian – limestones, mudstones, marls	Middle-Late Carboniferous (Pennsylvanian) (323.2–298.9 Ma) Early Permian (298.9–290.1 Ma)	Acritarchs, miospores Sarcodina: radiolarians, foraminifers (fusulinids, etc.) Cnidaria: Anthozoa (Rugosa, single forms) coral polyps (quadruple solitary) Mollusca: bivalves, cephalopods Arthropoda: crustaceans (trilobites, ostracods) Brachiopoda Bryozoa Echinodermata: Crinoidea Chordata: conodonts, fishes Acritarchs, miospores Algae (Tubiphytes) Sarcodina: foraminifers (fusulinids, etc.), radiolarians Spongiata: sponges Cnidaria: Anthozoa (Rugosa, solitary) Mollusca: cephalopods (ammonoids, straight nautiloids) Brachiopoda Bryozoa Echinodermata: Crinoidea Chordates: conodonts, fishes Perfect preservation Very good variety

Dalniy Tyulkas site (Russia) 1.8 ha	Not on the UNESCO Lists	Siltstones, mudstones marls, limestones, carbonate breccias	Early Permian (293.52–283.5 Ma)	Acritarchs, miospores Sarcodina: foraminifers (fusulinids, etc.), radiolarians Spongiata: sponges Mollusca: cephalopods (ammonoids) Echinodermata: Crinoidea Chordata: conodonts, fishes Good preservation Good variety
Closest objects of the Permian System, but the Middle (Guadalupian) and Upper (Lopingian) Epochs				
Carlsbad Caverns National Park (USA) 18.926 ha	World Heritage List vii,viii criteria	Carbonate rocks	Middle Permian (Guadalupian) (273.01–259.51 Ma)	Plants: algae Spongiata: sponges Arthropoda: trilobites Mollusca: gastropods, bivalves cephalopods (nautiloids and ammonitids) Echinodermata: Crinoidea Bryozoa Brachiopoda Good preservation Good variety

Guadalupe Mountains National Park 34951 ha	Not on the UNESCO Lists	Carbonate rocks	Middle Permian (Guadalupian) (273.01–259.51 Ma)	Plants: Algae Spongiata: sponges Arthropoda: trilobites Mollusca: gastropods, bivalves, cephalopods (nautiloids and ammonitids) Echinodermata: Crinoidea Bryozoa Brachiopoda Good preservation Good variety
Le Permien marin de Jebel Tebaga (Tunisia) Area – no data	Tentative World Heritage List vii,viii criteria	Carbonate, terrigenous-clastic rocks mudstones and sandstones with limestone interlayers	Middle-Late Permian (266.9–254.14 Ma)	Plants: algae Sarcodina: foraminifera (fusulinids) Sponges: solitary sponges, Chaetetoidea Cnidaria: Anthozoa Molluscs: Gastropoda Arthropods: trilobites, ostracods Brachiopods Echinoderms: sea lilies Good preservation Good variety

Carlsbad Caverns National Park, USA. The caves were developed in the Capitan Reef, which was formed in the Middle Permian at the border of the shelf and the Delaware Sea by phylloid algae, calcareous sponges and bryozoans (Newell et al., 1953; Wood, 2011) (Fig. 54). In addition, in back-reef facies, with increased salinity of water, finds of fusulinids, ostracods, crinoids and brachiopods are known; in the fore-reef facies – trilobites, brachiopods, sea urchins, algae and bryozoans are found. Thus, bryozoans and algae played a significant role in the formation of both the Delaware Reef and the Bashkir Shikhans. The main difference between the Bashkir Shikhans and the Capitan Reef is that in the Bashkir Shikhans hydroids (*Palaeoaplysina*) and bryozoans are the main reef builders, while in the Delaware reef these are sponges and bryozoans.

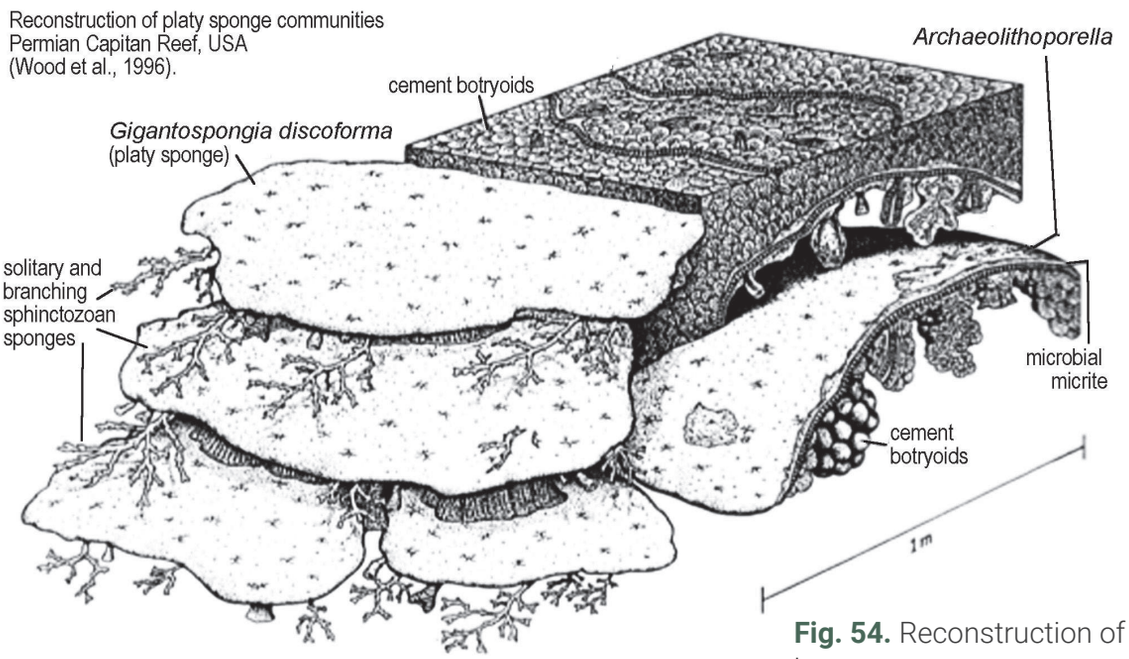
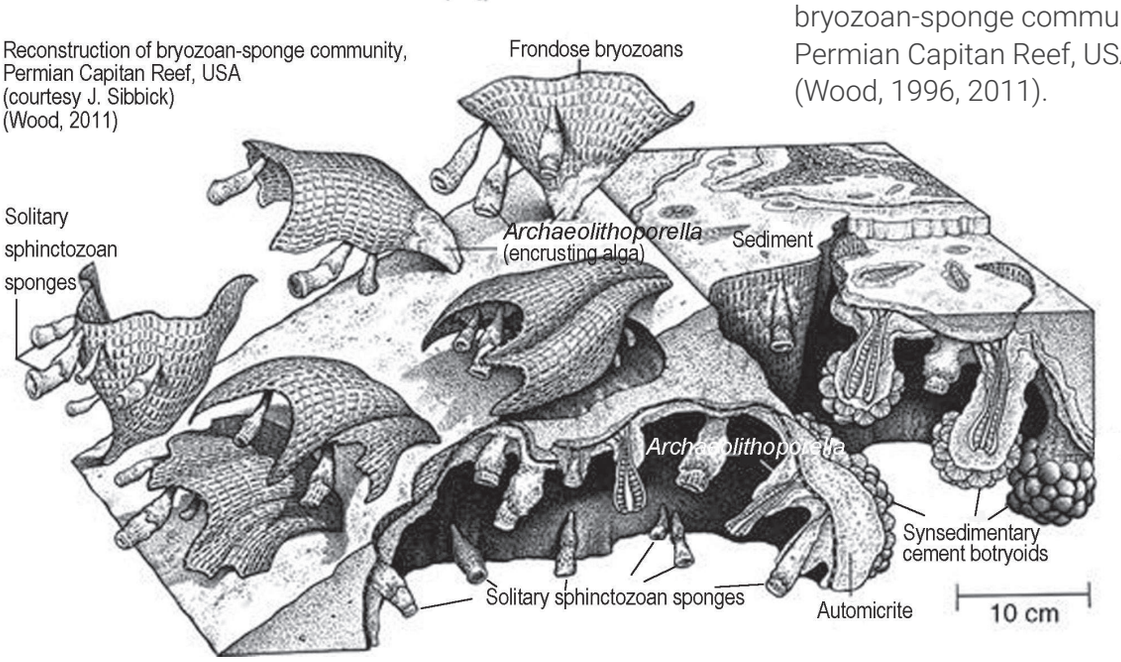


Fig. 54. Reconstruction of bryozoan-sponge community, Permian Capitan Reef, USA (Wood, 1996, 2011).



Le Permien marin de Jebel Tebaga, Tunisia. As noted by W. Ghazzay et al. (2015), most of the carbonate series belong to the Capitanian Stage of the Middle Permian, but nevertheless a clear correlation with the El Capitan stratotype in the USA and with coeval localities of the Tethys region is still not clear; exploration of the fossil remains of Jebel Tebaga continues. Fusulinids, a rich complex of solitary sponges, corals, ostracods, rare trilobites, gastropods, brachiopods, crinoids, and algae are known here (Fig. 55). The leading group are foraminifera (fusulinids). Ostracod data suggest a shallow sea around the reefs and western communication between the Tethys Ocean and the Texas Sea (Lethiers et al., 1989). Biofacies studies have established three types of structures according to fossil communities: a) *Archaeolithoporella – Tubiphytes* – Sponges bioherms, b) *Parachaetetes* – Phylloides bioherms, c) *Archaeolithoporella* – Sponges biostromes (Razgallah et al., 1989).

Thus, Le Permien marin de Jebel Tebaga, Tunisia, is closer to the Delaware Reef in terms of the main reef builders: bioherms from single sponges in combination with other organisms played the main role in Jebel Tebaga. In addition, parachaetetes, which were not found on the Bashkir Shikhans, are also present. The main difference between the Bashkir Shikhans and the Le Permien marin de Jebel Tebaga (as well as the Capitan reef) is the dominant role of hydroids (*Palaeoaplysina*) in the formation of the basic structure.

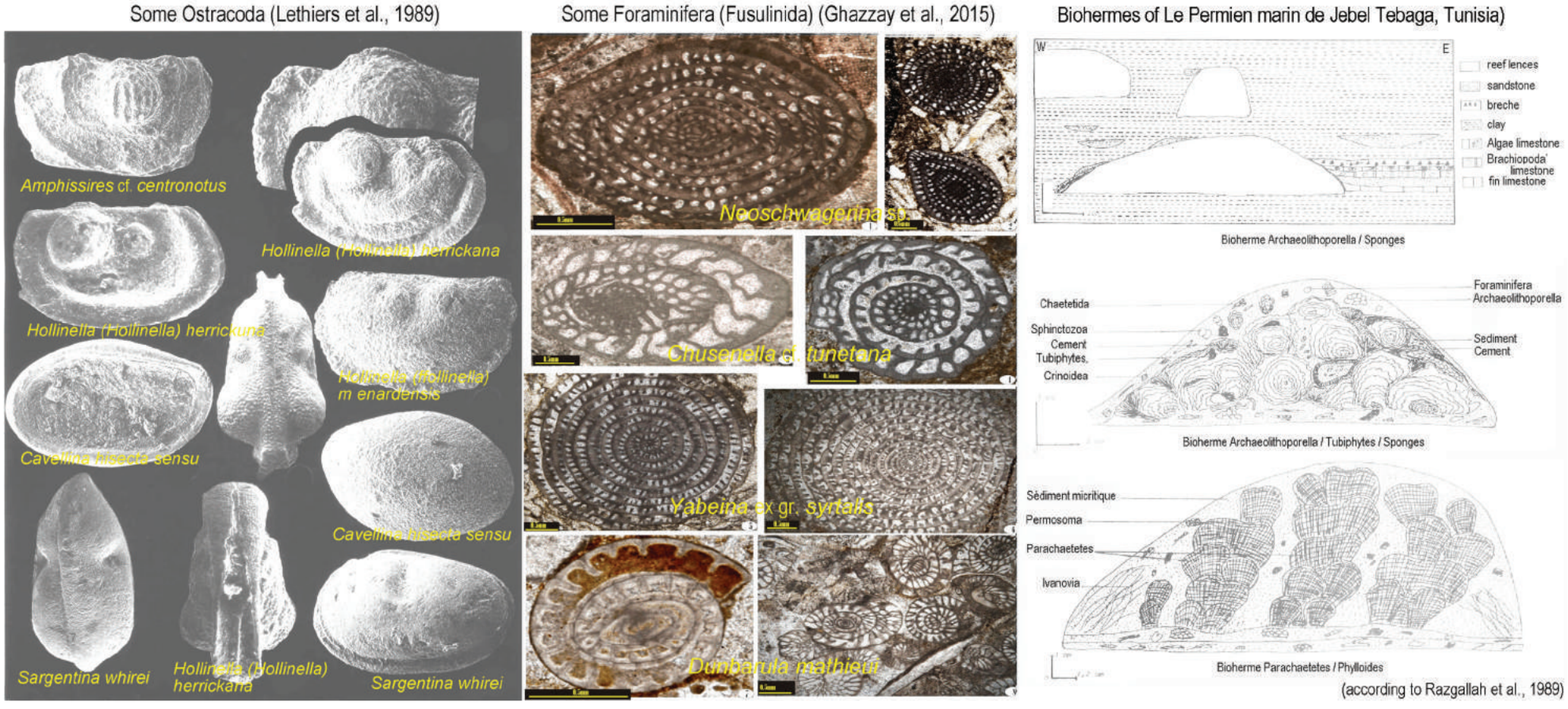
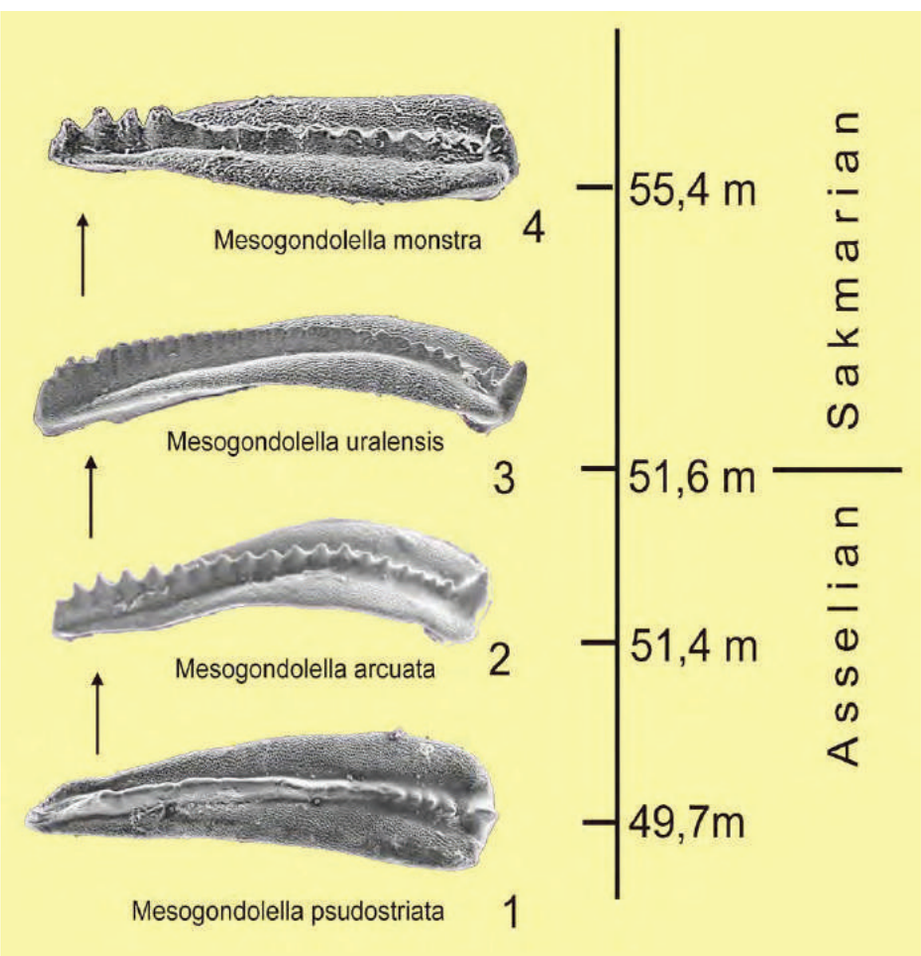


Fig. 55. . Some guiding palaeontological remains and schemes of the structure of bioherms of Le Permien marin de Jebel Tebaga, Tunisia.

There are similar objects which are not on the UNESCO lists. These are the geological sections of the Lower Permian Usolka and Dalniy Tyulkas sites in the Southern Urals, as well as carbonate structures of Dovžanova Soteska, Karavanka Mts., Slovenia.

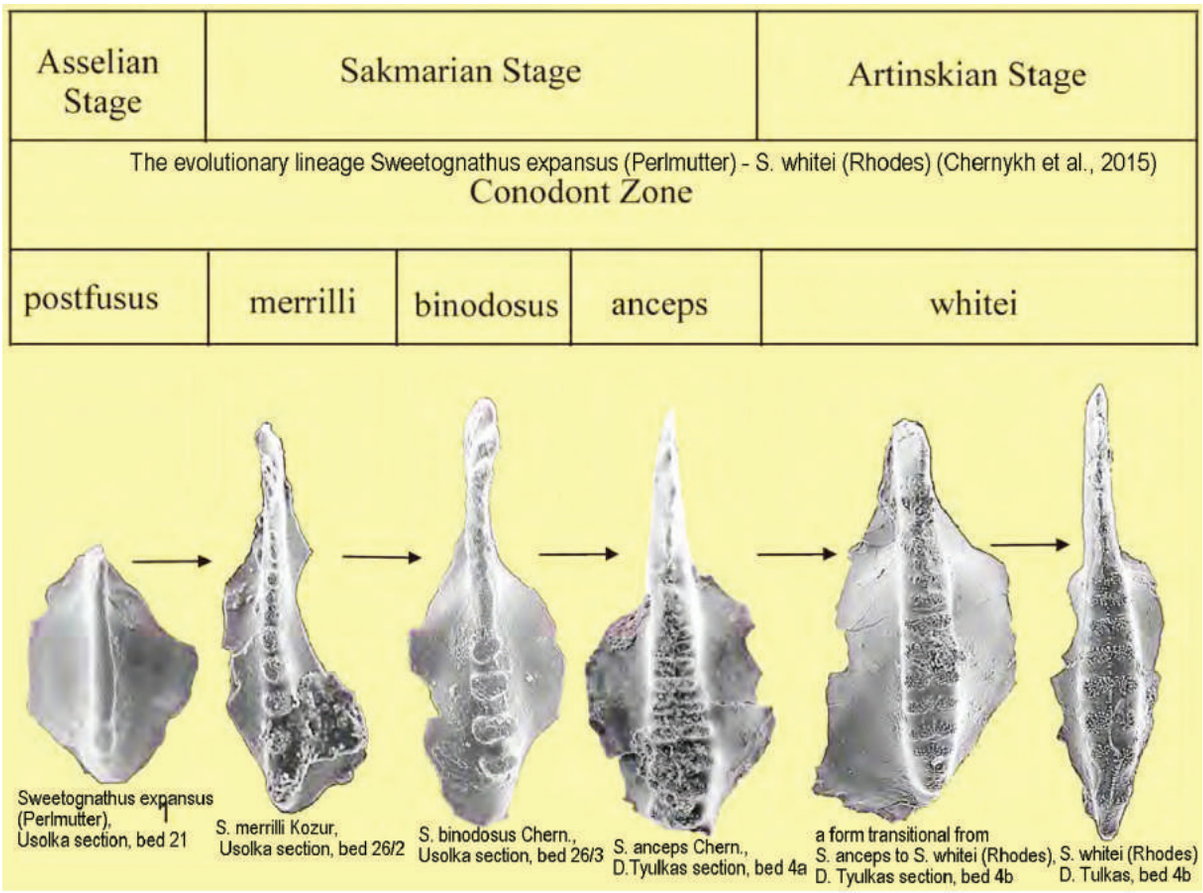
Upper Carboniferous (Mississippian) and Lower Permian rocks are exposed in the Usolka geological section. The Permian part in the Usolka geological section is represented by the Asselian, Sakmarian, and Artinskian Stages. The The Usolka section is the GSSP of the Sakmarian Stage. The deposits are characterized by conodonts, fusulinids, ammonitids, myospores (Chernykh et al., 2015) (Fig. 56).

In the geological section of the Dalniy Tyulkas site (Bashkir Fore-Urals, Russia), the Sakmarian (Sterlitamakian horizon) and Artinskian (Burtsevian and Irginian horizons) stages are distinguished in the Permian deposits according to the key palaeontological remains. This is the GSSP of the Artinskian Stage. Both the Sakmarian and Artinskian Stages are characterized by fusulinids, radiolarians, rare ammonoids, and bivalves. The lower boundary of the Artinskian is determined by the first occurrence in the middle of the 4th layer of cosmopolitan conodont *Sweetognathus whitei* in the phylogenetic lineage Sw. merrilli → Sw. binodosus → Sw. anceps → Sw. whitei → Sw. clarki and confirmed by data on fusulinids and ammonoids (Chernykh et al., 2015) (Fig. 56).



The evolutionary line of *Mesogondolella* conodonts, the leading group for the Asselian--Sakmarian deposits along the Usolka section (Chernykh et al., 2015).

Fig. 56. Conodonts are the leading group of fossils of the Asselian, Sakmarian and Artinskian deposits in the Usolka and Dalniy Tyulkas sections (Russia) (Chernykh et al., 2015).



The evolutionary line of *Sweetognathus whitei* conodonts, the leading group for the Lower Permian deposits along the Usolka and Dalniy Tyulkas sections (Chernykh et al., 2015).

Fig. 56. Conodonts are the leading group of fossils of the Asselian, Sakmarian and Artinskian deposits in the Usolka and Dalniy Tyulkas sections (Russia) (Chernykh et al., 2015).

The Permian part of the geological section of Dovžanova Soteska, Karavanka Mts., Slovenia, is characterized by green calcareous algae, foraminifera, sponges, gastropods, rugoses, fragments of crinoids, bryozoans, brachiopods, conodonts. Fusulinids in the section revealed regional formations of the Asselian (Dovžanova Soteska Formation, Born Formation) and Sakmarian (Rigelj Beds) Stages (Novak, 2007, fig. 53). In the overlying Tarvis breccia, palaeontological remains are absent, therefore these deposits are formally interpreted as alluvial deltas and compared with the Middle Permian (Novak, 2007, fig. 57).

Thus, the above-described objects, even if they have some similar fossil organisms, cannot in any way be regarded as complete analogues of the Bashkir Shikhans, since they differ significantly from the nominated property both in the time of existence, the main reef builders, abundance of fossils, and on the level of preservation of palaeo-finds.

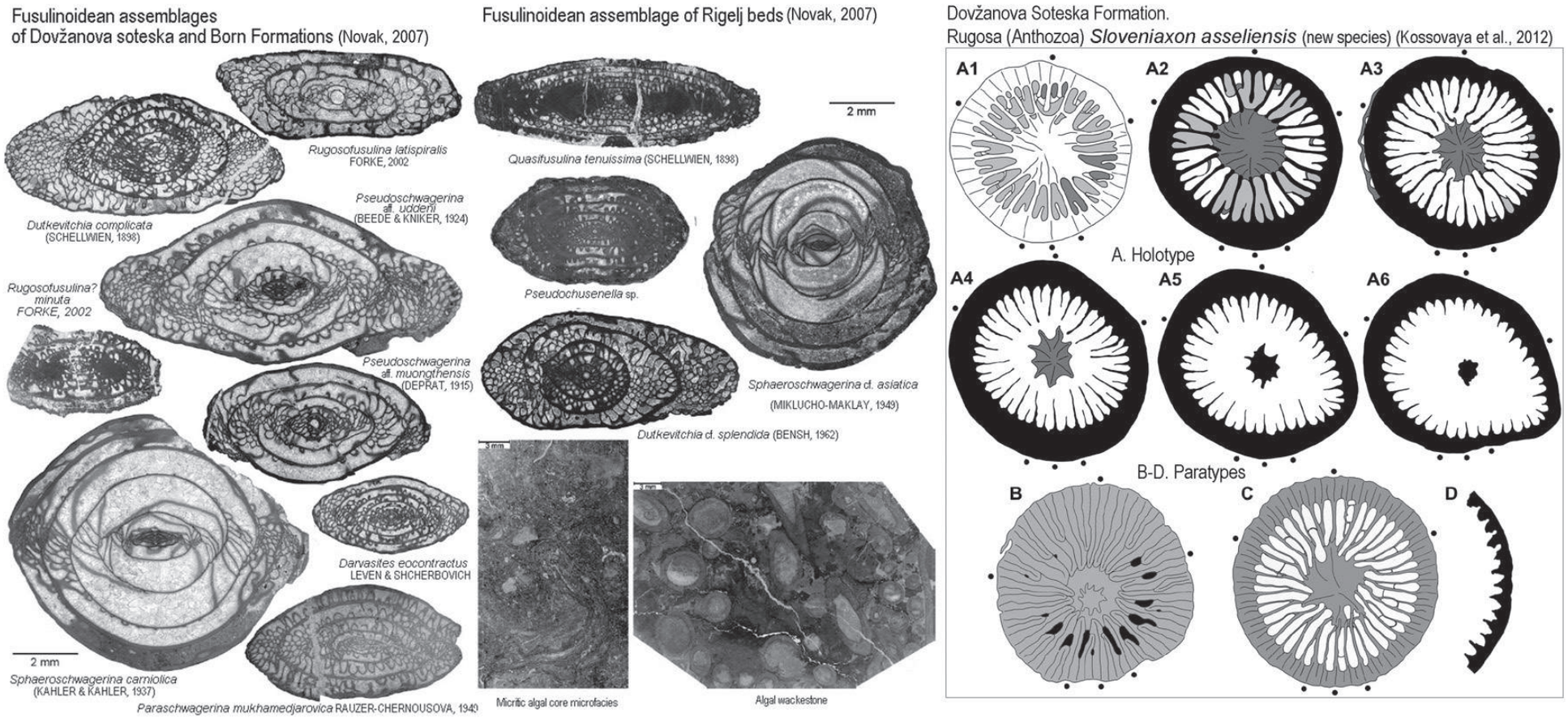


Fig. 57. Leading fusulinids of the Asselian-Sakmarian deposits in Dovžanova Soteska, Karavanka Mts. (Slovenia) (Novak, 2007; Kossovaya et al., 2012).

3.2.3. Comparison with fossil and modern reefs

Fossil reefs can also be found in other parts of the world. However, there are very few of them on the Earth's surface, and this is what makes it possible to define the Bashkir Shikhans as a unique second to none creation of nature.

The analysis of sites showed that among the UNESCO natural monuments nominated under criterion viii, there are some ancient and modern reefs (Table 8).

The Slovenian Dovžanova Soteska in the Karavanka Mountains, which is not on the UNESCO lists, is similar to the Bashkir Shikhans in terms of the time of formation of the reef (the Early Permian). A carbonate platform surrounded by patch reefs (intralagoonal reefs) (Born Formation) formed during Asselian (Novak and Forke, 2019; Kossovaya et al., 2020). However, the Bashkir Shikhans are a fragment of an Early Permian barrier reef, and in the Karavanka Mountains they are separate intralagoonal reefs formed around a carbonate platform. In addition, these objects differ in the climatic conditions in which the reefs grew. The Bashkir Shikhans, which formed in subtropical latitudes, differ significantly in the coral assemblages of those in the Karavanka Mountains, which formed in the tropical zone.

The Middle Permian Capitan Reef, which is located in the southeast of the United States, is represented in two nearby national parks: Carlsbad Caverns and Guadalupe Mountains. The first is already on the UNESCO World Heritage List and the second not on the UNESCO lists.

In the middle of the Permian period, on the outskirts of the Delaware Sea (part of the inland Perm Sea), the Capitan reef of an arched shape (up to 16 km in diameter) was formed. After the closure of the strait connecting the Permian Basin with the ocean (about 260 million years ago), the Delaware Sea began to shallow and fill with salt and silt. Thus, one of the reasons for stopping the Capitan reef formation was climate change, which led to the evaporation of the basin. A three-stage model of the formation of the shelf facing the sea was established, including (1) the sponge reef/algal cement/phylloid algae stage, (2) the *Shamovella (Tubiphytes)* stage, and (3) the progressive cyclic layers of the outer shelf with isolated reef builders (Fig. 58) (Weidlich and Fagerstrom, 1998, 2001; Fagerstrom and Weidlich, 1999).

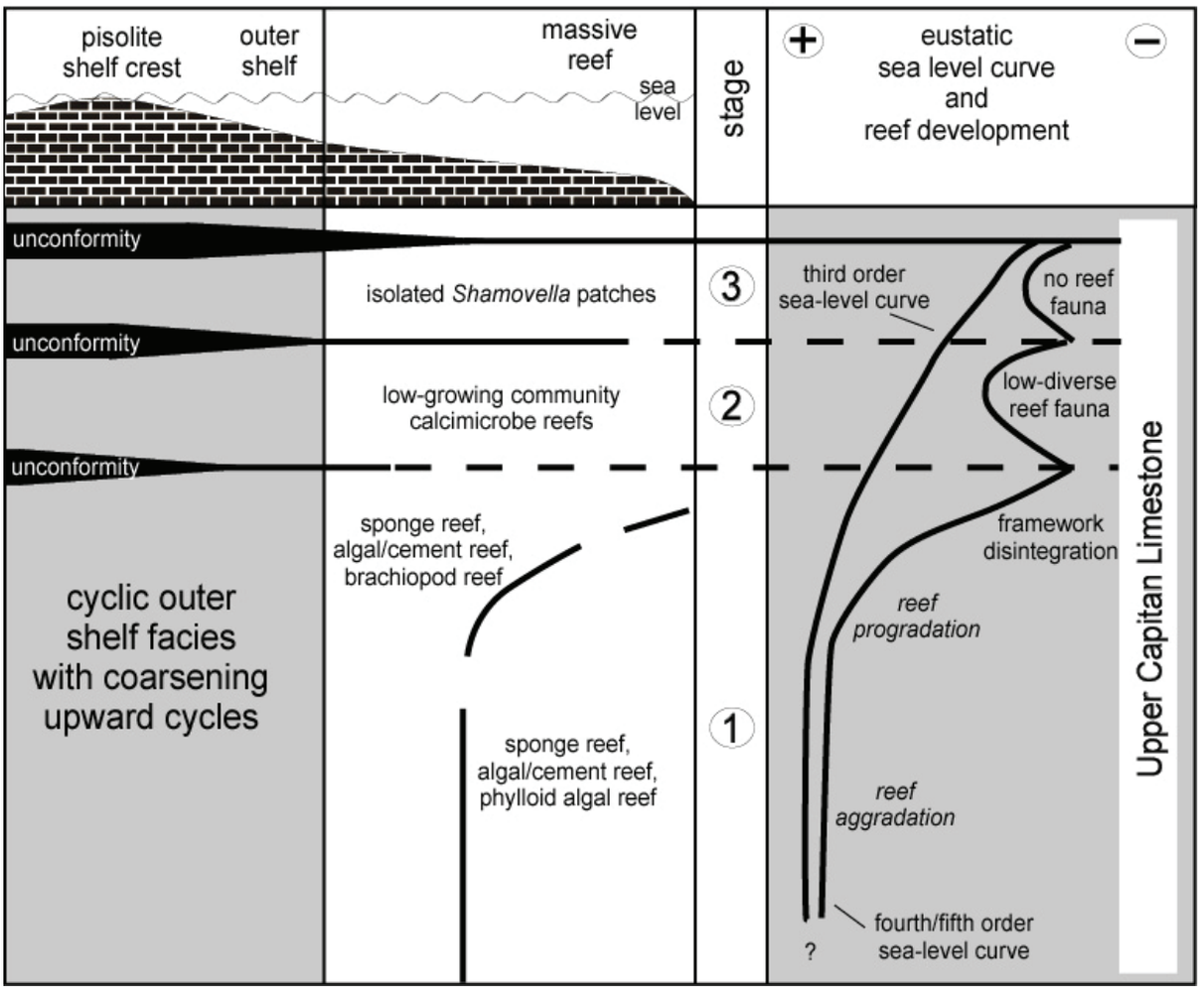
Thus, the difference between the Bashkir Shikhans and the Capitan reef lies in the different geographical conditions of their formation and morphology. The first was formed along the margin of the continent and the Ural Palaeoocean, had an elongated, linear shape. While the second one grew along the periphery of the continent and the semi-enclosed Delaware Sea, connected by a strait with the ocean, and had an arched shape. The objects differed in the main reef builders: hydroid (*Palaeoaplysin*a) are widely represented in the Bashkir Shikhans and are absent in the Capitan reef, but there are also common ones – bryozoans and *Tubifites (Shamovella)*.

Table 8. Comparison of the Bashkir Shikhans with other geological phenomena of the world – fossil and modern reefs.

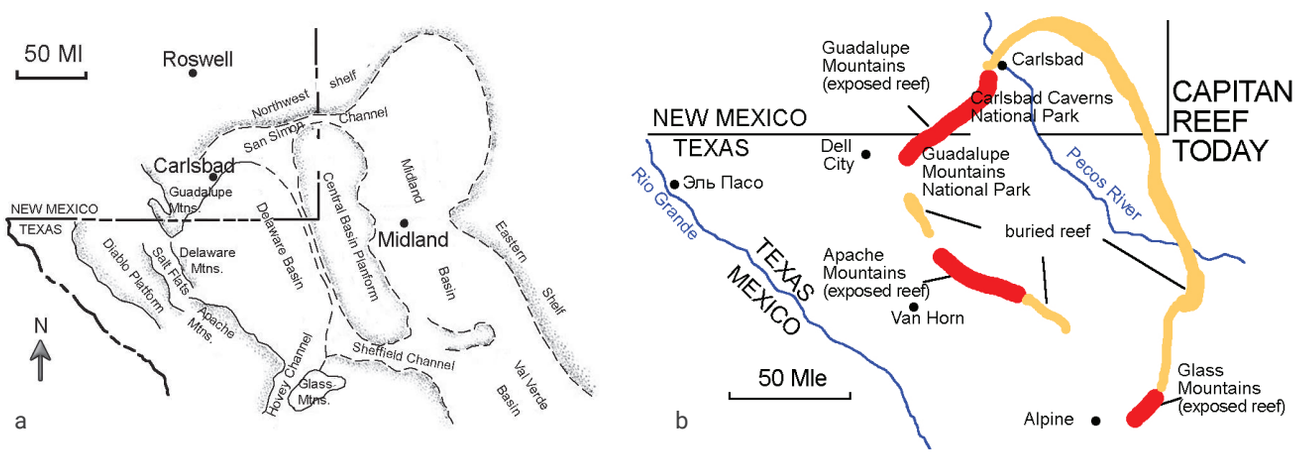
Name of the site / area, ha	World Heritage List /Criterion	Dominant rock formation / reef type / latitude of reef formation	Geological age, million years / Ma	Major reef-builders	Relevant fauna and flora
Bashkir Shikhans (Russia) Kushtau 575.95 ha Toratau 176.921 ha Yuraktau 132.1774 ha Total 885.0484 ha	Claimed under criterion viii	Carbonate rocks A planetary-scale barrier reef of an elongated, linear shape along the margin of the Laurussia continent and the Ural palaeoocean Subtropics	Early Perm, Asselian and Sakmarian Stages (298.9–290.1 Ma)	Plants: Algae (Tubifites) Cnidaria: Hydrozoa (Palaeoaplysina) Bryozoa	Stromatolites Sarcodina: foraminifera (fusulinids) Cnidaria: Anthozoa (Rugosa colonial and solitary) Arthropoda: trilobites Brachiopoda Echinodermata: Crinoidea
Objects closest in age (Permian)					
Dovžanova Soteska, Karavanka Mts. (Slovenia) Area – no data	Not on the UNESCO lists	Carbonate rocks Patch reefs (intralagoonal reefs) Tropics	Early Permian, Asselian and Sakmarian Stages (298.9–290.1 Ma)	Plants: Algae (Tubifites), Sarcodina: foraminifera (fusulinids), Cnidaria: Anthozoa	Bryozoa Echinodermata: Echinodea, Crinoidea Chordata: conodonts

Carlsbad Caverns National Park 18.926 ha	World Heritage List, Criteria vii, viii	Carbonate rocks Arc-shaped reef on the periphery of the platform and the semi-enclosed Delaware Sea, connected by a strait to the ocean Tropics	Middle Permian (Guadelupian) (273.01–259.51 Ma)	Plants: Algae Sponges	Cnidaria: Anthozoa Arthropoda: trilobites Mollusca: cephalopods (ammonoids, nautiloids), gastropods, bivalves Echinodermata: Crinoidea Brachiopoda
Guadalupe Mountains National Park 34951 ha	Not on the UNESCO lists	Carbonate rocks arc-shaped reef on the periphery of the platform and the semi-enclosed Delaware Sea, connected by a strait to the ocean tropics	Middle Permian (Guadelupian (273.01–259.51 Ma)	Plants: Algae Sponges	Cnidaria: Anthozoa Arthropoda: trilobites Mollusca: cephalopods (ammonoids, nautiloids), gastropods, bivalves Echinodermata: Crinoidea Brachiopoda
Le Permien marin de Jebel Tebaga (Tunisia) Area – no data	Tentative World Heritage List criteria vii, viii	Carbonate rocks Separate reefs on the edge of the irregularly shaped platform and semi-insulated basin	Middle (Wordian, Capitanian Stages)–Upper (Wuchiapingian Stage) Permian (Guadalupian – Lopingian) (266.9–254.14 Ma)	Plants: algae Sponges: solitary sponges, hatetids	Sarcodina: foraminifera (fusulinids) Cnidaria: Anthozoa, Mollusca: gastropods, Arthropods: trilobites, ostracods Brachiopoda Echinodermata: Crinoidea

Paleozoic objects (Cambrian)					
Lena Pillars Nature Park 1217941 ha	World Heritage List, criterion viii	Carbonate rocks Reefoids at the edge of the Siberian platform and palaeoocean Equatorial zone	Early and Middle Cambrian (538.8–509 Ma)	Archaeocyta Plants: Calcareous algae	Sponges Mollusca: bivalves Arthropoda: ostracods, trilobites Brachiopoda Problematic organisms: Tommatiids, chiolithozoa
Objects of the Late Pleistocene – Late Holocene (modern)					
Great Barrier Reef (Australia) 34870 ha	World Heritage List, criteria vii, viii, ix, x	Limestone A planetary-scale barrier reef of an elongated, linear shape along the margin of the continent of Australia and the Pacific Ocean tropics	Late Pleistocene (15 thousand years) – present	Cnidaria: Anthozoa (Octocoralla and Hexacoralla)	Plants: Algae Mollusca Echinodermata



Development of the late Capitanian reef massif (Weidlich and Fagerstrom, 2001).

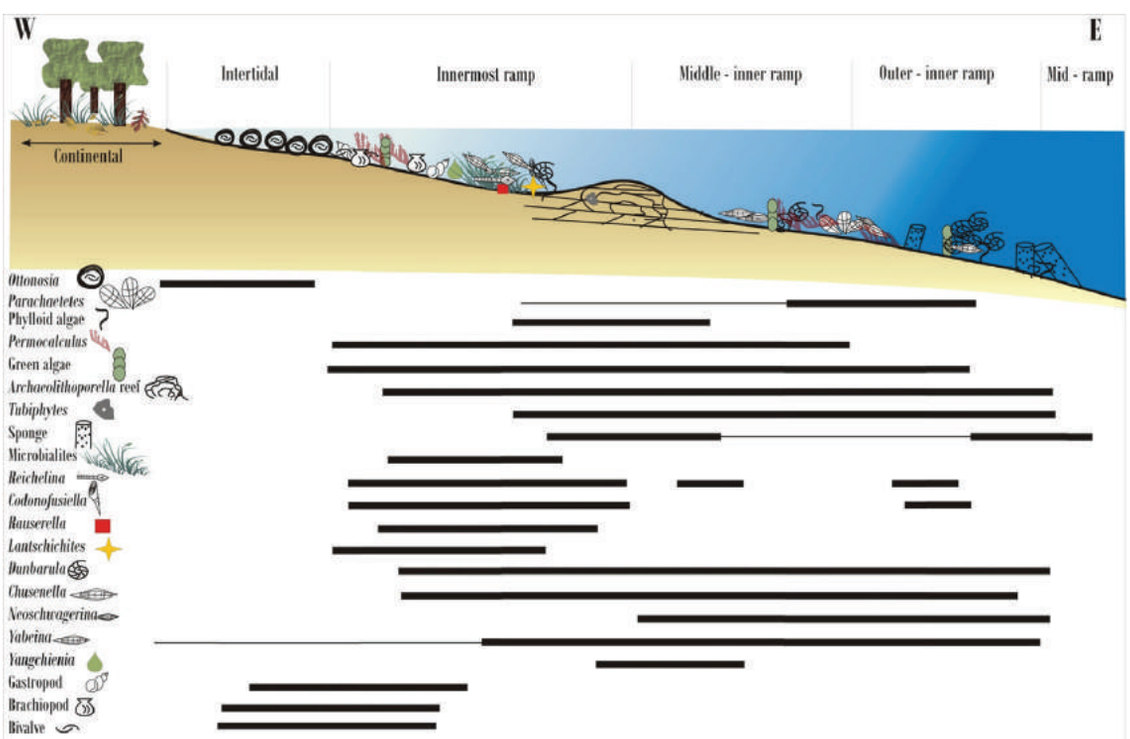


(a) Reconstruction of the Permian Sea and its individual parts relative to modern landmarks (Ward et al., 1986) and (b) modern parts of the Capitan Reef (https://www.nps.gov/gumo/learn/nature/geologicformations.htm).

Fig. 58. Captain Reef.

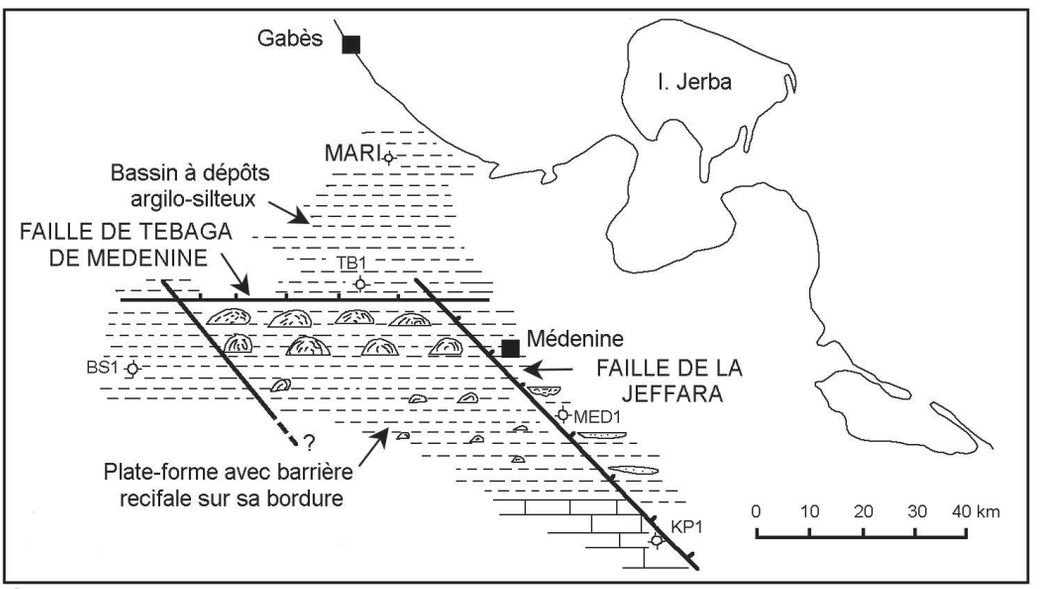
In the territory of the prospective UNESCO natural site, Le Permien marin de Jebel Tebaga, Middle Permian reef formations with palaeontological remains are protected. The reef formations were formed at the edge of an irregularly shaped platform and reflect vertical growth and lateral progradation during episodes of sea deepening, and then stasis during the regressive phase in the Late Permian. The study of fossils and facies made it possible to reconstruct the palaeoenvironments of reef development (Ghazzay et al., 2015) and identify five facies zones. Each zone is described in detail by Ghazzay et al. (2015) based on the synthesis of materials (Glintzboeckel and Rabaté, 1964; Termier et al., 1977; Termier and Termier, 1977; Vachard, 1985; Senowbari-Daryan and Rigby, 1988, 1991; Razgallah et al., 1989; Lethiers et al., 1989; Razgallah and Vachard, 1991; Vachard and Razgallah, 1993) (Fig. 59).

Thus, the difference between the Bashkir reefs and the reef of Le Permien marin de Jebel Tebaga site lies in the different geographical conditions of their formation. The Bashkir Shikhans formed along the margin of the continent and the Ural Palaeoocean, grew almost constantly, under the conditions of a sinking shelf. The second one grew on the edge of the irregularly shaped Tebaga shelf and semi-isolated basin, and reflects vertical growth and lateral progradation during sea deepening episodes, interrupted by regressive ones. The objects differed in the main reef builders, Hydrozoa (*Palaeoaplysina*) are widely represented in the Bashkir Shikhans, *Tubifites (Shamovella)* were common.



Palaeotransect of the Tebaga platform during the Late Capitanian, with the environmental distribution of the principal algae and foraminifers (Ghazzay et al., 2015).

Fig. 59. Jebel Tebaga reefs.



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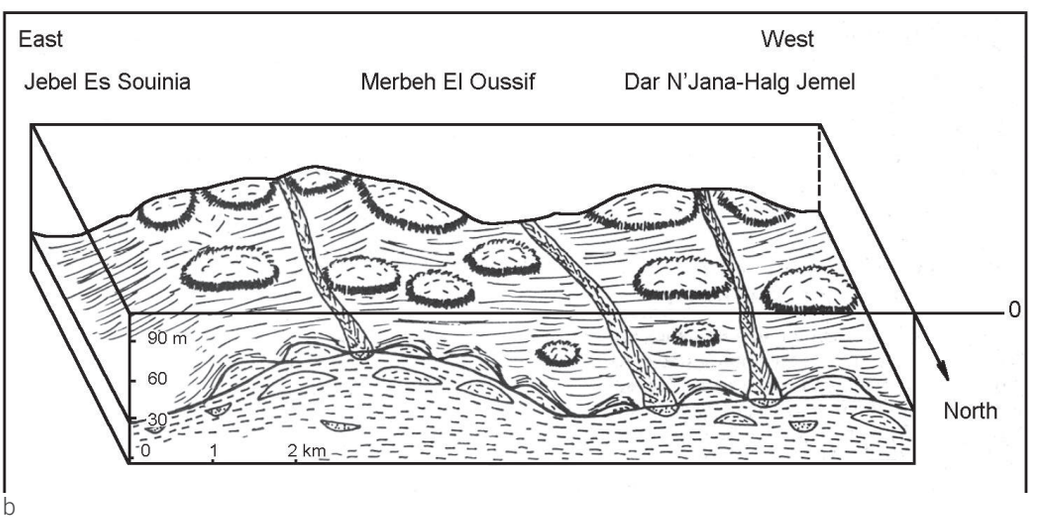


b

(a) Reconstruction of the location of the Jebel Tebaga reefs in the Middle Permian; (b) Reconstruction of Jebel Tebaga reef morphology (after Razgallah et al., 1989).

Fig. 59. Jebel Tebaga reefs.

Other fossil and modern reefs are known from the World Heritage Lists nominated under category viii. The Cambrian: Flinders Ranges (Australia), Lena Pillars Park (Russia); the Triassic: Dolomites (Italy); the Paleogene–Neogene Periods: Bunaken National Park (Indonesia); the Late Pleistocene – Late Holocene (modern): Great Barrier Reef (Australia), Moucha and Maskali Islands (Djibouti), Hecate Strait and Queen Charlotte Glass Sponge Reef Marine Sanctuary (Canada), Belize Barrier Reef (Belize), New Lagoons Caledonia (France), Tubbataha Reef (Philippines), Ras Mohammed (Egypt), Taka Bonerate National Park (Indonesia), Wakatobi National Park (Indonesia), Banco Chinchorro Biosphere Reserve (Mexico), Grenadines Island Group (Saint Vincent and the Grenadines) and etc. Some modern reefs were assigned the UNESCO natural monument status under criteria ix and x.

Among these reefs, two deserve special attention, which are already on the UNESCO World Heritage list.

The first one is a very ancient Cambrian reefoid located in the territory of the Lena Pillars Russian national park.

In the Early Cambrian, when the Siberian Platform was in the near-equatorial zone, numerous reefoids formed in the Aldan-Anabar uplift in a shallow sea (Rozanov et al., 1992; Kolosov, 2001), consisting of numerous dome-shaped archaeocyate-calcimicrobial isometric bioherms, up to 5 m in diameter. There are three cycles of development in the history of the Atdaban reefoid, each begins with the leveling (lowering) of the seabed and a strong sea flow and ends with differentiated uplift of the seabed, which, however, did not reach sea level. Organogenic buildups developed on these uplifts. For the reefoid as a whole, five morphological types of organogenic buildups are distinguished: stromatolitic massifs, microphytolithic massifs, cyanobacterial-Archaeocyathi hills – bioherms, cyanobacterial and cyanobacterial-Archaeocyathi meadows – biostromes, subautochthonous proauloporic and girvanella tafostrome. They were built by cyanobacteria and archaeocytes (Nikolaeva et al., 1986).

Reefoid facies analogues have not yet been identified among younger deposits. This is the first appearance of organogenic buildups in the geological history of the Earth with their builders and companions, diverse and abundant shell organisms, including skeletal problematics. This is the main difference between the Cambrian reefoid and the real reef, the nominated object, the Bashkir Shikhans.

The second one it is a giant modern reef, the Great Barrier Reef (GBR) (Australia). It is similar to the Bashkir Shikhans because both of them are the objects of a planetary scale. However, the GBR is the modern largest reef, and the Bashkir Shikhans represent a fragment of the largest Early Permian barrier reef. The objects also differ in the composition of the communities of the main reef-building organisms. The GBR forms the communities of Hexacoralla and Octocoralla; the reef builders of the Bashkir Shikhans were bryozoans, calcareous algae, *Palaeoaplysina* (Hydrozoa) and other organisms.

The main difference between fossil reefs and modern reefs is that fossil reefs reflect the entire history of their existence from inception to extinction over millions of years, while the current stage of their development is captured in the modern reef.

Thus, the Bashkir Shikhans represent an elongated, linear planetary-scale barrier reef along the margin of the Laurussia continent and the Ural Palaeoocean, which grew in the subtropics in the Asselian and Sakmarian time of the Early Permian (298.9–290.1 million years ago). Among the fossil reefs, there are no reef structures comparable to the Bashkir Shikhans. The only analogue of the reef structure is the Great Barrier Reef (Australia), which radically differs from the nominated object in terms of composition of reef-formers and the time of formation.

Conclusions to subsection 3.2

There is every reason to include the Bashkir Shikhans in the UNESCO World Heritage List under criterion viii since this natural phenomenon meets the following sub-criteria a) it represents a certain stage in the development of the Earth, b) it has multiple unique palaeontological remains and c) it represents a certain landform both ancient and modern.

The Toratau, Kushtau and Yuraktau Shikhans are natural objects interconnected by geodynamic, tectonic, stratigraphic, geomorphological features. These are valuable witnesses of real geological events, an important reference in understanding the geodynamic history of the Earth.

The diversity and change of facies reflect the conditions of existence and the sequence of formation of the reef system, of which each of the Shikhans was a part. On the Shikhans, ancient tectonic movements of the Earth's crust associated with the collision of lithospheric plates have been recorded.

The analysis of the characteristics of 93 sites from the current UNESCO World Heritage List (as of 01.07.2023), included in it, inter alia, under criterion viii, as well as over 200 sites from the Tentative Lists, nominated under the same criterion, showed that one can find few similar geological objects. Various natural phenomena outside the UNESCO lists were also taken into account, and several more possible similar objects were identified among them.

Comparison of the Bashkir Shikhans with the geological monuments that are the most similar to them in terms of the selected three aspects (stratigraphy/geology-fossils-ancient reefs) is given in Tables 6–8. The differences between the Bashkir Shikhans and their closest analogues are the following (Fig. 60):

1) The reef facies of the Shikhans formed over almost 9 million years during the Asselian and Sakmarian Ages of the Early Permian.

The patch reefs of Dovžanova Soteska (Slovenia) were formed during the same period of time. The difference lies in the fact that in Dovžanova Soteska, among the Lower Permian rocks, the Asselian deposits are better represented than the Sakmarian ones. The Dovžanova Soteska formation reflects transgressive-regressive basin development cycles with stops during regressions. The Bashkir Shikhans grew almost constantly during the Asselian-Sakmarian Age.

The difference between the simultaneously formed carbonate rocks of the Bashkir Shikhans and the terrigenous-carbonate deposits of the Usolka and Dalniy Tyulkas sections (Russia) is that the former are composed of shallow reef facies, and the latter are deep–water ones.

The Bashkir Shikhans differ from the Carlsbad Caverns, the Guadalupe Mountains and Le Permien marin de Jebel Tebaga in the age of formation of reef facies, the conditions of accumulation of rocks and, accordingly, the thickness of bioherm facies: the reefs of Jebel Tebaga and Capitan Reef, in contrast to the Shikhans, grew in semi-isolated basins. The Capitan Reef stopped to grow because of the shallowing of the Delaware Sea, caused by the closure of the strait connecting it with the ocean, while reef of the Bashkir Shikhans stopped to grow because of its sinking, i.e. flooding. The presence of overlying deep-sea deposits in the top of the Bashkir Shikhans makes it possible to determine the time of completion of reef formation and consider as a cause a global event which is an extensive transgression that involved both the Southern and Northern hemispheres. In combination with the Usolka and Dalniy Tyulkas deep-water sections of the Lower Permian, located in the same area, the Bashkir Shikhans represent a stone chronicle of the most important stage in the development of the planet in the Late Paleozoic: the disappearance of the Ural Palaeoocean, the uplift of the Urals and the final stages of the formation of Pangea.

2) According to the palaeontological criterion, the Bashkir Shikhans differ in the taxonomic composition of fossil remains, including the main reef builders.

The palaeobiota of the Shikhans, unlike other objects, is very richly represented and includes the waste products of cyanobacteria, almost all types of fauna and algae, and is typical of the Early Permian Period. The fossils of the Bashkir Shikhans are very specific. They include both endemics and forms that lived in two ancient oceans, the Tethys and Panthalassa, which communicated with each other through the Ural Palaeoocean.

In the Bashkir Shikhans, the main reef builders were Hydrozoa (*Palaeoaplysina*), *Tubifites (Shamovella)*, and bryozoans. The reef builders of the Capitan (Delaware) reef (Carlsbad caves and Guadalupe mountains) were mainly algae, sponges and bryozoans. The reef builders of the Dovžanova Soteska were algae, Anthozoa and foraminifers. The reef builders of the Jebel Tebaga were algae, solitary sponges, Chaetetoidea. The main difference between the Permian Sea object of Jebel Tebaga (as well as the Capitan reef) and the Bashkir Shikhans is that sponges were one of the main reef builders in the first case, and Hydrozoa (*Palaeoaplysina*) – in the Bashkir Shikhans. The geological sections of Usolka and Dalniy Tyulkas, due to the fact that they are composed of deep-sea facies, have a completely different set of fossils without reef builders.

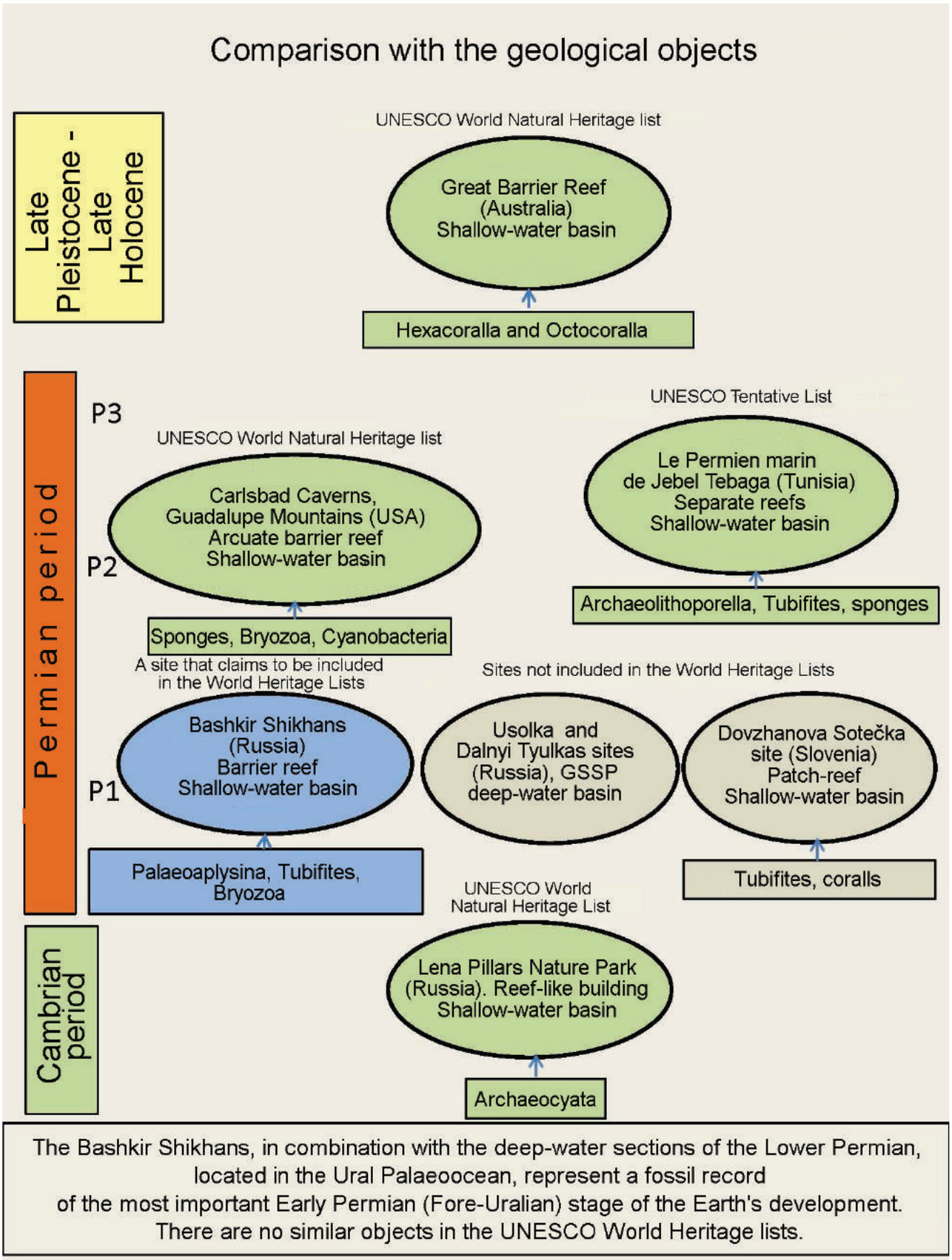


Fig. 60. Comparison of the nominated property, the Bashkir Shikhans, with geological objects reflecting the main stages of the development of the Earth.

3) Finally, the Bashkir reef massifs differ from the closest geological buildups, the Capitan Reef, and from the patch reefs of the Dovžanova Soteska in that they are part of a single system that existed for a long time (298.5–290.1 million years), which can be considered as a barrier reef, consisting of a series of facially and morphologically differentiated meridionally elongated bioherm structures of a complex type. The difference from the reefs of Jebel Tebaga, which grew on the edge of the shelf of a semi-isolated basin, lies in the completely different geographical conditions for their formation.

Compared with older and younger reefs, the Bashkir Shikhans show even more fundamental differences. Among the fossil reefs, there are no reef buildups comparable to the Bashkir Shikhans. The only analogue of the reef buildup on a planetary scale is the Great Barrier Reef (Australia), which radically differs from the nominated site in terms of composition of reef builders and the time of formation. Compared to the modern Great Barrier Reef, the fossil reefs of the nominated Bashkir Shikhans reflect the history of its development from origin to extinction over millions of years.

A unique feature of the Bashkir Shikhans is the possibility of studying reef deposits on significantly large areas of the Earth's surface, where on the naturally faceted limestones one can observe the textural features of rocks, the nature of the change in biofacies and palaeocommunities, and on their basis carry out palaeoreconstructions of palaeoenvironments of the past. This Early Permian reef, which reflects one of the early stages of the development of the Earth, is a landform on a planetary scale. It is among such grandiose geological monuments of UNESCO as the Great Barrier Reef, or the Belize Barrier Reef, or the mountains of Kamchatka.

The good exposure of this geological object turns it into a wonderful natural museum, a natural laboratory, available for study by both specialists and geology students, oil students, young geologists and all nature enthusiasts.

The assignment of the World Heritage status to the Bashkir Shikhans is also relevant from a geographical point of view. This object is located in the southeast of the European part of Russia, that is, in a vast region of old development and settlement, where the identification of World Natural Heritage sites is an extremely difficult task, precisely because of the very strong anthropogenic transformation of the territory (the only one similar site is the Western Caucasus). That is, the general picture of the distribution of UNESCO natural monuments in Eurasia in the northern hemisphere will be more uniform (if the Bashkir geological monument is assigned the desired status). This will fully comply with the modern concept of the formation of the List, the essence of which is to uniformly cover all the main cultural and natural regions of the Earth, to fully represent the existing cultural and natural diversity.

Thus, no obvious analogues of the Bashkir Shikhans are found anywhere: neither in the modern composition of the List, nor among the objects included in the Tentative Lists from different countries, nor among other geological phenomena in various parts of the world, including the region of the location of the studied object, the Fore-Urals and the Southern Urals.

3.3 Draft Statement of Outstanding Universal Value

a) Brief synthesis

The Bashkir Shikhans are three isolated hills in the Fore-Urals, located in a 20-kilometer chain along the right bank of the Belaya River, in the territory of the Republic of Bashkortostan, Russian Federation.

The Bashkir Shikhans, bioherm buildups of the Early Permian, are second to none in the world in terms of visibility and accessibility for study. They give an idea of how the organic world was developing during the Early Permian Period, and also represent unique palaeoecological features, by studying which, one can trace the history of the development and change of palaeoecosystems over time. Each of the Shikhans is unique in its own way, as it contains a different set of facies and fossils.

The Shikhans are natural nonrecoverable features. They were forming over 16 million years in certain geological conditions in the zone of transition from the shallow sea of the eastern margin of Laurasia to the deeper region of the Ural palaeobasin. They were built by ancient organisms that became extinct at the end of the Permian Period.

The nominated serial property, the Bashkir Shikhans, is an outstanding landscape illustrating the important stage in the geological history of the Earth. The property reflects the history of the ancient Ural Ocean and the formation of Pangea, the development of the organic world of the Early Permian and the formation of reef palaeocommunities and buildups on a planetary scale. The Bashkir Shikhans are a unique natural phenomenon due to the amazing combination of ancient and modern forms of the Earth's surface, while the good exposure of this geological feature turns it into a natural museum, a laboratory that is available for study by both specialists and students, young geologists and all nature enthusiasts.

b) Justification for Criteria

The serial natural property, Bashkir Shikhans, is nominated according to criterion viii.

The Toratau, Kushtau and Yuraktau Shikhans are part of a grandiose system of ancient reef buildups, which can be traced from the Caspian Sea to the Arctic Ocean. The Sterlitamak group of Shikhans were forming during 299-283 million years. The uniqueness of the Bashkir Shikhans lies in the fact that here the fossil reefs of the Early Permian are open for study in natural outcrops and contain various fossil remains of excellent preservation. Other fossil reefs on the globe are either poorly exposed or overlain by young sediments. The Bashkir Shikhans were brought to the surface as a result of Alpine tectogenesis during the last 5 million years.

The geology of the Bashkir Shikhans is a clear evidence of the history of the development of the Earth, its flora and fauna, at the end of the Carboniferous the beginning of the Permian. Here there are outcrops of rocks formed in warm marine conditions, as evidenced by a wide variety of palaeontological fossils. Fossil flora and fauna are represented by calcareous algae (35 species), foraminifers (about 100 species of small foraminifera and 53 fusulinid species), hydroids, corals (25 species), bryozoans (more than 80 species), brachiopods (more than 150 species), ostracods, echinoderms and others.

c) Statement of Integrity

The Toratau, Kushtau and Yuraktau Shikhans formed as reef formations in the Early Permian, raised to the surface as a result of tectonic movements in the Neogene and facetted by weathering processes in the Quaternary. They represent an integral natural complex, the main components of which are inextricably linked by a common origin and dynamics of natural development.

The Shikhans are of sufficient size for long-term conservation and preservation of their Outstanding Universal Value. Additional protection is provided by the buffer zones created around all three geological objects.

Despite the fact that the Shikhans are located in the populated territory of the Ishimbai District in the Republic of Bashkortostan, they are not damaged, retain their geological and palaeontological integrity and form an amazing bright landscape, which additionally represents an aesthetic appeal.

The nominated property is protected on the basis of the laws of the Russian Federation and the Republic of Bashkortostan. The Shikhans are complex natural monuments of the Republic of Bashkortostan. In addition to legal protection, the nominated property is protected by the population of the Republic, which considers them as features of national pride, worships them and sings them in folk songs and legends.

e) Requirements for protection and management

Currently, the Bashkir Shikhans of Toratau, Kushtau and Yuraktau have the status of complex regional natural monuments, which guarantees their safety. The protection regime of the nominated territory is established by the Federal Law of the Russian Federation "On Specially Protected Natural Areas", the Regulations on Natural Monuments in the Republic of Bashkortostan, as well as the Decree of the Government of the Republic of Bashkortostan "On Amendments to the Decree of the Council of Ministers of the BASSR "On the Protection of Natural Monuments of the Bashkir ASSR". The nominated serial object is part of the aspiring Toratau Geopark (Toratau aUGGP), which provides the property with additional guarantees of safety and integrity.

Control over compliance with the regime of protection of natural monuments and their buffer zones is carried out by the territorial committees of the Ministry of Nature Management and Ecology of the Republic of Bashkortostan. An independent assessment of the state of protected localities is carried out once every 4 years by a third-party scientific organization that performs an inventory of specially protected natural areas as part of the work on maintaining the cadaster of protected areas.

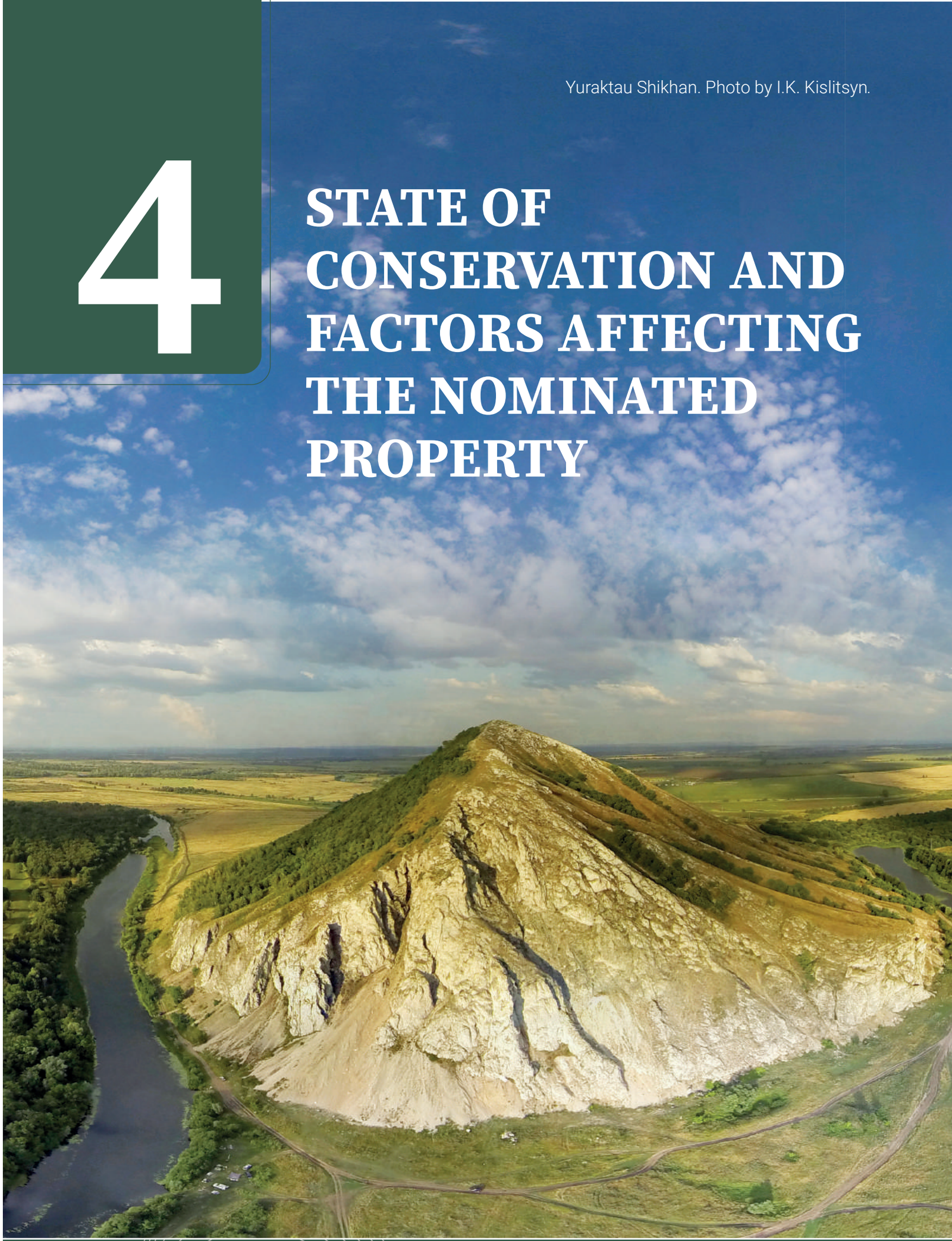
All natural monuments and their protected zones (if any) are necessarily taken into account when creating plans and prospects for economic and social development, territorial integrated schemes, land management schemes and district plans. On the territories of natural monuments and their protected zones, any activity that entails any violation of their safety is prohibited.

To implement strategic projects aimed at solving the complex goals of the nominated property and creating a meaningful context for its development, a medium-term management plan for the period 2024–2028 was developed.

All Special Protected Natural Areas are the areas of the nominated territory. They have sufficient financial and administrative resources for the long-term preservation of the declared Outstanding Universal Value.

Yuraktau Shikhan. Photo by I.K. Kislitsyn.

4 STATE OF CONSERVATION AND FACTORS AFFECTING THE NOMINATED PROPERTY



4. STATE OF CONSERVATION AND FACTORS AFFECTING THE NOMINATED PROPERTY

4.a Present state of conservation

Before becoming the protected property, the natural Shikhan complexes had been negatively influenced by a number of anthropogenic factors for a long time. Crushed and building stone was mined in the Shikhans, uncontrolled grazing was carried out on their slopes, tourists cut down trees and shrubs, and also collected rare plant species. Steppe fires were quite frequent. Massive and unregulated recreation caused great harm. Visitors left various “autographs” on the stones and arbitrarily climbed off the paths, which led to the destruction of rare plant species, disruption of the vegetation cover and soil erosion, screes formation and littering of the slopes. The tops of the Shikhans near the viewing platforms suffered most. Natural vegetation there degraded severely due to constant trampling and firing.

Nevertheless, today the condition of the natural Shikhan complexes of Toratau, Kushtau and Yuraktau is quite satisfying. Populations of some rare plant species need protection and number tens and hundreds of thousands of specimens. The flora analysis also displayed its stability. Despite many years of economic exploitation of the Shikhans in the past, they have remained unique natural attractions and have not lost their scientific and cultural significance.

The geological objects, the outcrops and fossils in carbonate rocks are subject to natural destruction as a result of weathering and denudation. Palaeontological objects are well preserved in hard-to-reach places, for example, on the slopes of Toratau and in caves.

4.b Factors affecting the property

(i) Development pressures and management response

The threat of development and extraction of limestone

In 1936 the Bashkir Shikhans were discovered to contain huge limestone reserves as the raw material for soda and cement. At that time, there were four Shikhans: Toratau, Kushtau, Yuraktau, and Shakhtau (Fig. 61), the development of the latter began in the 1940s and by now it is a quarry.

Fig. 61. Shakhtau Shikhan. Photo from the monograph by Kulagina et al. (2015).

Until 2020, only Yuraktau and Toratau had the protected property status. In connection with the depletion of limestone reserves in the Shakhtau quarry, the limestone processing and soda production enterprise (JSC "Bashkir Soda Company", Sterlitamak) raised the issue of the raw material base, and the Kushtau Shikhan, which did not have environmental status, was considered as a promising source of raw materials. However, this proposal caused protests from the local population and scientific and environmental communities. As a result, the Kushtau Shikhan was assigned the status of a natural monument in 2020. The government of the Republic of Bashkortostan offered the soda company the Khudolaz quarry as an alternative source of raw materials, which does not have any environmental value.

Thus, at present, all the three Bashkir Shikhans are protected by the Law of the Russian Federation No. 33-FZ "On Specially Protected Natural Areas" dated 14 March 1995 and are not considered as raw material sources for soda production.

Impact of the Sterlitamak-Salavat-Ishimbai urban agglomeration

The Bashkir Shikhans are located close to the Sterlitamak-Salavat-Ishimbai urban agglomeration (Table 9).

Table 9. Proximity of the Bashkir Shikhans to the cities of Sterlitamak, Salavat and Ishimbai, km

Shikhans	Cities		
	Sterlitamak	Salavat	Ishimbai
Toratau	12	23	12
Yuraktau	8	37	32
Kushtau	5	33	27

There is no doubt that such large settlements can negatively affect water bodies and atmospheric air. As for water bodies, the Belaya River flows in the immediate vicinity of the Shikhans, which is not included in the boundaries of both natural monuments and their protected zones. Only during the flood period, the Belaya River joins with one of the oxbow lakes in the protected zone of the Yuraktau natural monument. The water quality from the Belaya River is monitored regularly (weekly) by the Ministry of Nature Management and Ecology of the Republic of Bashkortostan in order to assess the wastewater impact from the enterprises in the city of Sterlitamak.

According to the state reports of the Ministry of Nature Management and Ecology of the Republic of Bashkortostan on the state of natural resources and the environment, atmospheric air pollution during the last 5 years has been decreasing in all the three cities (Fig. 62).

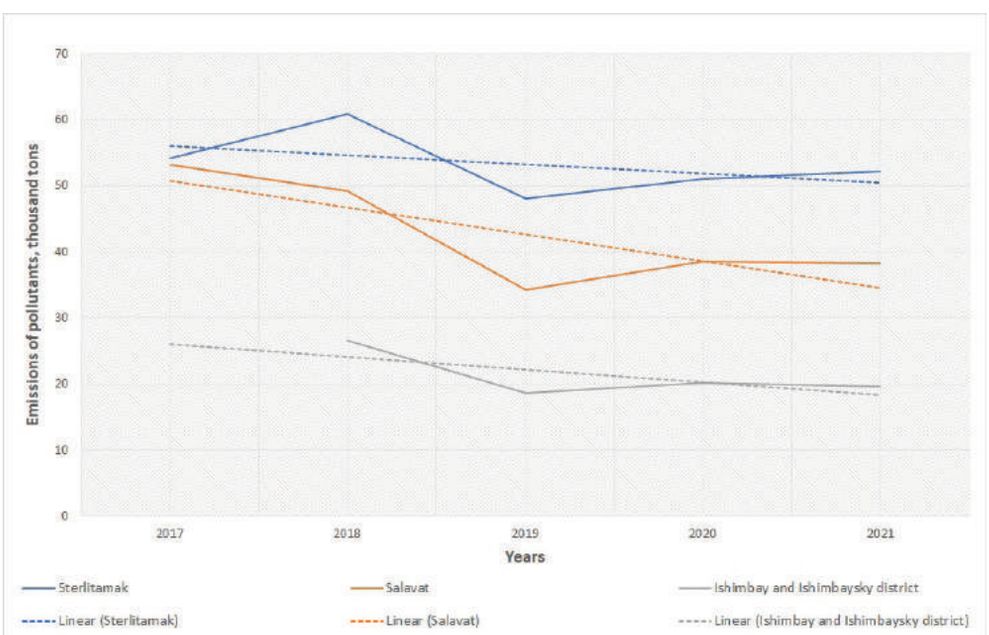


Fig. 62. Pollutant emission from stationary and mobile sources in 2017–2021, thousand tons.

Since southern and northern winds prevail in the Shikhan area during the year, and the Shikhans themselves are located east of the cities of Sterlitamak and Salavat, respectively, the waftage of pollutants to the nominated sites is negligible.

More to it, the atmosphere quality is being constantly monitored in the cities. For example, in Sterlitamak, air pollution observations are carried out at 5 stations of the state environmental monitoring network. Salavat also has a monitoring station of the same kind.

Impact on biodiversity

Over the past century, the anthropogenic impact on the Shikhans has been undulating. Before the establishment of natural monuments, the Shikhans vegetation were heavily affected by grazing. By the beginning of the 2000s, the protection of natural monuments intensified and at the same time there was a sharp decrease in the number of private livestock. Grazing on the Shikhans themselves stopped and remained only in their protected areas. At the same time, heated debates on the use of Shikhans as a raw material for soda production have aroused great tourists' interest in these objects, which led to unregulated recreation. At present, the Shikhans are not threatened and obtain the status of a specially protected natural area. However, the flow of tourists is constantly growing.

It should be noted that for the local population and many Bashkirs, the Shikhans are a kind of shrines. Constant discussions in the media were held by scientists on the value of the Shikhans as unique objects, preachers, ethnographers, historians, etc., spoke about them and have formed a stable understanding of caring for these objects. The creation of the Toratau Geopark has greatly contributed to strengthening this understanding. Therefore, at present, despite a significant increase in the tourist flow, there is no significant degradation of the natural Shikhan complexes.

The nomination of the Shikhans for the status of the UNESCO World Heritage Site will inevitably lead to an even greater increase in the tourist flow to the Shikhans, and hence to greater anthropogenic impact. In view of this fact, the authorities of the Republic of Bashkortostan decided to build special stairs (Fig. 63), which will significantly increase the recreational flow, although reduce the impact on the natural Shikhan complex, since ascending to the observation platforms outside the stairs will be prohibited. In addition, with the development of the Toratau Geopark and its tourist infrastructure, the tourist flow will be clearly regulated.

Fig. 63. Staircase on grief Toratau. Photo by A. Saitova.

(ii) Environmental pressures, natural disasters and risk preparedness

Erosion processes

Erosion processes are most pronounced on the territory of the Bashkir Shikhans. To assess the degree of their activity, the staff of Ufa University of Science and Technology created maps with the Basic Terrain Analysis module of the SAGA GIS software based on SRTM data. They allow for making a conclusion that the erosion potential is much higher for the Bashkir Shikhans than for the adjacent territories, and that the slope of the Shikhans surface is 0.96 radians, or 55°, which indicates extremely intense manifestations of erosion processes.

In this case, the measure to protect the Shikhans is definitely the development of the territory and the regulation of tourist flows. To this end, in 2022, stairs were installed and ecological paths were developed on Toratau, which makes it possible to reduce the negative influence of erosion processes and recreational digression.

Steppe and forest fires

From time to time, strong fires occurred on the Shikhans, which covered large areas and caused great damage to their biodiversity. After the establishment of natural monuments and assigning the protection status to the Shikhans, the frequency and scale of fires decreased sharply. If a fire takes place, the local population and the Ministry of Emergency Situations quickly localize the outbreak. With the development of the Toratau Geopark, the frequency of fires around the Shikhans and the severity of their consequences will be minimized.

Dangerous climatic phenomena

Extreme temperatures, abnormally cold and warm weather, droughts, advanced rains or heavy downpours, as well as frosts, fogs and hail are the most unfavorable and dangerous weather and climate phenomena in the Bashkir Shikhans.

The maximum average annual temperature for the period under review was 5.9°C (1995 and 2012). In addition, in the last two decades, in nine years this value exceeded 5°C. The maximum average monthly temperatures were recorded in July 1931 (24.8°C) and in August 2016 (24.3°C). The maximum daily air temperatures (above +38°C) were observed on 14th July 2020 and 4th and 21st of August 2021. The coldest year was 1969 (-0.3°C), when an absolute immediate minimum was recorded on 24th of January (-43.6 °C) and the minimum monthly average temperature in January (-28.9°C).

The maximum annual precipitation was in 1990 (734 mm). The maximum monthly precipitation (relative to the norm) was observed in May 1997 (163 mm), September 1987 (161 mm) and February 1966 (117 mm). Daily precipitation maxima were recorded on the 2nd of July 1993 (55.0 mm) and 16th of July 1969 (48.5 mm).

The periods of severe drought were in September 1971, May-September 1975, May-August 2010, August 2016, June-July 2021.

The period when cold snaps may occur is 27 days in spring and 22 days in autumn. The average number of days with hail is 2, maximum 4. There are about 30 foggy days a year, a large proportion of which falls on the cold period.

Climate change

Recent studies have shown that climate warming is observed in the South Ural region with a simultaneous trend of decreasing summer and increasing winter precipitation (see climate section 2a). This leads to an increase in droughts frequency, which may affect the conservation of Shikhans' biodiversity. However, this process is slow and vegetation monitoring reveals the absence of any significant changes. However, over time, such changes may become more obvious.

(iii) Visitation, other human activities and sustainable use

Recreational load

Tourism activities have a significant impact on the Bashkir Shikhans ecosystems. According to the Toratau Geopark, more than 28 thousand people visited the Toratau Shikhan in 2022, more than 10 thousand people visited the Kushtau Shikhan, and about 6 thousand people visited the Yuraktau Shikhan. The largest number of tourists is observed from May to August. The maximum load falls on weekends. For example on Saturdays and Sundays in July, more than 2000 people visit Toratau whereas more than 300 people come to see Yuraktau. The one-time recreational load on the Toratau Shikhan is 10.4 people per hectare (500 people at a time), 1.5 people per hectare (100 people at a time) on the Yuraktau Shikhan – and 0.5 people per hectare (150 people at a time) on the Kushtau Shikhan. Thus, for the Yuraktau and Kushtau Shikhans, the maximum allowable recreational load is not exceeded, while for the forested part of Toratau, the recreational load is increased, and in the steppe part, the load is exceeded significantly. The latter is manifested in the fragmented recreational digression of the nominated property. According to the results of field studies and analysis of remote sensing data (June 2022), the manifestations of recreational digression are insignificant for the Yuraktau and Kushtau Shikhans, while for Toratau, the level of recreational digression in some places was exceeded by 4.5 times (Table 10, Fig. 64-66).

Table 10.

Recreational degression indicators	Toratau		Kushtau		Yuraktau	
	Value	Stage of digression	Value	Stage of digression	Value	Stage of digression
Linear and areal trampling, in % of the total area of the natural territorial complex	14 %	1	2 %	1	3%	1

To prevent the ecosystem degradation along tourist paths, the Toratau Geopark provides for the following activities[1] included in the management plan:

- limiting the number of people in a group (up to an acceptable number of visits per unit of time - per day, per week, per month);
- fitting of trails, especially in sensitive areas, with resting places and stops, walkways, crossings, railings, steps, paving them with durable material, installing garbage bins, etc.;
- regulation of the behavior of sightseers and tourists on the trails (prohibition of noise, leaving the trails, collecting plants, stones, etc.);
- a ban on visiting the trail during critical periods (when animals in the ecosystem are particularly sensitive to disturbance, or there is a threat of destruction of the trail bed due to weather conditions, etc.)

[1]Guidelines for determining the norms of recreational loads on tourist routes and ecological paths of specially protected natural areas. Nur-Sultan, 2020 - p. 76

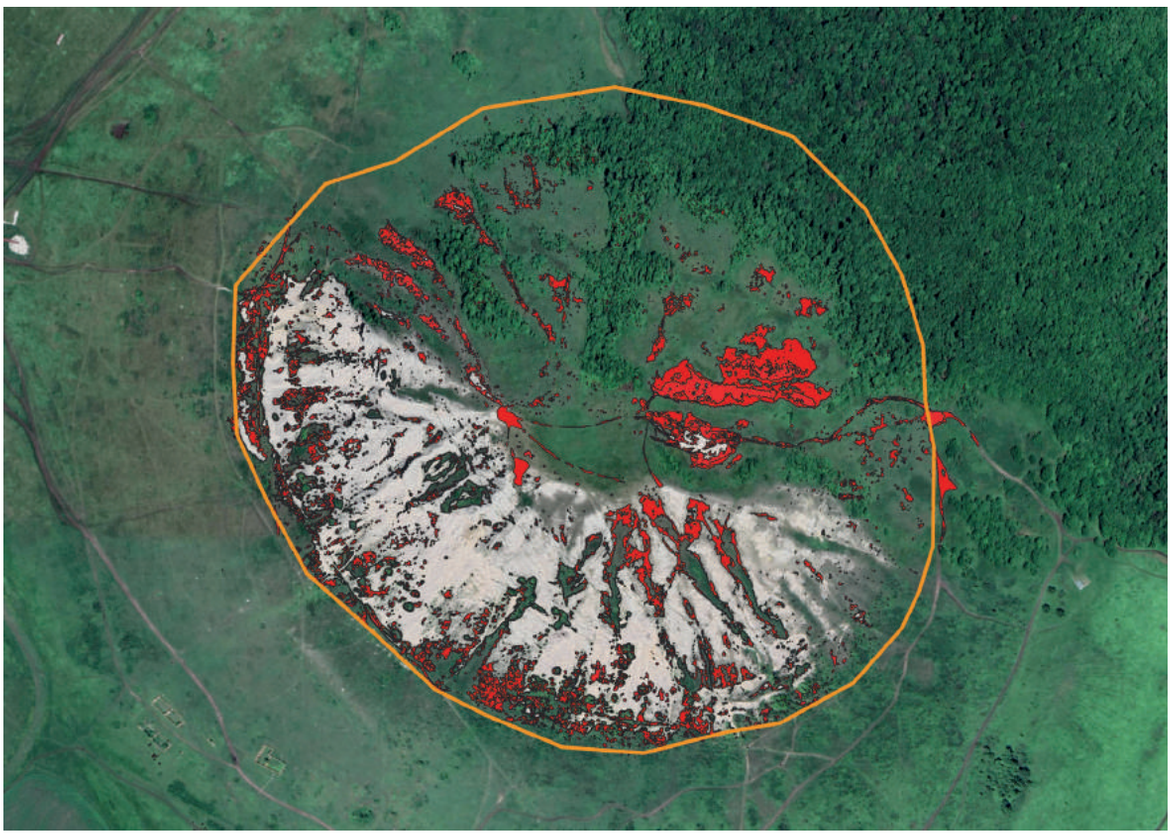


Fig. 64. Areas with pronounced linear and areal trampling on Toratau.

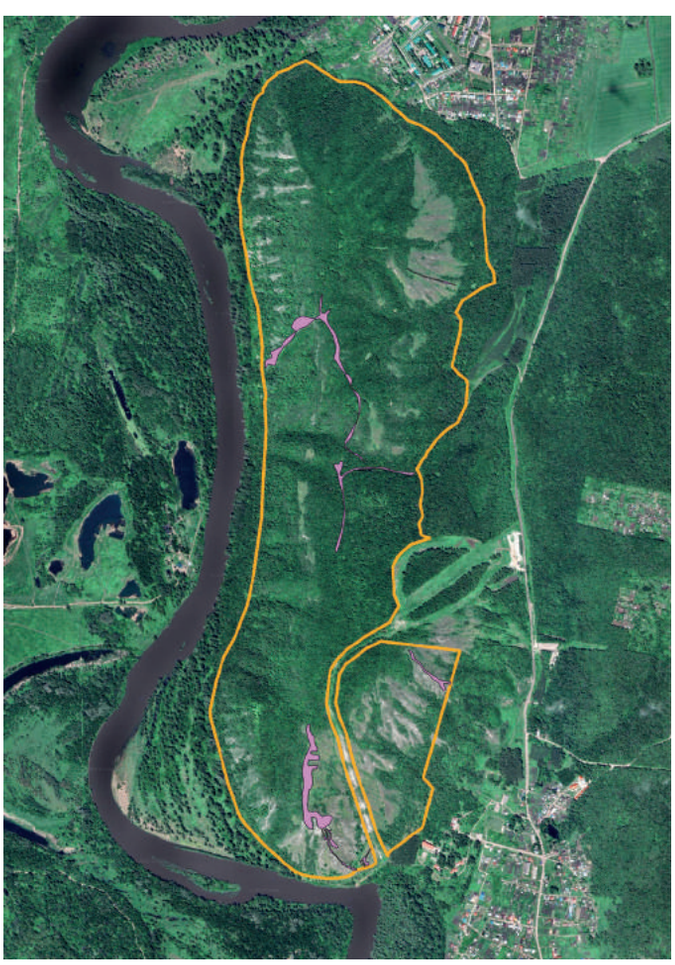


Fig. 65. Areas with pronounced linear and areal trampling on Kushtau.

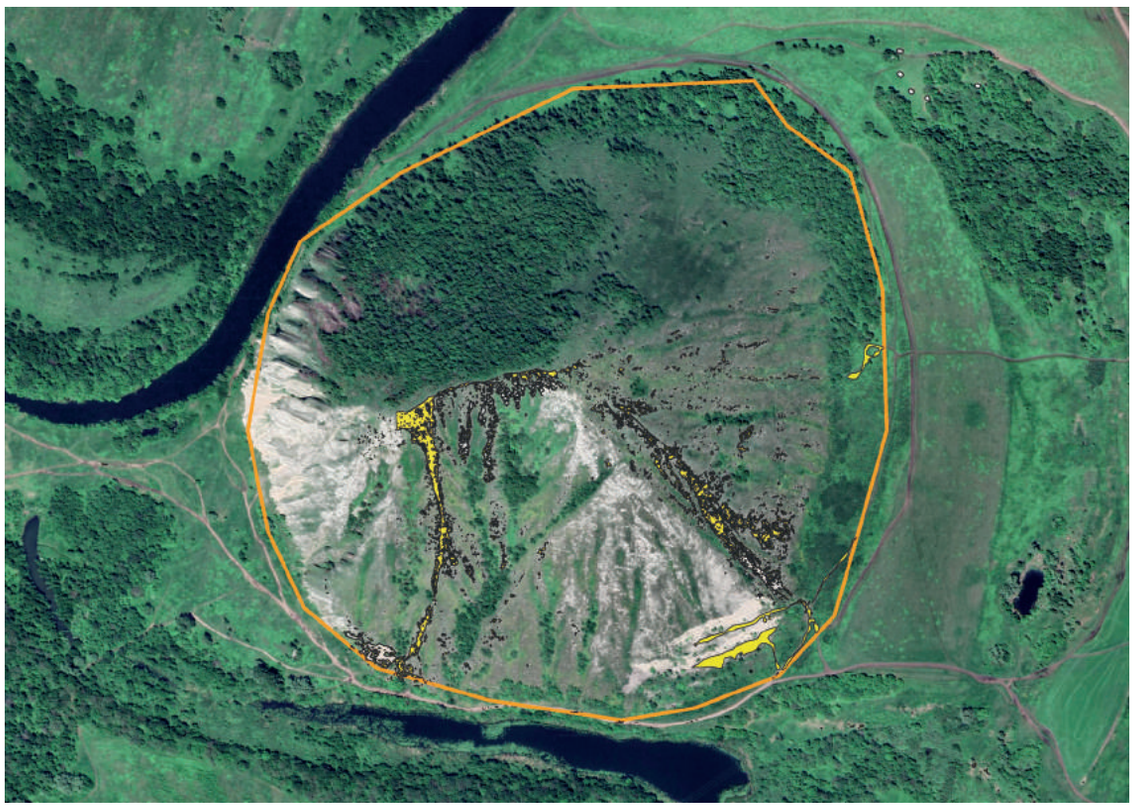
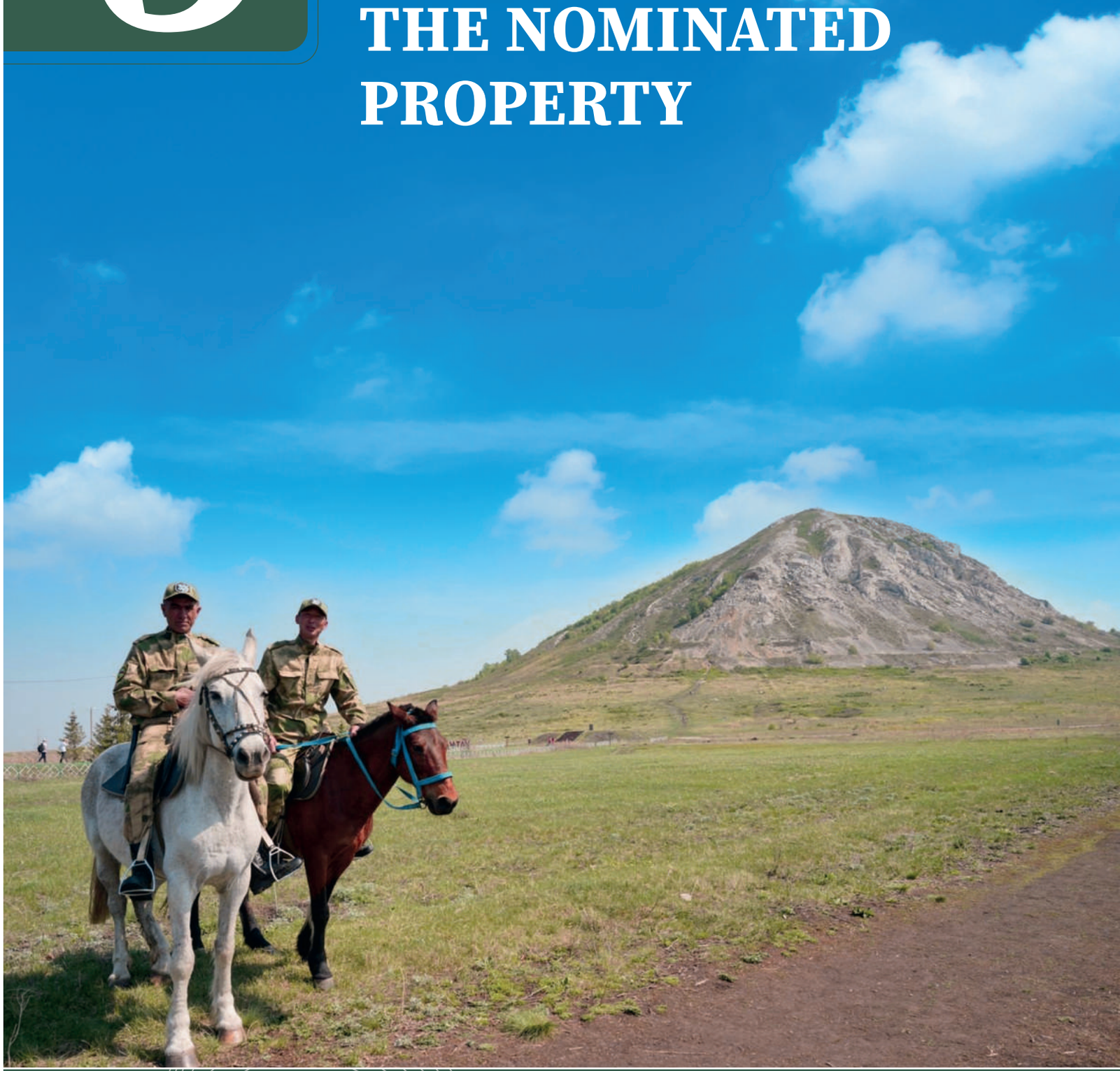


Fig. 66. Areas with pronounced linear and areal trampling on Yuraktau.

An important role in the implementation of measures to preserve the Toratau Shikhan and prevent recreational digression is played by the Toratau Geopark. The territory at the foot of the mountain is fitted with amenities, there is a visit center, garbage containers, including those for sorting it out. Rules of conduct are published on the Geopark website and information stands, geoguides explain visitors the features of the protective regime. To reduce the recreational degradation of Shikhans, a staircase was built along the main path, and alternative routes and excursions are being formed to regulate the tourist flow.

Mounted patrol of the Toratau Geopark.
Photo by the Toratau Geopark.

5 PROTECTION AND MANAGEMENT OF THE NOMINATED PROPERTY



5. PROTECTION AND MANAGEMENT OF THE NOMINATED PROPERTY

5.a Stakeholders

5.a (i) Ownership and inhabitants

There are 4 types of land ownership within the nominated property:

- lands of the forest fund (forests and other forestry facilities);
- lands of specially protected territories and objects;
- settlement lands;
- agricultural lands.

There is no residential population directly within the boundaries of the object and its buffer zone. The table below demonstrates the population size of settlements located near the nominated objects (01.01.2023):

	Toratau	Kushtau	Yuraktau
1	Shikhan – 19	Shikhany – 312	Nikolaevka – 66
2	Urman-Bishkadak – 745	Urniak – 119	Yuraktau – 181
Total, people	764	431	247

Estimated population located within

The nominated property_____ Year_____

The buffer zone_____ Year_____

5.a (ii) Indigenous Peoples

In the Sterlitamak and Ishimbai districts, as well as throughout the Republic of Bashkortostan, the main population is made up of three ethnic groups, namely the Russians, the Bashkirs, the Tatars. The Bashkirs predominate in the Ishimbai district. According to the All-Russian Population Census 2010, they constitute 71.59%, the Russian population is 16.76%, the Tatar population is 5.85% and the Chuvash population is 4.86%. In the Sterlitamak district, the Russian population predominates (34.2%), while the Bashkir and Tatar population accounts for 21.59% each. There is a noticeable number of the Chuvash (13.76%), the Ukrainians (3.69%) and the Mordovians (2.55%). Russian and Bashkir are the languages of social interaction.

In order to inform the local population about the ongoing work to include the Bashkir Shikhans in the UNESCO World Heritage List, in February-March 2023, specialists from Ufa University of Science and Technology, conducted a comprehensive sociological study called "The attitude of the local population and business entities to the inclusion of the Bashkir Shikhans in the UNESCO World Heritage List" as part of the ESG-models for the growth of new eco-territories strategic project, and interviewed more than 300 people.

According to the results of the study, more than 88% of the local residents supported the initiative to promote Shikhans to the List.

Further, on 26th of April 2023, in the Shikhan Village, Ishimbai district, public hearings were held among the local population in the Russian and Bashkir languages on nominating the Bashkir Shikhans for the World Heritage site. The hearings were attended by 56 people, the residents of the Ishimbai and Sterlitamak districts of the Republic of Bashkortostan, representatives of district administrations, federal and republican scientific and public organizations, and enthusiasts.

During the nomination development team's presentations, local residents learned about the benefits and obligations of the World Heritage Site, the procedure and features of inscription in the List, asked their questions, expressed their suggestions and concerns. As a result of the discussions, the local residents gave their free, prior and informed consent to the inclusion of the Bashkir Shikhans of Toratau, Kushtau and Yuraktau in the World Heritage List. The vast majority of the participants in the public hearings expect that the Bashkir Shikhans will be preserved as a unique natural monument and that the solution to various local environmental and social problems will be found. The resolution on the results of the public hearings and the list of participants are provided in Appendix B 10.

5.a (iii) Participation

All stakeholders and right holders could express their opinion on the inclusion of the natural geological object the Bashkir Shikhans of Toratau, Kushtau and Yuraktau in the World Heritage List (the List) in several ways:

1. Participation in sociological research.

In order to conduct a preliminary study of public opinion, determine the locals' attitude to the inclusion of the Bashkir Shikhans of Toratau, Yuraktau and Kushtau in the List, identify stakeholders, inform the residents about upcoming public hearings in February-March 2023, qualitative (focus group interview) and quantitative (mass sociological survey) sociological research among residents of nearby settlements was conducted.

In order to better analyze the attitude of local entrepreneurs and authorities towards inclusion of the Bashkir Shikhans of Toratau, Kushtau and Yuraktau in the List, a focus group interview was also carried out among representatives of local authorities and businesses. A questionnaire for the study consisted of several blocks of questions covering various aspects of the topic, including the attitude of the local population and authorities towards the Shikhans, practical and environmental activities related to the natural site, attitudes towards changing the status of the territory: expectations, fears and concerns etc.

2. Participation in public hearings (see paragraph 5.a (ii))

3. Comments on the Toratau Geopark group in VK (https://vk.com/geoparktoratau).

Thus, during the preparation of the nomination dossier for the Bashkir Shikhans of Toratau, Kushtau and Yuraktau, both the indigenous population and all stakeholders and right holders were involved in the discussion.

5.b Protective designation

1) Taking into account a high value of the Shikhans, the nominated object is subject to regulatory mechanisms applicable to specially protected natural areas:

- The Shikhans are protected by Federal Law No. 33-FZ dated 14 March 1995 "On Specially Protected Natural Areas" (Annex B1) and the Law of the Republic of Bashkortostan No. 5–З dated 31 July 1995 "On Specially Protected Natural Areas in the Republic Bashkortostan" (Annex B2);

- The system of specially protected natural areas approved by the government of the Republic of Bashkortostan (Decree of the Government of the Republic of Bashkortostan dated 01.09.2003 No. 209 "On approval of the concept of the system of protected natural areas in the Republic of Bashkortostan") operates on the territory of the republic. All the three Shikhans are natural monuments of republican significance (Annex B5–B7).

- In order to protect natural monuments from adverse anthropogenic impacts on adjacent land plots, protected zones with a regulated regime of economic activity were established by Decree of the Head of the Republic of Bashkortostan No. UG-375, dated 22 July 2021 "On the creation of protected zones of natural monuments of republican significance" (Annex B4).

- The Toratau and Yuraktau Shikhans are also classified as cultural heritage and are protected by the federal laws since valuable archaeological and historical objects were found on them. Toratau Settlement refers to monuments of federal significance (Decree of the Council of Ministers of the RSFSR dated 30.08.1960, No. 1327), and the YurakTau Sanctuary refers to the monuments of regional significance (Decree of the Council of Ministers of the BASSR No. 599 dated 31.12.1970);

2) An important moment in the history of the conservation of the Bashkir Shikhans is the creation of the Toratau Geopark, which is currently being prepared for inclusion in the UNESCO Global Geopark Network (Toratau aspiring UNESCO Global Geopark). The Geopark was created by Decree of the Head of the Republic of Bashkortostan No. UG-308 dated 12 December 2018 "On the Toratau Geopark" (Annex B8).

Despite the fact that there is no such a category of protected areas as a "geopark" in the environmental legislation of the Russian Federation, the Republic of Bashkortostan has Law No. 609-з dated 27.09.2022 "On Geoparks in the Republic of Bashkortostan" in accordance with which the geoparks' efforts are aimed at the development and implementation of activities for preserving the natural heritage.

5.c Means of implementing protective measures

State supervision in protection and use of specially protected natural areas of the republican significance is carried out by the executive authority of the Republic of Bashkortostan in environmental protection (Ministry of Nature Management and Ecology of the Republic of Bashkortostan) when exercising regional state environmental supervision in accordance with the legislation of the Russian Federation on environmental protection in the manner prescribed by the Government of the Republic of Bashkortostan.

Protection of natural monuments and their buffer zones is carried out by the territorial committees of the Ministry of Nature Management and Ecology of the Republic of Bashkortostan annually. An independent assessment of the protected areas state is made by a third-party scientific organization that performs stock taking of specially protected natural areas as part of the maintenance of the cadaster of protected areas. Such an assessment is carried out every 4 years for each protected area.

Besides, Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization, together with its partners and local communities, provides all possible support to the state in maintaining order in the territories where the Shikhans are located. Joint cleaning campaigns are regularly held. By joint efforts, a mounted patrol was created to protect the objects. Its duties include monitoring the general order and protecting natural monuments from unauthorized tourists' use.

Natural monuments and their protected zones are marked by warning and information signs along their boundaries. All natural monuments and their protected zones (if any) are necessarily taken into account when creating plans and prospects for economic and social development, territorial integrated schemes, land management schemes and district plans. Any activity that entails safety violation is prohibited on the territories of natural monuments and their protected zones.

5.d Existing plans related to municipality and region in which the nominated property is located (e.g. regional or local plan, conservation plan, tourism development plan)

1. The state programme on Ecology and natural resources of the Republic of Bashkortostan, approved by Decree of the Government of the Republic of Bashkortostan No. 61 dated 18 February 2014, serves as a plan for implementing the environmental policy of the Republic of Bashkortostan. One of the main goals of the program is the conservation and rational use of the natural resources of the Republic. The programme objectives include measures to conserve existing natural resources and biodiversity. Within the framework of the programme, budgetary financing of environmental activities until 2030 is planned, including support and development of the system of specially protected natural areas of the Republic of Bashkortostan.

2. The state programme on the Development of domestic and inbound tourism in the Republic of Bashkortostan, approved by Decree of the Government of the Republic of Bashkortostan No. 185 dated 7 June 2012, is aimed at ensuring the annual growth in Russian and foreign citizens in collective accommodation facilities of the Republic of Bashkortostan by at least 1.5%. The programme objectives are to ensure the development of the tourism industry in the Republic of Bashkortostan, increase awareness and the number of organized vacationers among certain categories of Bashkortostan citizens. Within the framework of the programme, budgetary financing of activities for the ecological tourism development is expected including specially protected natural areas of the Republic of Bashkortostan. The programme was implemented until 2023 with a possible extension until 2030.

5.e Property management plan or other management system

Management structure of the nominated property

- In the territory of natural monuments, state supervision in the field of protection and use of specially protected natural areas of republican significance is carried out by the executive authority of the Republic of Bashkortostan, namely the Ministry of Nature Management and Ecology of the Republic of Bashkortostan;

- Local self-government bodies of municipalities (Ishimbai and Sterlitamak districts), where the Shikhans are located, are entrusted with the functions of cleaning, maintaining public order, as well as socio-economic development of lands;

- In order to ensure interaction between representatives of scientific, business, public circles and government bodies for the conservation and development of especially valuable natural territories of the Republic of Bashkortostan, the Board of Trustees was created under the Head of the Region, which includes both representatives of government and business communities, as well as scientists, public figures, and experts;

- The operational management of the territories of the Bashkir Shikhans is carried out by a specially created center, Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization. It is a key institution for the territory development and the coordinator of the work of all stakeholders. The Toratau Geopark forms action plans and budgets for their implementation, which are coordinated at the level of the regional government. In order to comprehensively develop the territory of the nominated object, the Development Strategy of the Toratau Geopark "Green Heart of Eurasia" was developed and adopted. The document contains a target model for the development of the territory, including ideology and development priorities, territorial organization, marketing concept, formation of the main and supporting infrastructure (including land development master plans), the concept of functional programming, management concept, as well as organizational and financial mechanisms for the implementation of the strategy.

- Locals participate in the discussion of land development plans. To do this, representatives of the management company hold regular meetings and consultations with local communities. Locals are in the staff of the management company, and many local entrepreneurs are its partners.



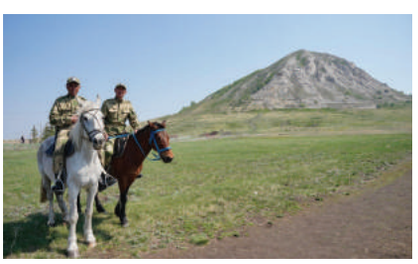


Fig. 67-69. Meetings of local residents, territory cleaning, mounted patrol. Photos by the Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization.

Medium-term management plan of the nominated territory for the period 2024-2028 provides for the implementation of a number of strategic projects that are aimed at solving the complex tasks of the territory and forming a meaningful context for its development. An extract from the management plan, a detailed description of the projects with key activities, schedules for their implementation, sources of funding and executors are provided in Annex B9.

5.f Sources and levels of finance

The sources of funding of **the activities implemented** in the territory of the nominated facility are the regional budget of the Republic of Bashkortostan, the budgets of scientific and educational institutions, namely the Ufa Institute of Biology, the Institute of Geology of the Ufa Federal Research Center of the Russian Academy of Sciences. Financing of ongoing activities is carried out in the following main areas:

Table 11. Financing of ongoing activities at the nominated property.

Item No.	Area	Source of funding	Expenditures in 2020-2022	
			₽ million	€ t housand
1	Creation of basic and auxiliary infrastructure facilities, ensuring safe and proper access to the Bashkir Shikhans	Budget of the Republic of Bashkortostan	178.9	1987.8
2	Acquisition of equipment, inventory for the organization / arrangement of tourist paths in the territory of the Bashkir Shikhans	Budget of the Republic of Bashkortostan	29.9	332.2
3	Organization and holding of mass cultural, educational and other events aimed at increasing the recognition of the Bashkir Shikhans	Budget of the Republic of Bashkortostan	142.9	1587.8
4	Construction and reconstruction of private collective accommodation facilities (estimated)	Private investment	10	111.1
5	Scientific research, design of protected areas of specially protected natural territories	Budgets of scientific and educational institutions	9.0	100.0
	Total for 2020–2022		**370.7**	**4,118.9**

The current activities of the key institution for the development of the territory of the Bashkir Shikhans, Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization are financed at the expense of:

- targeted subsidies from the budget of the Republic of Bashkortostan;
- income from the current commercial activities of the organization;
- grants, financial support provided to the organization for the implementation of specific social initiatives.

Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization is a regular participant in regular grant competitions including:

- Grant competition of the Russian Geographical Society;
- All-Russian best urban projects competition;
- All-Russian competition for the creation of tourist and recreational clusters and the development of ecotourism in Russia;
- Ozon competition called Small business makes big deals;
- Tourist souvenir all-Russian competition;
- Muzeyny Dvorik republican online competition.

Entrepreneurs involved in the activities of the nominated facility, implementing projects on environmental protection and tourist infrastructure facilities creation in the territory of the Bashkir Shikhans, actively participate and win in thematic federal and regional grant competitions.

5.g Sources of expertise and training in conservation and management techniques

In 2019–2023, many events were held on the territory of the nominated object, as well as during field sessions, to build competencies, share experience and train Geopark employees:

31	7	>50	7	>30
Participation in congress and exhibition events	Career enhancement training	Educational and environmental events in the nominated territory	Republican and municipal competitions	Publications in scientific journals

1) Participation in congress and exhibition events

The regular participation of employees of the Bashkir Shikhans in international, all-Russian and republican forums (round tables, festivals, exhibitions) is aimed at expanding scientific and practical cooperation, training new technologies and exchanging professional experience, including attracting and organizing of tourist flows. Plenary presentations of employees at all events are aimed primarily at attracting institutional investors and promoting the unique territory of the Bashkir Shikhans both in Russia and abroad.

2) Career enhancement training

The annual preparation of professional development plans and the subsequent training of employees within the company and on site in customer service, ecological excursion workshops, natural science knowledge in relation to the Bashkir Shikhans (geological structure of the Earth's crust, palaeontology, rare plant species and animals, etc.), as well as skills to work with children and people with disabilities are the integral part of the professional development of the staff.

3) Educational and environmental events in the nominated territory

The concept of continuous environmental education is being implemented on the territory of the Bashkir Shikhans. It is aimed at forming the foundations of environmental culture. According to the recommendations of the scientific community, special additional education programmes have been developed for students of local schools in sustainable development, conservation of natural and ethno-cultural heritage. Lectures for schoolchildren are regularly held in educational institutions, and during school holidays, excursions to the Bashkir Shikhans with geoguides and experts in the field of natural sciences are organized.

Starting from 2021, excursions for children with disabilities are being held on the territory of the Bashkir Shikhans with the direct participation of the Committee of the Republic of Bashkortostan for UNESCO and the Breaking Barriers Charitable Foundation.

Summer field camps, youth meetings and quizzes gather a large number of students from secondary and higher educational institutions during the warm season. Educational events combine both learning and live communication with nature, e.g. international bird watching days, environmental events and community work days that teach younger generation to rational nature management.

Students, undergraduates and graduate students of universities are given the opportunity to conduct field studies on the territory of the Bashkir Shikhans, as well as undergo summer practice under experienced teachers.

An important goal of the ongoing activities is early training of future personnel for work on the Bashkir Shikhans territory carefully preserving the existing rich heritage for future generations.

4) Republican and municipal competitions

Competitions held on a regular basis for students of republican schools make it possible to find talented children in climatology, geology and other sciences. Support and further development of their abilities and talents, subsequent targeted training in specialties at the republican universities (for example, the Faculty of Earth Sciences and Tourism of Ufa University of Science and Technology) will further contribute to the replenishment of the staff of qualified personnel.

5) Publications in scientific journals

On the territory of the Bashkir Shikhans, scientists from leading scientific and educational institutions of Russia and the world conduct fundamental scientific studies, the results of which are published in international journals, including those indexed by Scopus and Web of Science. The scientific articles discuss the features of the geological structure, issues of stratigraphy, palaeontology, magmatism and hydrogeology of the Bashkir Shikhans.

Specialists who develop the program are required to be knowledgeable enough to implement various activities on the nominated territory. Therefore, a search for the solution in this situation will be carried out by combining deep loyalty to the values of the territory and the enthusiasm of local residents with knowledge of a systematic approach and new technologies.

Priority areas of the staff

1. Discovering the personnel potential of the territory to prepare local specialists
2.Involving volunteers in projects on the “volunteering through life” principle
3. Advanced training of specialists of the management company and the creation of a competence center

5.h Visitor facilities and infrastructure

The infrastructure for serving visitors on the Bashkir Shikhans territory consists of the following main components:

5	9	5
Supporting infrastructure	Collective accommodation facilities	Public catering facilities

>350 places for all-season accommodation
>30 places in campsites

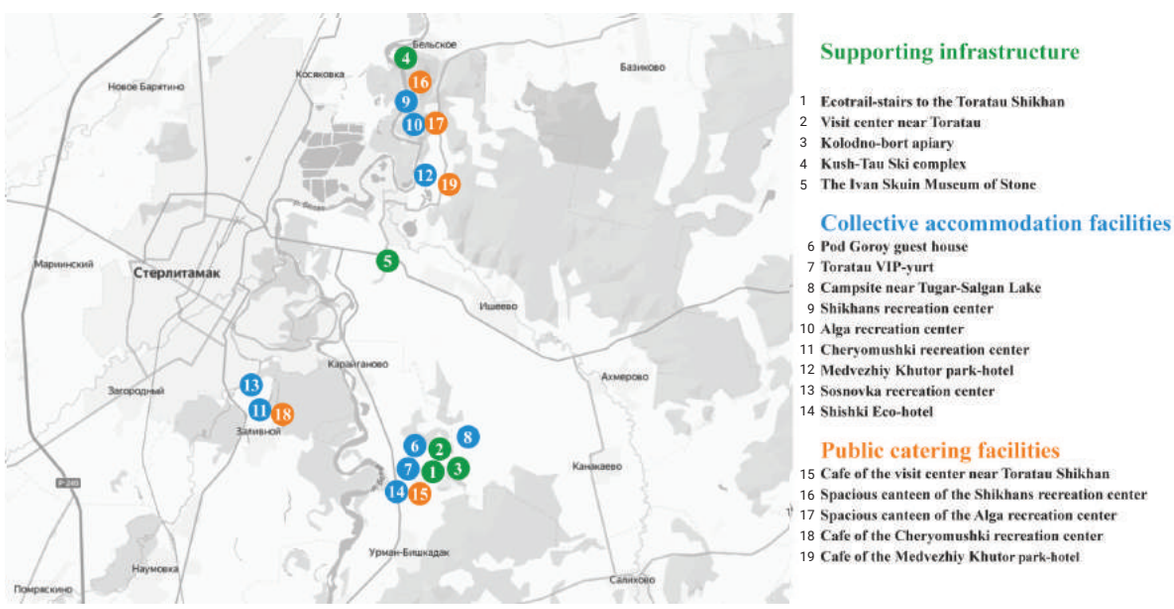


Fig. 70. Layout of infrastructure facilities for serving visitors.

1) Supporting infrastructure

Currently, the following facilities operate in the Bashkir Shikhans:

- Ecotrail-stairs to the Toratau Shikhan provide safe and proper access to one of the Bashkir Shikhans, preventing tourists from spontaneously trampling rare plant species, including those listed in the Red Book. The routes for visitors are equipped with signs and information stands;

- Tourist Information Center (visit center near Toratau), which includes an extensive museum geological exposition;

- The Ivan Skuin Museum of Stone, dedicated to the Shakhtau Early Permian fossil reef of the Ural Palaeoocean. The exposition presents exhibits of remains of ancient organisms and rocks collected by the local geologist in the Shakhtau quarry Ivan Skuin in 1985–2013;

- Kolodno-bort apiary, which demonstrates the process of honey collection to visitors using traditional Bashkir beekeeping techniques;

- Kush-Tau Ski complex.

The visitor center near the Toratau Mountain, all-weather sanitary facilities (toilet), ecotrail to the Toratau Shikhans are suitable for people with limited mobility of 1–3 categories.

In the near future, it is planned to build a permanent Toratau visitor center.

Fig. 71-75. Objects of the supporting infrastructure. Photos by Toratau Geopark Center of Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization.

2) Collective accommodation facilities

Visitors to the Bashkir Shikhans have access to 8 collective accommodation facilities (CAF) for temporary residence with a total one-time capacity of more than 380 people, including 350 beds in stationary facilities and 30 beds in seasonal accommodation facilities. With an average annual load of the CAF planned by 2035 of 50%[2] and an increase in the share of the total number of tourists living in the CAF to 80%[3], more than 80 thousand people will be able to visit the Bashkir Shikhans annually, including about 65 thousand people staying overnight.

Fig. 76-80. Objects of the supporting infrastructure. Photos by Toratau Geopark Center of Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization.

Tourist accommodation facilities:

- Shikhans recreation center is located at the foot of Kushtau. Vacationers are accommodated in comfortable sleeping buildings (including suites and junior suites) with a capacity of up to 105 people,

- Alga recreation center surrounded by a picturesque coniferous-deciduous forest at the foot of Kushtau. There is a building with double and triple rooms, as well as cozy wooden houses for 8 and 20 people with a total capacity of up to 70 people;

- Cheryomushki and Sosnovka recreation centers are located 15 kilometers from the city of Sterlitamak. There are from economy to luxury hotel rooms offering 2-, 4-, 8-bed accommodation with a total one-time capacity of more than 100 people;

- Medvezhiy Khutor park-hotel is a country family complex with six comfortable houses, located in a quiet natural area near the Urnyak village, can simultaneously admit and accommodate up to 70 people;

- Pod Goroy guest house near the Shikhan village. A-frame format with a capacity of 4–6 guests;

[2]Tourism development strategy in the Russian Federation up to 2035
[3]Tourism development strategy in the Republic of Bashkortostan up to 2035

- Toratau VIP-yurt at the foot of Toratau in a stylized Bashkir but modern style, designed for 4–6 guests;

- campsite near Tugar-Salgan Lake, which operates in the warm season, provides equipped places for tents and parking;

- Shishki Eco-hotel (services: bath complex, steam-master, cedar baths, bathing in a vat, yurts, glamping, archery, snowmobiles, quad bikes, horses, national dinners, sightseeing tours).

3) Public catering facilities

There are cafes / canteens in most of the collective accommodation facilities operating on the Bashkir Shikhans territory. For example, at the Shikhans and Alga recreation centers for vacationers there are spacious canteens with three meals a day. In the visitor center near Toratau, at the Cheryomushki recreation center and in the Medvezhiy Khutor park-hotel, there are cafes with a limited range of ready-made products.

The infrastructure development programme provides for the creation and improvement of the main, auxiliary and nature-saving infrastructure in order to develop regulated tourism without damaging nature, distribute the anthropogenic load, and increase the cognitive effect of being in the territory of natural complexes.

Priority areas in infrastructure development

1. Creation of a nature-saving supporting infrastructure, implementation of measures for the conservation and improvement of places and objects of significance for the local population

2. Development of road and engineering networks to provide ongoing projects with the necessary infrastructure, as well as improvement of the local population's life quality.

3. Improvement of the historical and cultural environment and social infrastructure with the creation of comfortable conditions for the reproduction of cultural values and the development of socio-cultural activities.

4. Development of infrastructure basing on local initiatives and projects and taking into account the residents' opinions on planning the functional sites.

5.i Policies and programs related to the presentation and promotion of the nominated property

The promotion of the nominated property is solidly founded. The tools for promoting the nominated object are addressed both to the external environment and to an internal consumer.

Priority areas of promotion:
1. Promotion of geo-heritage and coverage of scientific research
2. Promoting environmentally conscious human behavior
3. Promotion of ecological educational tourism
4. Promotion of creative community engagement to preserve heritage
5. Networking.

Integrated marketing communications are used to promote the nominated property and interact with all stakeholders:

- promotion of the information portal, informing stakeholders about events;
- promotion of information and educational content, video streaming through VK, Telegram, YouTube and other media services;
- promotion through pages on social networks with inclusion in specialized groups, blogging on these pages;
- establishing contacts with federal and regional mass media, press releases of events, photo reports, videos in the publicity format;
- attracting the media to active cooperation through inclusion in the partnership system, organizing special excursions for their representatives;
- participation of the management company, residents of the territory in the life of local communities, implementation of joint projects with the local population, etc.;
- presentations of the nominated object at regional, Russian and international seminars, conferences, forums;
- production and distribution of leaflets, booklets and other printed materials;
- familiarization and education of visitors through information stands located in the territory;
- participation in competitions of projects for the development of infrastructure of the territory, the implementation of projects of local initiatives and others;
- publications in scientific journals or on web portals.

Main promotion channels used:

- Website: https://geopark-toratau.ru/
- Page on social networks: https://vk.com/geoparktoratau
- Telegram channel: https://t.me/geoparktoratau
- YouTube channel: https://www.youtube.com/@torataugeopark320

Examples to promote nominated objects.

Examples of video and photo content:

- https://disk.yandex.ru/d/NGhq2YOGKmTwVw
- https://disk.yandex.ru/d/EUTYE3vNkfc8Ng

Examples of printed materials:

- https://disk.yandex.ru/d/UI1iNqkzjvV0xA
- https://disk.yandex.ru/d/XLwCFQNiCswnSA
- https://disk.yandex.ru/d/rPXWRZm5uxmwnQ
- https://disk.yandex.ru/d/vRA80uIoXiLsSQ

Examples of publications:

- https://disk.yandex.ru/i/cxGerkVh4FKzlQ
- https://drive.google.com/drive/u/0/folders/183JT_ZtsdQJLTPxwM7v6tf3N-HrcpuRg

Examples of information stands:

- https://disk.yandex.ru/d/Sdmqz0InbVTajA

Examples of promotional activities:

- https://disk.yandex.ru/i/kmzkhQpo1Vlg2Q
- https://docs.google.com/spreadsheets/d/1w8QN5UGifYiXPuBKT_P49UUvzdhXaK9wNKGSwITBe3M/edit#gid=227762164
- https://geopark-toratau.ru/en/na-konferencii-junesko-v-ispanskoj-sevile-prezentovali-geopark-toratau/
- https://geopark-toratau.ru/en/geopark-toratau-predstavili-mezhdunarodnomu-soobshhestvu-na-forume-urbanistiki-v-ufe/

Traditionally, the Russian Geographical Society provides extensive support for the preservation, promotion and interpretation of the heritage of the Shikhans. In 2014, the collective monograph called the Unique Natural Monuments - the Toratau and Yuraktau Shikhans, dedicated to geology, soil formation processes, flora and vegetation of the Shikhans was awarded the Crystal Compass National Prize.

The key area is environmental education of the younger generation. Today, the main focus is on school and preschool children:

- the local history coterie in the school of Urman-Bishkadak. The educational programme “My home area” (for children aged 11-16) teaches history, geology, legends and traditions associated with Toratau, information about rare plant and animal species, living on the mountain;
- regular excursions for schoolchildren;

- with the support of the Russian Geographical Society, a series of lectures on global climate change is held for schoolchildren and the educational base is being formed;
- research papers for students, for example “Business plan for organizing weekend tours for Pearl of Toratau”, “Guide to the village of Urman-Bishkadak”, “Historical and ecological route “the Mountain of legends”, “My village and surroundings in the history of the region” and many other. All works are winners of regional, republican and Russian competitions of children’s research works.



Fig. 81-83. Excursions and lectures for schoolchildren on the Bashkir Shikhans. Photos by Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization.

Examples of educational activities implemented over the past 3 years:

- Excursion programmes for schoolchildren (starting from 2020), including excursions for children with disabilities (together with the Committee of the Republic of Bashkortostan for UNESCO and the Breaking Barriers Charitable Foundation, starting from 2021);
- Field lectures (+ practical sessions) for students of rural schools on climate change (under an agreement with the Ufa University of Science and Technology) – starting from 2020;
- Field lectures on ornithology, entomology, geology, ecology for students in grades 7-11 (in cooperation with Children’s Ecological and Biological Center of the Republic of Bashkortostan) – 2020–2022;
- Field lectures on natural and cultural heritage for students of secondary schools in the Ishimbai and Gafurysky districts – annually, starting from 2020;
- Presentations of the Bashkir Shikhans in the districts and cities of the Republic (Ishimbai, Sterlitamak, Krasnousolsk, Alsheevo and Fedorovka districts, Salavat, Kumertau) – 2021;
- Municipal creative competition “My home area” – annually, starting from 2020;
- Republican contest “The World of Palaeontology” (together with the Institute of Geology of the Ufa Federal Research Center of the Russian Academy of Sciences) - annually, starting from 2020;
- Republican competition “The World of Karst and Caves” (together with the Institute of

Geology of the Ufa Federal Research Center of the Russian Academy of Sciences) - annually, starting from 2021;

- Republican gathering-competition “Friends of reserved islands” – 2021;
- Quiz on the natural and cultural heritage of the Republic of Bashkortostan for the participants of the district festival “Bringing childhood back” - 2021;
- Congress of school forestries of the Republic of Bashkortostan as part of the Republican environmental action “March of Parks 2022” – 2022;
- First Congress of Principals and Students of the UNESCO Associated Schools of the Republic of Bashkortostan – 2021;
- 21.08.2021 – visiting meeting of the Council of Young Scientists of the Ural Federal Research Center of the Russian Academy of Sciences.
- Municipal competition (together with the administration of the Ishimbai district) “Reserved Islands” – 2023

In the near future, field practices are planned for students of Bashkir universities, as well as the development of a special educational programme for preschoolers.

In order to promote the object, as well as to develop entrepreneurship and ensure the safety of entrepreneurial and investment activities in the nominated area, the institution of business sheriffs successfully operates in the Republic municipalities. Authorized employees of the administrations of the Ishimbai and Sterlitamak districts provide information, methodological and administrative support to investors in the implementation of private and municipal-private joint projects in the area near the nominated facility.

The municipal districts of the Ishimbai and Sterlitamak districts of the Republic of Bashkortostan are carrying out ongoing activities to maintain, improve, support and develop social infrastructure in the territory of the Bashkir Shikhans. In the short term, it is planned to implement environmental measures and projects in the Ishimbai and Sterlitamak regions, including those aimed at reducing greenhouse gas emissions.

5.j Staffing levels and expertise (professional, technical, maintenance)

By 01.01.2023, the staff of Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization, managing the territory of the nominated object, consists of 21 employees.

The Geopark has three geologists: Faniz Ardislamov, Azamat Iskhakov and Airat Minibaev, who are responsible for science, geotourism, protection of geological heritage and local participation. The staff list includes 11 women, 4 employees are locals.

Table 12. Staffing of the Toratau Geopark for 01.01.2023

N°	name	employment	function	skill	% time	Gender
1	**Arthur Idelbaev**	permanent	**General Director.** Management, geopark development strategy	Manager	100	m
2	**Regina Baitulina**	permanent	**Deputy General Director.** Planning, financial management	Economist	100	f
3	**Natalia Lukashina**	permanent	**Chief Advisor.** Control and management of the geopark development strategy	Architect	50	f
4	**Ildar Baibulatov**	permanent	**Advisor.** Interaction with republican and municipal executive authorities, third-party organizations. Geopark development projects. Grants	Lawyer	100	m
5	**Faniz Ardislamov**	permanent	**Researcher.** Science, geotourism	Geologist, geophysicist	50	m
6	**Azamat Iskhakov**	permanent	**Environmental Engineer**. Conservation, local participation, geotourism	Ecologist, geologist	100	m
7	**Ilvira Zakharova**	permanent	**Guide**	Bashkir language teacher	50	f

8	**Zukhra Iskandarova**	permanent	**Guide**	Russian language, history teacher	50	f
9	**Airat Minibaev**	permanent	**Tour guide, specialist in geo-education**	Geologist	50	m
10	**Natalia Smirnova**	permanent	**Guide.** Guided tours	Cultural Specialist	75	f
11	**Gulfiya Tuzbekova**	permanent	**Guide.** Guided tours	Historian-archivist	25	f
12	**Shakir Murzabaev**	permanent	**Construction supervision engineer.** Infrastructure Development Projects	Civil engineer	100	m
13	**Gulnara Sakhapova**	permanent	**Financial economist.** Planning, reporting	Economist	100	f
14	**Ekaterina Kirillova**	permanent	**Press secretary.** Website and social media management. Media Relations	PR Specialist	100	f
15	**Olga Voronova**	permanent	**Purchasing agent**	Economist	100	f
16	**Alexander Zakharov**	permanent	**Head of the household**	Supply, service	100	m
17	**Azalia Fatkullina**	permanent	**Administrator.** Receiving and advising guests	Finance, Informatics - Economist, Teacher-organizer	100	f
18	**Marina Marchenko**	permanent	**Administrator.** Receiving and advising guests	Psychologist, teacher education	100	f
19	**Ilnur Lutfullin**	permanent	**Driver**	Car driver	100	m
20	**Aliya Yaikarova**	Permanent	**Specialist**	Lawyer	100	f
21	**Tatyana Cheprasova**	Permanent	**Cleaner**	Technician, economist	100	f

In addition, the Bashkir Shikhans, as natural monuments, are under jurisdiction and control of the Ministry of Nature Management and Ecology of the Republic of Bashkortostan. Below are the data of the head of the sector for work with specially protected natural areas and biological diversity, and the head of the Sterlitamak Territorial Administration of the Ministry of Nature Management and Ecology of the Republic of Bashkortostan.

N°	name	employment	function	skill	% time	Gender
1	**Fathylislamova Anna Igorevna**	permanent	Sector manager work with specially protected natural areas and biodi-versity	Manager	100	f
2	**Khaibullin Azat Farvazovich**	permanent	Head of the Sterlitamak Territorial Administration of the Ministry of Natural Resources and Ecology of the Republic of Bash-kortostan	Control	100	m

6

MONITORING

Yuraktau Shikhan. Google Earth image.

6. MONITORING

6.a Key indicators for measuring state of conservation

Indicator	Periodicity	Location of records
State of geological objects	Once every 4 years	Ministry of Nature Management and Ecology of the Republic of Bashkortostan
Specimens for palaeontological collections	Annually	Institute of Geology, Ufa Federal Research Center of the Russian Academy of Sciences Palaeontological Institute of the Russian Academy of Sciences All-Russian Research Geological Institute
Lithological studies	Once every 2 years	Institute of Geology, Ufa Federal Research Center of the Russian Academy of Sciences
Total number of plant and animal species found (excluding weeds and invasive species)	Once every 5 years	Institute of Biology, Ufa Federal Research Center of the Russian Academy of Sciences
Projective cover in natural plant communities of weeds and invasive plant species	Once every 5 years	Institute of Biology, Ufa Federal Research Center of the Russian Academy of Sciences
The number of plant and animal species, the number of plants and animals listed on the Red Books of various levels	Once every 5 years	Institute of Biology, Ufa Federal Research Center of the Russian Academy of Sciences
Areas of rare types of communities with the participation of plants listed on the Red Books of various levels	Once every 5 years	Institute of Biology, Ufa Federal Research Center of the Russian Academy of Sciences
Recorded steppe and forest fires	Annually	Institute of Biology, Ufa Federal Research Center of the Russian Academy of Sciences
Degree of recreational digression	Annually	Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization

Scientific, tourism and educational significance	Annually	Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization, Ufa University of Science and Technology
Landscape vulnerability	Annually	Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization, Ufa University of Science and Technology

6.b Administrative arrangements for monitoring property

In accordance with Federal Law No. 33-FZ of 14 March 1995 "On Specially Protected Natural Areas", cadastral information about the Bashkir Shikhans is updated every 4 years, including the description of the state of the flora and fauna, the current level of nature management, risk and threat assessments. The work is carried out by order of the Ministry of Ecology and Nature Management of the Republic of Bashkortostan. Since 2021, Ufa University of Science and Technology has been assessing the state of specially protected natural areas.

Ufa Federal Research Center of the Russian Academy of Sciences conducts regular monitoring of the state of the flora. All information received is transferred to the Ministry of Nature Management and Ecology of the Republic of Bashkortostan and taken into account when updating the Red Book of the Republic of Bashkortostan.

In the Toratau Geopark, a methodology has been developed for regular inventory of geological heritage objects, within which the condition and vulnerability, as well as the scientific, educational and tourist significance of the Bashkir Shikhans are annually assessed with the participation of geologists from the Ufa University of Science and Technology. Regular studies are carried out by the Institute of Geology of the Ufa Federal Research Center of the Russian Academy of Sciences, including those aimed at studying the karst processes of the Bashkir Shikhans.

Contacts of the listed organizations are presented in section 7d.

6.c Results of previous reporting exercises

1. Report on the Development of a methodology for stock taking of key objects of the geological heritage of the Toratau Geopark. Ufa – 2022, 101 p.

2. Ministry of Nature Management and Ecology of the Republic of Bashkortostan. Reports on the assessment of the state of protected areas of republican significance. Once every 4 years. Yuraktau natural monument – 2021, Toratau and Kushtau natural monuments – 2023. A comprehensive assessment of the state of natural complexes of specially protected natural areas is carried out, risks and threats are identified, the current level of degradation is assessed. According to the results of recent surveys, the state of the natural complexes of the Bashkir Shikhans is assessed as satisfactory.

Traditional Bashkir yurt — element of the tourist infrastructure.
Photo by the Toratau Geopark.

7 DOCUMENTATION

7. DOCUMENTATION

7.a Photographs and audiovisual image inventory and authorization form

PHOTOGRAPHS AND AUDIOVISUAL IMAGE INVENTORY AND AUTHORIZATION FORM

Format (slide/ photo/ video)	Title, Date (month, year)	Photographer/ Director	Owner (if other than the photographer / director)	Contact data of the owner (name, address, tel/fax, Email)	Non-exclusive transfer of rights
photo	View from Toratau to Kushtau and Yuraktau, August 2022	Aidar Daminov	Aidar Daminov	+357 97 962018, daminov1989@yahoo.com	Yes
photo	Toratau, August 2020	Andrey Budnik	Andrey Budnik	+7 963 995 00 08	Yes
photo	Toratau, 2019	Faniz Ardislamov	Faniz Ardislamov	+7 917 415-96-14, ardislamov_faniz@mail.ru	Yes
photo	Fossils of Mount Toratau, 2018	Shamil Muslukhov	Shamil Muslukhov	+7 9174013986	Yes
photo	Fossils of Toratau	Shamil Muslukhov	Shamil Muslukhov	+7 9174013986	Yes
photo	Fossils of Toratau	Shamil Muslukhov	Shamil Muslukhov	+7 9174013986	Yes
photo	View of Yuraktau	Andrey Budnik	Andrey Budnik	+7 963 995 00 08	Yes
photo	View of Yuraktau and Kushtau	Alexey Lotsmanov	Alexey Lotsmanov	+7 967 050-92-36, alotsmanov@parametr.to	Yes
photo	View of Toratau	Alexey Lotsmanov	Alexey Lotsmanov	+7 967 050-92-36, alotsmanov@parametr.to	Yes
photo	View from Toratau to Kushtau and Yuraktau, September 2022	Aliya Yaikarova	Aliya Yaikarova	+7 917 4035130, aliushk@yandex.ru	Yes

video	Kushtau 2020	Andrey Budnik	Andrey Budnik	+7 963 995 00 08	exclusive
video	Toratau 2019	Andrey Budnik	Andrey Budnik	+7 963 995 00 08	exclusive
video	Summer in Toratau 2020	Andrey Budnik	Andrey Budnik	+7 963 995 00 08	exclusive
video	Autumn in Toratau	Andrey Budnik	Andrey Budnik	+7 963 995 00 08	exclusive
video	Winter in Toratau 2020	Andrey Budnik	Andrey Budnik	+7 963 995 00 08	exclusive

7.b Texts relating to protective designation, copies of property management plans or documented management systems and extracts of other plans relevant to the nominated property

The following documentation in English is provided in Appendix B of the nomination dossier:

B1. EXTRACT FROM THE FEDERAL LAW OF THE RUSSIAN FEDERATION "ON SPECIALLY PROTECTED NATURAL AREAS" DATED 14.03.1995 (NATURAL MONUMENTS)

B2. EXTRACT FROM LAW OF THE REPUBLIC OF BASHKORTOSTAN NO. 5-3 "ON SPECIALLY PROTECTED NATURAL AREAS OF THE REPUBLIC OF BASHKORTOSTAN" DATED 31.07.1995 (NATURAL MONUMENTS)

B3. DECREE OF THE CABINET OF MINISTERS OF THE REPUBLIC OF BASHKORTOSTAN NO. 48 DATED 26.02.1999 "ON APPROVAL OF THE REGULATIONS ON SPECIALLY PROTECTED NATURAL AREAS IN THE REPUBLIC OF BASHKORTOSTAN"

B4. DECREE OF THE HEAD OF THE REPUBLIC OF BASHKORTOSTAN NO. УГ-375 DATED 22.07.2021 "ON THE CREATION OF PROTECTED ZONES OF NATURAL MONUMENTS OF REPUBLICAN SIGNIFICANCE"

B5. EXTRACT FROM DECREE OF THE GOVERNMENT OF THE REPUBLIC OF BASHKORTOSTAN NO. 163 DATED 11.04.2018 "ON AMENDING DECISION OF THE COUNCIL OF MINISTERS OF THE BASHKIR ASSR DATED 17.08.1965 NO. 465 ON THE PROTECTION OF NATURAL MONUMENTS OF THE BASHKIR ASSR" (COMPLEX NATURAL MONUMENT THE TORATAU MOUNTAIN)

B6. EXTRACT FROM DECREE OF THE GOVERNMENT OF THE REPUBLIC OF BASHKORTOSTAN DATED 11.04.2018 NO. 162 "ON AMENDING THE DECISIONS OF THE COUNCIL OF MINISTERS OF THE BASHKIR ASSR, THE CABINET OF MINISTERS OF THE REPUBLIC OF BASHKORTOSTAN AND THE GOVERNMENT OF THE REPUBLIC OF BASHKORTOSTAN" (COMPLEX NATURAL MONUMENT THE YURAKTAU MOUNTAIN)

B7. DECREE OF THE GOVERNMENT OF THE REPUBLIC OF BASHKORTOSTAN DATED 02.09.2020 NO. 529 "ON THE CREATION OF A SPECIALLY PROTECTED NATURAL TERRITORY OF REPUBLICAN SIGNIFICANCE THE MOUNTAIN KUSHTAU IN THE ISHIMBAI AND STRELITAMAK MUNICIPAL DISTRICTS OF THE REPUBLIC OF BASHKORTOSTAN"

B8. DECREE OF THE HEAD OF THE REPUBLIC OF BASHKORTOSTAN NO. UG-308 DATED 12.12.2018 “ON THE TORATAU GEOPARK”

B9. ACTION PLAN FROM THE MANAGEMENT PLAN OF THE TORATAU GEOPARK

B10. RESOLUTION AND LIST OF PARTICIPANTS IN PUBLIC HEARINGS ON THE INCLUSION OF THE NATURAL GEOLOGICAL OBJECT THE BASHKIR SHIKHANS OF TORATAU, YURAKTAU AND KUSHTAU INTO THE UNESCO WORLD HERITAGE LIST

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2.4. Puchkov V.N. Features of the geological structure of the Toratau Geopark // Geological Bulletin. 2019. No. 3. pp. 18–49. DOI: http://doi.org/10.31084/2619-0087/2019-3-3 .

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4. Report on the вevelopment of a methodology for stock taking of key objects of the geological heritage of the Toratau Geopark. Ufa - 2022, 101 p.

5. Ministry of Nature Management and Ecology of the Republic of Bashkortostan. Reports on the assessment of the state of the special protected natural areas of republican significance. Once every 4 years. Yuraktau natural monument - 2021, Toratau and Kushtau natural monuments – 2023.

7.d Address where inventory, records and archives are held

1. Institute of Geology of the Ufa Federal Research Center of the Russian Academy of Sciences.

450077 Russian Federation, Republic of Bashkortostan, Ufa, Karl Marks str. 16/2, Tel: +7(347) 272-82-56, fax: +7(347) 273-03-68, Email: ig@ufaras.ru

2. Institute of Biology of the Ufa Federal Research Center of the Russian Academy of Sciences. 450054, Ufa, Prospekt Oktyabrya, 69, tel./fax: +7(347) 235-62-47, Email: ib@anrb.ru

3. Ministry of Nature Management and Ecology of the Republic of Bashkortostan. 450006, Russian Federation, Republic of Bashkortostan, Ufa, Lenin str. 86, tel./fax: +7(347)218-04-01, +7(347)218-04-22, +7(347)272-74-21

4. Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization. Ufa, Zaki Validi str. 2, Toratau congress hall, tel. +7 (987) 480-00-21 Email: geopark.toratau@mail.ru

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8

CONTACT INFORMATION OF RESPONSIBLE AUTHORITIES

View from the Yuraktau Shikhan to Kushtau and Toratau.
Photo by A.A. Butorin.

8. CONTACT INFORMATION OF RESPONSIBLE AUTHORITIES

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8.b Official Local Institution/Agency

Natural monuments are under the jurisdiction of the Ministry of Nature Management and Ecology of the Republic of Bashkortostan. The organization of sustainable tourism activities, environmental education and enlightenment, interaction with local communities and the scientific community is carried out by Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism Autonomous non-profit organization. International cooperation is carried out through the Committee of the Republic of Bashkortostan for UNESCO.

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2. Autonomous non-profit organization, Tourism Development Center of the Republic of Bashkortostan 450008, Republic of Bashkortostan, Ufa, Pushkin str. 95, office 319, Tel: +7 (347) 246-37-03, +7 (917) 376-17-06, Email: bashtourism@mail.ru
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9. SIGNATURE ON BEHALF OF THE STATE PARTY

ANNEX A

MAPS AND SCHEMES

A1. LOCATION OF THE SERIAL PROPERTY THE BASHKIR SHIKHANS OF TORATAU, YURAKTAU AND KUSHTAU ON THE MAP OF THE REPUBLIC OF BASHKORTOSTAN. SCALE 1:1 500 000.

A2. TOPOGRAPHIC MAP WITH PRECISE INDICATION OF THE BOUNDARIES OF THE TORATAU SHIKHAN SITE. SCALE 1:25,000.

A3. TOPOGRAPHIC MAP WITH PRECISE INDICATION OF THE BOUNDARIES OF THE KUSHTAU SHIKHAN SITE. SCALE 1:50,000.

A4. TOPOGRAPHIC MAP WITH PRECISE INDICATION OF THE BOUNDARIES OF THE YURAKTAU SHIKHAN SITE. SCALE 1:25,000.

Maps on 4 sheets of A3 format in 2 copies are attached to the nomination dossier.

ANNEX B

TEXTS RELATING TO PROTECTIVE DESIGNATION, COPIES OF PROPERTY MANAGEMENT PLANS

B1. EXTRACT FROM THE FEDERAL LAW OF THE RUSSIAN FEDERATION “ON SPECIALLY PROTECTED NATURAL TERRITORIES” DATED 14.03.1995 (NATURAL MONUMENTS)

B2. EXTRACT FROM LAW OF THE REPUBLIC OF BASHKORTOSTAN NO. 5–3 “ON SPECIALLY PROTECTED NATURAL TERRITORIES OF THE REPUBLIC OF BASHKORTOSTAN” DATED 31.07.1995 (NATURAL MONUMENTS)

B3. DECREE OF THE CABINET OF MINISTERS OF THE REPUBLIC OF BASHKORTOSTAN NO. 48 DATED 26.02.1999 “ON APPROVAL OF THE REGULATIONS ON SPECIALLY PROTECTED NATURAL AREAS IN THE REPUBLIC OF BASHKORTOSTAN”

B4. DECREE OF THE HEAD OF THE REPUBLIC OF BASHKORTOSTAN NO. УГ-375 DATED 22.07.2021 “ON THE CREATION OF PROTECTED ZONES OF NATURAL MONUMENTS OF REPUBLICAN SIGNIFICANCE”

B5. EXTRACT FROM DECREE OF THE GOVERNMENT OF THE REPUBLIC OF BASHKORTOSTAN NO. 163 DATED 11.04.2018 “ON AMENDING DECISION OF THE COUNCIL OF MINISTERS OF THE BASHKIR ASSR DATED 17.08.1965 NO. 465 ON THE PROTECTION OF NATURAL MONUMENTS OF THE BASHKIR ASSR” (COMPLEX NATURAL MONUMENT THE TORATAU MOUNTAIN)

B6. EXTRACT FROM DECREE OF THE GOVERNMENT OF THE REPUBLIC OF BASHKORTOSTAN DATED 11.04.2018 NO. 162 “ON AMENDING THE DECISIONS OF THE COUNCIL OF MINISTERS OF THE BASHKIR ASSR, THE CABINET OF MINISTERS OF THE REPUBLIC OF BASHKORTOSTAN AND THE GOVERNMENT OF THE REPUBLIC OF BASHKORTOSTAN” (COMPLEX NATURAL MONUMENT THE YURAKTAU MOUNTAIN)

B7. DECREE OF THE GOVERNMENT OF THE REPUBLIC OF BASHKORTOSTAN DATED02.09.2020 NO. 529 “ON THE CREATION OF A SPECIALLY PROTECTED NATURAL-TERRITORY OF REPUBLICAN SIGNIFICANCE THE MOUNTAIN KUSHTAU IN THE ISHIMBAI AND STRELITAMAK MUNICIPAL DISTRICTS OF THE REPUBLIC OF BASHKORTOSTAN”

B8. DECREE OF THE HEAD OF THE REPUBLIC OF BASHKORTOSTAN NO. UG-308 DATED 12.12.2018 “ON THE TORATAU GEOPARK”

B9. ACTION PLAN FROM THE MANAGEMENT PLAN OF THE TORATAU GEOPARK

B10. RESOLUTION AND LIST OF PARTICIPANTS IN PUBLIC HEARINGS ON THE INCLUSION OF THE NATURAL GEOLOGICAL OBJECT THE BASHKIR SHIKHANS OF TORATAU, YURAKTAU AND KUSHTAU INTO THE UNESCO WORLD HERITAGE LIST

ANNEX B1

RUSSIAN FEDERATION
FEDERAL LAW
ON SPECIALLY PROTECTED NATURAL AREAS

Adopted by
the State Duma
on 15 February 1995

Specially protected natural areas are plots of land, water surface and air space above them with natural complexes and objects, species of wild fauna and flora, natural ecological systems of special nature protection, scientific, cultural, aesthetic, recreational and health-improving significance, which, by decisions of public authorities, fully or partially, are withdrawn from economic use and for which the regime of special protection is set.

Specially protected natural areas belong to objects of national heritage.

This Federal Law governs the relations in the field of protection and use, including establishment, of specially protected natural areas for the purpose of preserving unique and typical natural complexes and objects, species of wild fauna and flora, natural ecological systems, biodiversity, carrying out scientific research in the field of environmental protection, environmental monitoring, and environmental education.

Section VI. NATURAL MONUMENTS

Article 25. General provisions

1. Natural monuments are unique, irreplaceable, valuable in ecological, scientific, cultural and aesthetic relations natural complexes, as well as objects of natural and artificial origin.
2. Natural monuments may be of federal or regional significance.

Article 26. Procedure for recognizing territories occupied by natural monuments as specially protected natural areas

1. Natural objects and complexes are declared natural monuments of federal significance, and the territories occupied by them are specially protected natural areas of federal significance by the Government of the Russian Federation on the proposal of federal executive authorities in the field of environmental protection.
2. Natural objects and complexes are declared natural monuments of regional significance, and the territories occupied by them are specially protected natural areas of regional significance by the relevant state authorities of the subjects of the Russian Federation.
3. The state authorities of the Russian Federation and the state authorities of the subjects of the Russian Federation approve the borders and determine the regime of special protection of the territories of natural monuments under their jurisdiction. The transfer

of natural monuments of federal and regional significance and their territories under the protection of the persons under whose jurisdiction they are transferred, the registration of a protective obligation, passport and other documents are carried out respectively by the federal executive authority in the field of environmental protection and the executive state authorities of the subjects of the Russian Federation.

4. The declaration of natural complexes and objects as natural monuments, and the territories occupied by them as territories of natural monuments is allowed with the withdrawal of the land plots occupied by them from the owners, holders and users of these plots.

5. The declaration of natural complexes and objects as natural monuments, and the territories occupied by them as territories of natural monuments of federal or regional significance shall be carried out, respectively, by a decree of the Government of the Russian Federation or by a decision of the executive authorities of the relevant subjects of the Russian Federation. If necessary, the relevant land plots and water bodies may be withdrawn for state needs in accordance with the procedure established by civil, land and water legislation.

Article 27. Regime of special protection of territories of natural monuments

1. In the territories where natural monuments are located and within the boundaries of their protected zones, any activity entailing a violation of the preservation of natural monuments is prohibited.

2. Owners, holders and users of land plots on which natural monuments are located assume obligations to ensure the regime of special protection of natural monuments.

3. The expenses of the owners, holders and users of the specified land plots to ensure the established regime of special protection of natural monuments of federal or regional significance shall be reimbursed at the expense of the federal budget and budgets of the subjects of the Russian Federation, respectively, as well as funds of extra-budgetary funds.

ANNEX B2

31 July 1995 No. 5-3

REPUBLIC OF BASHKORTOSTAN

LAW

ON SPECIALLY PROTECTED NATURAL AREAS

IN THE REPUBLIC OF BASHKORTOSTAN

Adopted by the Legislative Chamber of the State Assembly of the Republic of Bashkortostan on 29 June 1995.

Approved by the House of Representatives of the State Assembly of the Republic of Bashkortostan on 14 July 1995.

Specially protected natural areas of republican significance are plots of land, water surface and air space above them, subsoil, including natural complexes and objects of special ecological, environmental, scientific, cultural, aesthetic, recreational and sanitary and health-improving significance, which, by decisions of state bodies the authorities of the Republic of Bashkortostan, are wholly or partially withdrawn from economic use and for which a special protection regime has been established. In the organization and functioning of the system of specially protected natural areas, social and environmental interests take precedence over economic ones.

Specially protected natural areas of republican significance are owned by the Republic of Bashkortostan.

This Law regulates relations in the field of organization, protection and use of specially protected natural areas to ensure sustainability of the social and economic and spiritual development of the Republic, preservation and protection of unique and reference natural complexes and objects, natural landmarks, objects of flora and fauna, their genetic fund, study of natural and anthropogenic processes in and around specially protected natural areas, in adjacent areas, biosphere, as well as for the establishment of special control over changes in the state of specially protected natural areas and for environmental education of the population.

Section I GENERAL PROVISIONS

Article 1. The legislation of the Republic of Bashkortostan on specially protected natural areas

The legislation of the Republic of Bashkortostan on specially protected natural areas is based on the relevant provisions of the Constitution of the Russian Federation, the Constitution of the Republic of Bashkortostan, the Federal Law “On Specially Protected Natural Areas”, other federal laws and consists of this Law and other regulatory legal acts.

Acts of local self-government authorities adopted within their competence shall not contradict this Law.

Article 2. Categories of specially protected natural areas, features of their creation and development

1. When making decisions on the creation of specially protected natural areas, the following shall be taken into account:

1) the importance of the relevant area for the conservation of biological diversity, including rare, endangered and economically and scientifically valuable objects of flora and fauna and their habitats;

2) the presence within the boundaries of the relevant area of natural and cultural landscapes, which are of special aesthetic, scientific and cultural value;

3) the presence within the boundaries of the relevant area of geological, mineralogical and paleontological objects of special scientific, cultural and aesthetic value;

4) the presence within the boundaries of the relevant area of unique natural complexes and objects, including single natural objects, which are of special scientific, cultural and aesthetic value.

2. Taking into account the peculiarities of the regime of specially protected natural areas, the following categories of areas are distinguished:

1) state nature reserves, including biosphere ones;

2) national parks;

3) natural parks;

4) state nature sanctuaries;

5) natural monuments;

6) dendrological parks and botanical gardens.

3. The laws of the Republic of Bashkortostan may also establish other categories of specially protected natural areas of republican and local significance.

4. Specially protected natural areas may have federal, republican, local significance and be under the jurisdiction of federal executive authorities, executive authorities of the Republic of Bashkortostan and local governments, respectively, and in cases provided for by Article 28 of the Federal Law “On Specially Protected Natural Areas”, also be operated by state scientific and state educational organizations of higher education.

5. State nature reserves and national parks are classified as specially protected natural areas of federal significance. State natural reserves, natural monuments, dendrological parks and botanical gardens can be classified as specially protected natural areas of federal or republican significance. Natural parks are specially protected natural areas of republican significance.

6. The Government of the Republic of Bashkortostan coordinates decisions on the creation of specially protected natural areas of republican significance, on changing the regime for their special protection together with:

1) the authorized federal executive body in the field of environmental protection;

2) federal executive authorities in the field of national defense and state security, if it is assumed that lands and other natural resources provided for the needs of the Armed Forces of the Russian Federation, other troops, military formations and bodies are located within the boundaries of specially protected natural areas.

7. The Republic of Bashkortostan has the right to co-finance expenditure obligations of the Russian Federation arising from the exercise of powers related to the creation and development of specially protected natural areas of federal significance from the budget of the Republic of Bashkortostan in accordance with the budget legislation of the Russian Federation.

8. Local self-government authorities create specially protected natural areas of local significance on land plots owned by the respective municipality. If the specially protected natural area to be created will occupy more than five percent of the total area of land owned by the municipality, the decision to create the specially protected natural area is coordinated by the local self-government body together with the executive authority of the Republic of Bashkortostan in the field of environmental protection.

9. Local self-government authorities resolve the issues of use, protection, conservation, reproduction of forests of specially protected natural areas located within the boundaries of settlements, urban district, in accordance with the provisions on the relevant specially protected natural areas.

10. In order to prevent adverse anthropogenic impacts on state nature reserves, national parks, natural parks and natural monuments, protective zones are created on adjacent land plots and water bodies. Creation of protective zones, establishment of their boundaries, determination of the regime for protection and use of land and water bodies within the boundaries of the protective zones are carried out in the manner established by the Government of the Russian Federation. The regime of protection and use of land plots and water bodies within the boundaries of the buffer zone is established by the regulation on the corresponding buffer zone, which is approved by the state authority that decides on its creation.

11. Decisions on the creation of buffer zones and establishment of their boundaries are taken in relation to:

1) protective zones of state natural reserves, national parks and natural monuments of federal significance by the federal executive body in charge of the said specially protected natural areas;

2) protective zones of natural parks and natural monuments of republican significance by the Head of the Republic of Bashkortostan.

Article 4

1. The state cadaster of specially protected natural areas includes information on the status of these territories, their geographical location and boundaries, the regime of special protection of these territories, nature users, environmental education, scientific, economic, historical and cultural value.

2. The state cadaster of specially protected natural areas of the Republic of Bashkortostan is maintained in order to assess the state of the natural reserve fund, determine the prospects for the development of a network of these territories, improve the efficiency of state supervision in the field of protection and use of specially protected natural areas, as well as take these territories into account when planning social economic development of the Republic and is an integral part of the state cadaster of specially protected natural areas of the Russian Federation.

Article 5

Citizens, as well as public associations and non-profit organizations carrying out activities in the field of environmental protection, have the right to assist the state authorities of the Russian Federation, state authorities of the Republic of Bashkortostan, local governments in the implementation of measures for the organization, protection and use of specially protected natural areas. When implementing these measures, the state authorities of the Russian Federation, state authorities of the Republic of Bashkortostan, local governments take into account the proposals of citizens, as well as public associations and non-profit organizations operating in the field of environmental protection.

Section VI NATURAL MONUMENTS

Article 25. General provisions

Natural monuments are unique, irreplaceable, valuable in ecological, scientific, cultural and aesthetic relations natural complexes and their components, as well as objects of natural and artificial origin.

Article 26. Procedure for recognizing territories occupied by natural monuments as specially protected natural areas

2. Natural objects and complexes are declared natural monuments of republican significance, and the territories occupied by them are specially protected natural areas of regional significance by the Government of the Republic of Bashkortostan.

3. The Government of the Republic of Bashkortostan approves the borders and determines the regime of special protection of the territories of natural monuments of republican significance. The transfer of natural monuments of republican significance and their territories under the protection of the persons under whose jurisdiction they are transferred, registration of a protective obligation, passport and other documents are carried out by the republican executive authority in the field of environmental protection.

4. The declaration of natural complexes and objects as natural monuments, and the territories occupied by them as territories of natural monuments is allowed with the withdrawal of the land plots occupied by them from the owners, holders and users of these plots.

5. The declaration of natural complexes and objects as natural monuments, and the territories occupied by them as territories of natural monuments of republican significance is carried out by the decision of the Government of the Republic of Bashkortostan. If necessary, the relevant land plots and water bodies may be withdrawn for state needs in accordance with the procedure established by civil, land and water legislation.

Article 27. The regime of special protection of the territories of natural monuments

1. In the territories where natural monuments are located and within the boundaries of their protected zones, any activity entailing a violation of the preservation of natural monuments is prohibited.

2. Owners, holders and users of land plots on which natural monuments are located assume obligations to ensure the regime of special protection of natural monuments.

3. The expenses of the owners, holders and users of these land plots to ensure the established regime of special protection of natural monuments of republican significance shall be reimbursed from the budget of the Republic of Bashkortostan, as well as from extra-budgetary funds.

Section X ORGANIZATION OF PROTECTION OF SPECIALLY PROTECTED NATURAL AREAS

Article 34. State supervision in the field of protection and use of specially protected natural areas

1. State supervision in the field of protection and use of specially protected natural areas is aimed at the prevention, detection and suppression of violations by legal entities, their heads and other officials, individual entrepreneurs, their authorized representatives (hereinafter referred to as legal entities, individual entrepreneurs) and citizens, established in in accordance with the international treaties of the Russian Federation, the Federal Law "On Specially Protected Natural Areas", other federal laws adopted in accordance therewith, other regulatory legal acts of the Russian Federation, laws and regulatory legal acts of the Republic of Bashkortostan, requirements in the field of environmental protection relating to:

1) the regime of a specially protected natural area;

2) the special legal regime for the use of land plots, natural resources and other real estate objects located within the boundaries of specially protected natural areas;

3) the regime of protective zones of specially protected natural areas.

2. In specially protected natural areas of republican significance, state supervision in the field of protection and use of specially protected natural areas is carried out by authorized republican executive bodies in the exercise of regional state environmental supervision in accordance with the legislation of the Russian Federation on environmental protection in the manner established by the Government of the Republic of Bashkortostan.

3. In specially protected natural territories of republican significance, which are managed by state institutions, state supervision in the field of protection and use of specially protected natural territories is also carried out by officials of these state institutions, who are state inspectors in the field of environmental protection.

Article 35

The rights of officials of bodies and state institutions exercising state supervision in the field of protection and use of specially protected natural areas are determined by the Federal Law "On Specially Protected Natural Areas".

Article 36

1. The protection of the territories of natural parks, state natural reserves and other specially protected natural areas is carried out by the state bodies in charge of them in the manner prescribed by the regulatory legal acts of the Russian Federation, as well as the regulatory legal acts of the Republic of Bashkortostan.

2. Employees protecting the territories of natural parks, state nature reserves and other specially protected natural areas enjoy the same rights as state inspectors in the field of environmental protection.

Section XIII FINAL PROVISIONS

Article 39. Final provisions

1. This Law shall enter into force on the day of its publication.

2. Within two months, the Government of the Republic of Bashkortostan shall bring its normative legal acts in line with this Law and ensure that the state committees, ministries, departments of the Republic of Bashkortostan review and cancel their normative acts that contradict this Law.

The President
Republic of Bashkortostan
M. RAKHIMOV

Ufa, Republic House
31 July 1995
No. 5-3

ANNEX B3

Annex No. 3 to Decree of the Cabinet of
Ministers of the Republic of
Bashkortostan dated 26 February 1999
No. 48

RESOLUTION

ON NATURAL MONUMENTS IN THE REPUBLIC OF BASHKORTOSTAN

1.GENERAL PROVISIONS

1.1. This Regulation determines the status, procedure for the declaration, use and regime of special protection of natural monuments in the Republic of Bashkortostan.

1.2. Natural monuments are unique, irreplaceable, valuable in environmental, scientific, cultural and aesthetic terms natural complexes and their components, as well as objects of natural and artificial origin.

1.3. The main purpose of declaring natural complexes and objects as natural monuments is to preserve their natural state.

1.4. Areas and objects of natural monuments, depending on their environmental, aesthetic and other value, can be classified as specially protected natural areas of federal or republican significance.

1.5. In order to protect natural monuments from adverse anthropogenic impacts, protected areas with a regulated economic activity regime are created on adjacent land or water bodies.

1.6. Natural monuments and their protected zones (if any) are marked with warning and information signs along their perimeter.

1.7. Natural objects and complexes located in the territory of state natural reserves, national natural parks and their protected zones, state nature reserves cannot be declared natural monuments.

2. MAIN CATEGORIES OF NATURAL MONUMENTS

2.1. Territories and water bodies, as well as single natural objects, can be declared natural monuments, including:

scenic areas;

reference areas of untouched nature;

areas with a predominance of the cultural landscape (old parks, alleys, canals, ancient mines, etc.) that are not classified as historical and cultural monuments;

places of growth and habitat of valuable, relic, small, rare, endangered and listed on the Red Book of the Republic of Bashkortostan plant and animal species;

forest areas, especially valuable in terms of their characteristics (species composition, productivity, age, genetic qualities, structure of plantations), as well as examples of outstanding achievements in forestry science and practice;

water bodies regulating the hydrological regime of the territory and water sources;

unique landforms and associated natural landscapes (mountains, rocks, gorges, canyons, groups of caves, etc.);

geological outcrops of special scientific value (reference sections, stratotypes, outcrops of rare minerals, rocks and minerals);

geological and geographical polygons, including classic areas with pronounced traces of seismic events, as well as outcrops of dislocation with a break of continuity and folded rock formations;

locations of rare and especially valuable accumulations of fossil flora and fauna;

unique sections of rivers, lakes, wetlands, reservoirs, small rivers with floodplains, lakes, reservoirs and ponds and coastal features (dunes, spits, isthmuses, peninsulas, bays, lagoons, capes, etc.);

natural hydro-mineral complexes;

thermal and mineral water sources, deposits of therapeutic mud;

individual objects of animate and inanimate nature (bird nesting sites, trees long-livers and plants of bizarre forms of historical and memorial significance, single specimens of exotics and relics, springs, waterfalls, river sources, rocks, remnants, manifestations of karst, caves, grottoes).

2.2. Natural monuments can be biological (botanical, dendrological, zoological), geological (geomorphological, mineralogical, paleontological), hydrological, complex (landscape), according to their natural properties.

3. PROCEDURE FOR DECLARATION OF NATURAL COMPLEXES AND OBJECTS AS NATURAL MONUMENTS

3.1. The Government of the Republic of Bashkortostan declares natural complexes and objects as natural monuments of republican significance, and the territories occupied by them as specially protected natural areas of republican significance on the basis of a comprehensive environmental survey (including stock-taking) of such objects and after agreement with the authorized federal executive body on environmental protection, as well as after receiving a positive opinion from the state environmental expert authority of the regional level.

3.2. The Government of the Republic of Bashkortostan approves the boundaries and the regime of special protection of the territory of each natural monument of republican significance, and also determines a legal entity or an individual who is responsible for ensuring this regime.

3.3. The transfer of the natural monument under protection is provided for in the decision to declare a natural object or complex the natural monument, adopted in agreement with the individuals or legal entities who are responsible for the protection of the natural monument, which is recorded in the passport of the natural monument (Annex No. 1 hereto).

3.4. The specially authorized executive body of the Republic of Bashkortostan in the field of environmental protection issues a passport for each natural monument, approved in the prescribed manner.

3.5. Copies of passports of natural monuments and conservation obligations (Annex No. 2 hereto) should be kept by the owners, users and tenants of land plots, on which the natural

monument and its buffer zone (if any) are located, individuals or legal entities who are obliged to ensure the established regime for protecting the natural monument, the relevant local self-government authorities and a special executive authority of the Republic of Bashkortostan in the field of environmental protection.

3.6. All natural monuments and their protected zones (if any) are necessarily taken into account when creating plans and prospects for economic and social development, territorial integrated schemes, land management schemes and district plans.

3.7. Changing the boundaries, the regime of special protection of territories and the abolition of natural monuments are carried out in the same manner as their creation.

The Government of the Republic of Bashkortostan makes an appropriate decision to abolish the natural monument in case of loss of its significance as a result of natural disasters and other factors, based on the results of a comprehensive environmental survey of the natural monument (including stock-taking) and a positive opinion from the state environmental expert authority of the regional level.

4. REGIME OF SPECIAL PROTECTION OF AREAS OF NATURAL MONUMENTS

4.1. In the territories of natural monuments and within the boundaries of their protected zones, any activity that entails any violation of the preservation of natural monuments is prohibited.

Data on the features of the natural monument protection regime are recorded in its passport and conservation obligation.

4.2. Owners and users of the land plots on which natural monuments are located assume obligations to ensure the regime of special protection of natural monuments, which are officially formalized in the form of a conservation obligation.

4.3. The expenses of the owners, users and tenants of the said land plots for ensuring the established regime of protection of natural monuments of republican significance are reimbursed at the expense of the budget of the Republic of Bashkortostan and extra-budgetary funds.

5. USE OF NATURAL MONUMENTS

5.1. It is allowed to use natural monuments for the following purposes:

scientific (monitoring of the state of the natural environment, study of natural ecosystems and their components);

environmental education (conducting educational excursions, creating and equipping environmental educational paths, shooting video films, photographing for making printing products);

environmental and educational (organization of children's environmental camps at natural monuments, work of various children's organizations for the protection and cleaning of monuments, etc.);

recreational (transit walks);

environmental protection (preservation of the gene pool of species of living organisms, provision of living conditions for rare and endangered species of plants and animals);

other purposes, including production purposes and purposes that do not contradict the objectives of declaring natural complexes and objects natural monuments and the special protection regime established in relation thereto.

5.2. Permissible uses of each natural monument are established depending on its nature and condition and are indicated in the passport of the natural monument. The regime of special protection of the natural monument may provide for seasonal and other restrictions for its permissible types of use.

5.3. The use of a particular natural monument for one purpose or another must be coordinated with the executive authority of the Republic of Bashkortostan in the field of environmental protection, which monitors compliance with the established regime for the protection of natural monuments.

6. STATE SYSTEM OF ACCOUNTING OF NATURAL MONUMENTS

6.1. State registration and inventory of natural monuments are carried out by the executive authority of the Republic of Bashkortostan in the field of environmental protection.

Identification of new natural complexes and objects for the purpose of their subsequent declaration as natural monuments can be carried out by local governments, scientific, public and other interested organizations.

6.2. In the event of an imminent threat of destruction of newly identified unique natural complexes or objects, prior to declaring them natural monuments, environmental regulatory authorities suspend actions that may lead to the destruction or damage to these natural complexes or objects in the prescribed manner.

7. STATE SUPERVISION IN THE FIELD OF PROTECTION AND USE OF NATURAL MONUMENTS

7.1. In the territory of the natural monument, state supervision in the field of protection and use of specially protected natural areas of republican significance is carried out by the executive authority of the Republic of Bashkortostan in the field of environmental protection in the exercise of regional state environmental supervision in accordance with the legislation of the Russian Federation on environmental protection in the manner established by the Government Republic of Bashkortostan.

The rights of officials exercising state supervision in the field of protection and use of natural monuments, are determined by the Federal Law “On Specially Protected Natural Areas”.

8. REGULATIONS ON THE PROTECTION ZONE OF THE NATURAL MONUMENT

(introduced by Resolution of the Government of the Republic of Belarus dated 27 July 2018 No. 354)

8.1. The resolution on the protected zone of the natural monument, developed and approved in the manner prescribed by law, determines the objectives, regime and boundaries of the protected zone of the natural monument in the Republic of Bashkortostan.

Specific features, regime, area and boundaries of the protected zone of the natural monument are determined by the regulation on the protected zone of the natural monument, approved in the manner prescribed by law.

8.2. The protected zone of the natural monument is created in order to preserve the specially protected natural area from adverse anthropogenic impacts.

8.3. The protected zone of the natural monument forms a single protected natural complex with the main territory of the natural monument, which provides an ecologically necessary space for the conservation of flora, fauna and ecosystems in general.

In the territory of the protected zone, preservation of natural ecosystems, restoration and reconstruction of cultural landscapes, as well as preservation of water bodies, flora and fauna, history and culture for environmental, educational and scientific purposes are carried out.

8.4. In the territories and within the boundaries of the protected zone of the natural monument, any activity that entails any violation of the safety of the protected zone of the natural monument is prohibited.

Data on the features of the protection regime of the protected zone of the natural monument are entered into its passport and security obligation.

Economic activity is carried out within the boundaries of the buffer zone in compliance with the provisions on the corresponding buffer zone and the requirements to prevent the damage to wildlife in the implementation of production activities, operation of highways, pipelines, communication lines and power transmission lines, approved in accordance with Article 28 of the Federal Law “On Animal Welfare”.

Owners and users of land plots on which the protected zones of the natural monument are located, undertake to ensure the regime of special protection of the protected zone of the natural monument, which is formalized in the form of a conservation obligation for the natural monument.

8.5. The boundaries of the buffer zone are marked with special warning notices and information signs.

Changing the boundaries and regime of the buffer zone is carried out in the same order as their establishment.

Individuals and legal entities, including owners, land users, tenants of land plots within the boundaries of the buffer zone, are required to comply with the established regime of the buffer zone.

ANNEX B4

HEAD OF THE REPUBLIC OF BASHKORTOSTAN

DECREE

On the establishment of the protected zones for the natural monuments of republican significance

In accordance with the Federal Law "On Specially Protected Natural Areas", the Law of the Republic of Bashkortostan "On Specially Protected Natural Areas in the Republic of Bashkortostan", Resolution of the Government of the Russian Federation No. 138 "On approval of rules for the establishment of the protected zones for some categories of the specially protected natural areas, establishing their boundaries, determining the regime for protection and use of land plots and water bodies within the boundaries of the said zones" dated February 19, 2015, in order to protect specially protected natural areas from adverse anthropogenic impacts, I hereby decree:

1. To create protected zones for natural monuments of republican significance: the Kushtau Mountain, the Toratau Mountain, the Yuraktau Mountain, the Karlamanskaya Cave, the Tugar-Salgan Lake, the Okhlebininskaya gypsum cave, the Big Kolpak Rock.

2. Approve:

Regulations on the buffer zone of the Kushtau Mountain natural monument of republican significance in accordance with Annex No. 1 hereto;

Regulations on the protected zone of the Toratau Mountain natural monument of republican significance in accordance with Annex No. 2 hereto;

Regulations on the protected zone of the Yuraktau Mountain natural monument of republican significance in accordance with Annex No. 2 hereto;

Regulations on the protected zone of the Karlamanskaya Cave natural monument of republican significance in accordance with Annex No. 4 hereto;

Regulations on the buffer zone of the Tugar-Salgan Lake natural monument of republican significance in accordance with Annex No. 5 hereto;

Regulations on the buffer zone of the Okhlebininskaya gypsum cave natural monument of republican significance in accordance with Annex No. 6 hereto;

Regulations on the buffer zone of the natural monument of the Big Kolpak Rock natural monument of republican significance in accordance with Annex No. 7 hereto.

3. To recommend to the administrations of the municipal districts of the Republic of Bashkortostan, on the territories of which the natural monuments and their protected zones provided for by this Decree are located, to develop comprehensive schemes for land management and regional planning, taking into account the regime of specially protected natural areas and their protected zones.

4. This Decree shall enter into force on the day of its official publications.

Head of the Republic of Bashkortostan R. Khabirov
Ufa, Republic House
July 22, 2021
No. УГ-375

Seal / Central Office of the Government of the Republic of Bashkortostan, Department of registration of legal acts/

Annex No. 1 to Decree of the Head
of the Republic of Bashkortostan
No. УГ-375 dated July 22, 2021

Regulations on the protected zone of the Kushtau Mountain natural monument of republican significance

Site name: protected zone of the Kushtau Mountain natural monument of republican significance.

The following is prohibited in the territory of the protected zone of the Kushtau Mountain natural monument of republican significance:

geological study of the subsoil, including the exploration and evaluation of mineral deposits;

exploration and production of minerals;

drilling, blasting and mining operations, with the exception of drilling wells for the purposes of water supply for tourism infrastructure;

laying pipelines;

construction of capital facilities, with the exception of tourism facilities and facilities necessary for functioning of tourism infrastructure (water supply, sewerage, power lines, gas pipelines, ski complex facilities, cellular tower, etc.);

placement of cattle burial grounds, cemeteries, places of burial and storage of production and consumption waste, radioactive, chemical, explosive, toxic and poisonous substances;

use of toxic chemicals, radioactive substances;

hunting;

pollution of the area with solid municipal, construction, industrial and other waste and garbage;

burning brushwood, forest floor, dry grass and other combustibles;

damage or destruction of warning and information signs (banners).

Information about the site

1	Site location	Republic of Bashkortostan, Ishimbai and Sterlitamak districts, the monument is located on the lands of the state forest fund between the Belaya River, the Shikhany village, the Belskoe Village and the highway connecting the said settlements
2	Site area	250.65 ha or 2506484 sq. m

Information about the characteristic points of the boundaries of the buffer zone of the Kushtau Mountain natural monument of republican significance (WGS -84 coordinate system).

Annex No. 2 to Decree of the Head
of the Republic of Bashkortostan
No. УГ-375 dated July 22, 2021

Regulations on the protected zone of the Toratau Mountain natural monument of republican significance

Site name: protected zone of the Toratau Mountain natural monument of republican significance.

Description of the boundaries of the buffer zone of the Toratau Mountain natural monument of republican significance:

the boundary of the protected zone of the Toratau Mountain natural monument of republican significance begins at the end of the alley leading to the mountain and goes south along the left side of the road, facing the Toratau Shikhan. Thus, this road does not fall into the protected zone. At point 19, the boundary turns to the south-southeast and runs between the remains of two destroyed barracks of the former prison camp. At point 30 the boundary goes south along the road and at point 35 turns gently east. At point 42, at the intersection of three field roads, the boundary passes along the left edge of the middle road in directions first to the northeast and then to the north-northeast and reaches the forest area at point 60. Further, the boundary runs along the edge of the forest area in the east direction along the northern side of the road and at point 70 turns northeast through the forest. At point 79, the boundary turns north and follows the western side of the field road. At point 108 at the intersection of field roads, the boundary turns west and follows the southern side of the road to point 126. The boundary then turns southwest and runs along the southeastern side of the field road to point 143 and joins point 1.

The following is prohibited in the territory of the protected zone of the Toratau Mountain natural monument of republican significance:

mining, blasting, exploration;

any construction, except for non-permanent objects for tourist infrastructure, museum complexes, memorial stelae and ethno-cultural objects;

laying of roads, pipelines, installation of antennas, towers, lifts;

arrangement of cattle burial grounds and cemeteries, storage of fertilizers and pesticides;

grazing;

hunting, holding mass events: rallies, Sabantuy holidays, competitions;

felling of forest, except for sanitary felling;

passage of any automoto and electric vehicles, except for motor or electric vehicles of the Toratau Geopark, which are needed for functioning, arrangement of the territory and fulfillment of the statutory goals of the Toratau Geopark.

The following is allowed in the territory of the protected zone of the Toratau Mountain natural monument of republican significance:

arrangement of tent camps and campfire sites;

dumping, asphalting and arrangement of the existing roads and footpaths;

arrangement of fire breaks;

cutting of trees that pose a danger to vacationers;

felling of individual trees when expanding the existing roads and footpaths;

felling of shrubs for the arrangement of roads and footpaths, tourist service facilities and tent camps;

haymaking;

installation of banners, information panels, boards, signs, etc.;

drilling under poles for arranging fences and placing information panels, scoreboards, signs, etc. (if necessary);

drilling of wells for water supply for tourists.

Information about the site

1	Site location	Republic of Bashkortostan, Ishimbai district
2	Site area	129.221 ha or 1292210 sq. m

Information about the characteristic points of the boundaries of the buffer zone of the Toratau Mountain natural monument of republican significance (WGS -84 coordinate system)

Annex No. 3 to Decree of the Head
of the Republic of Bashkortostan
No. УГ-375 dated July 22,

Regulations on the protected zone of the Yuraktau Mountain natural monument of republican significance

Site name: protected zone of the Yuraktau Mountain natural monument of republican significance.

Description of the boundaries of the buffer zone of the Yuraktau Mountain natural monument of republican significance:

The protected zone of the Yuraktau Mountain natural monument of republican significance begins from the eastern outskirts of the oxbow, located on the southern side of the Yuraktau Mountain at point 1, and runs along the northern forest edge in the east-north-east direction to point 5, then crosses the power line in the north direction to point 6. Further, the boundary runs eastward along the southern forest edge and at point 15 reaches the field road.

From point 16, the boundary runs east along the northern side of the field road to point 19, then turns north and follows the western side of the same road. On the east boundary there is a cultivated field, and on the west boundary there is a long ravine with sink holes. At point 35, the boundary turns east and runs along the northern shoulder of the field road. Then, at point 47, it sharply, almost 180 degrees, turns west-northwest. Then it goes along the southern side of the field road to the northwest. At point 73 the border turns west. At points 92-96, the boundary of the buffer zone passes in close proximity to the northern boundary of the natural monument.

At point 99, the boundary of the buffer zone turns to the northwest and crosses the outskirts of two oxbow lakes at points 103 and 104. At point 104

it turns to the southwest and runs along the bank of the oxbow river in the southwestern direction, and starting from point 116 - in the western direction.

At point 122, the boundary of the buffer zone turns south, then runs along the eastern edge of the forest. At point 134, the boundary goes around the northern border of the forest in an easterly direction to point 141, then again turns south-southeast to the eastern bank of the oxbow river at point 143. Further, the boundary passes along the oxbow bank in the south direction to point 153, then turns south-east and smoothly passes to the southern bank of the oxbow, located in the southern part of the Yuraktau Mountain, and goes eastward to point 169. Further, the boundary of the buffer zone turns along the shore of the oxbow to the northeast and connects with point 1.

The following is prohibited in the territory of the protected zone of the Toratau Mountain natural monument of republican significance:

mining, blasting, exploration;

extraction of sand and gravel mixture in oxbow lakes;

any construction, except for tourist infrastructure facilities, museum complexes, memorial stelae and ethno-cultural objects;

laying of roads, power lines, pipelines, installation of antennas, towers, lifts;

arrangement of cattle burial grounds and cemeteries, storage of fertilizers and pesticides;

grazing;

hunting, holding mass events: rallies, Sabantuy holidays, competitions;

felling of forest, except for sanitary felling.

The following is allowed in the territory of the protected zone of the Yuraktau Mountain natural monument of republican significance:

arrangement of tourist infrastructure facilities, tent camps and campfire sites;

dumping, asphalting and arrangement of the existing roads and footpaths;

arrangement of fire breaks, including around the places where tent camps are located;

dredging and bank cleaning on the oxbow lakes in order to remove the silt fraction and coastal aquatic vegetation for the arrangement of bathing places for visitors;

stocking of oxbow lakes;

cutting of trees that pose a danger to vacationers;

felling of individual trees when expanding the existing roads and footpaths, cutting of shrubs for the arrangement of the roads and footpaths, tourist service facilities and tent camps;

haymaking;

installation of banners, information panels, boards, signs, etc.;

drilling under poles for arranging fences and placing information panels, boards, signs, etc. (if necessary);

drilling of wells for water supply for tourists.

Information about the site

1	Site location	Republic of Bashkortostan, Sterlitamak district, 2.2 km west of the Yuraktau Village
2	Site area	68.0774 ha or 680774 sq. m

Information about the characteristic points of the boundaries of the buffer zone of the Yuraktau Mountain natural monument of republican significance (WGS -84 coordinate system)

ANNEX B5

Government of the Republic of Bashkortostan

450101, Ufa, Republic House

Decree No. 163

11 April 2018

On Amending Decision of the Council of Ministers of the Bashkir ASSR dated 17.08.1965 No. 465 On the Protection of Natural Monuments of the Bashkir ASSR

The Government of the Republic of Bashkortostan DECREES:

To approve the attached amendments to the Decree of the Council of Ministers of the Bashkir ASSR dated 17.08.1965 No. 465 “On the protection of natural monuments of the Bashkir ASSR” (as subsequently amended).

Prime Minister of the Government of the Republic of Bashkortostan R.Kh. Mardanov

Seal /Central Office of the Government of the Republic of Bashkortostan, Central Office of the Government of the Republic of Bashkortostan, Department of registration of legal acts/

Approved by the Decree of the Government of the Republic of Bashkortostan dated 11 April 2018 No. 163

Amendments

to the Decree of the Council of Ministers of the Bashkir ASSR dated 17.08.1965 No. 465 "On the protection of natural monuments of the Bashkir ASSR"

1) In the decree:

a) the title shall be reworded as follows:

"On the protection of natural monuments of the Republic of Bashkortostan";

b) the preamble and paragraph 1 shall be reworded as follows:

"In order to ensure accounting and protection of noteworthy natural plantations and sites of health, scientific, educational, cultural, aesthetic and historical values, in accordance with the Federal Law "On Specially Protected Natural Areas" and the Law of the Republic of Bashkortostan "On Specially Protected Natural Areas in the Republic of Bashkortostan" the Government of the Republic of Bashkortostan DECREES:

1. Approve the attached List of natural monuments of the Republic of Bashkortostan.";

c) delete subparagraph 2 of paragraph 2;

2) The list of natural monuments of the Bashkir ASSR, approved by the said decree, shall be reworded as follows:

1	2	3	4	5	6	7
64	Toratau Mountain	complex (geological, stratigraphic, paleontological, paleogeographic, geomorphological, botanical, historical)	Ishimbai district, the monument is located 2 km southeast of the Shikhan Village	47.7	the boundaries of the natural monument run along the foot of the mountain, taking into account the given geographical coordinates: 53°33'28.88" N, 56°6'2.42" E. (North), 53°33'4.13" N, 56°6'4.2" E (South), 53°33'18.67"N, 56°5'38.56" E (West), 53°33'15.5"N, 56°6'22.35" E (East)	The following is prohibited: mining; grazing; planting or felling; collection of plants, herbarization; collection of insects and other animals; any construction (buildings, roads, power lines, antennas, towers, ski slopes, lifts); exploration (drilling, blasting); hunting; holding mass events (meetings, Sabantuy holidays, competitions); any activity that may lead to a violation of the integrity of the monument or the loss of its aesthetic appearance, as well as the deterioration of the conditions for the growth of vegetation.

ANNEX B6

Government of the Republic of Bashkortostan

450101, Ufa, Republic House

Decree No. 162

11 April 2018

On Amendments to Certain Decisions of the Council of Ministers of the Bashkir Autonomous Soviet Socialist Republic, the Cabinet of Ministers of the Republic of Bashkortostan and the Government of the Republic of Bashkortostan

The Government of the Republic of Bashkortostan DECREES:

To approve the attached amendments to some decisions of the Council of Ministers of the Bashkir ASSR, the Cabinet of Ministers of the Republic of Bashkortostan and the Government of the Republic of Bashkortostan.

Prime Minister of the Government of the Republic of Bashkortostan
R.Kh. Mardanov

Seal /Central Office of the Republic of Bashkortostan, Department of registration of legal acts/

Approved by Decree of the
Government of the Republic of
Bashkortostan dated 11 April 2018
No. 162

AMENDMENTS

to certain decisions of the Council of Ministers of the Bashkir ASSR, the Cabinet of Ministers of the Republic of Bashkortostan and the Government of the Republic of Bashkortostan

1) In resolution of the Council of Ministers of the Bashkir Autonomous Soviet Socialist Republic dated 26 December 1985 No. 212 "On the protection of wild plant species on the territory of the Bashkir ASSR" (as amended by Decree of the Government of the Republic of Bashkortostan dated 21 February 2013 No. 49):

1) In the resolution:

a) The phrase "Bashkir ASSR" shall be reworded as follows "Republic of Bashkortostan";

b) paragraphs 1 and 2 shall be reworded as follows:

"1. To prohibit the collection of ornamental, medicinal, rare plants in the green zone of cities and other settlements in the territory of the Republic of Bashkortostan in accordance with Annex No. 1 hereto;

2. Approve the List of natural monuments of the Republic of Bashkortostan in accordance with Annex No. 2 hereto;

c) paragraphs 3-8 shall be deleted;

d) paragraph 9 shall be considered as point 3 and shall be reworded as follows:

"3. Control over the implementation of this decree shall be entrusted to F.A. Samedov, Deputy Prime Minister of the Government of Bashkortostan";

2) Annex No. 1 to the said resolution shall be excluded;

3) Annex No. 2 to the said resolution shall be Annex No. 1 and shall be reworded as follows: "List of ornamental, medicinal, rare plants, which are prohibited for collection in the green zone of cities and other settlements";

4) Annex No. 3 to the said resolution shall be Annex No. 2 and shall be reworded in accordance with Annex No. 1 hereto.

1	2	3	4	5	6	7
17	Yuraktau Mountain	Complex	Sterlitamak district, the monument is located 1.7 km north of the Mebelny village and 1.3 km west of the Yuraktau village	64.1	the boundaries of the natural monument pass along the foot of the mountain; geographic coordinates: 53°44'42.79" N, 56°6'9.16" E (North), 53°44'26.86" N, 56°6'19.36" E (East), 53°44'13.67" N, 56°5'58.97" E (South), 53'44'26.86"N, 56'5'30.23"E (West), 53'44'28.93" N, 56'5'52.36" E (Peak)	The following is prohibited: mining; grazing; mining of fossils; extraction of peat and moss in a karst swamp; exploration (drilling, blasting); forest planting; collection of plants and herbarization; collection and trapping of insects and other animals; any construction (buildings, roads, power lines, towers, ski slopes and ski lifts); hunting; conducting mass events (meetings, competitions); any economic activity that may lead to a destruction of the natural, monument or loss of its aesthetic appearance

ANNEX B7

GOVERNMENT

OF THE REPUBLIC OF BASHKORTOSTAN

450101, Ufa, Republic House

September 2, 2020 No. 529

On the establishment of the specially protected natural area of republican significance in the Ishimbai and Sterlitamak municipal districts of the Republic of Bashkortostan

In accordance with Article 26 of the Federal Law "On Specially Protected Natural Areas" and Article 26 of the Law of the Republic of Bashkortostan "On Specially Protected Natural Areas in the Republic of Bashkortostan", Resolution of the Cabinet of Ministers of the Republic of Bashkortostan No. 48 "On approval of the regulations on specially protected natural areas in the Republic of Bashkortostan" dated February 26, 1999, in order to preserve rare plant and animal species, unique natural landscapes, the Government of the Republic of Bashkortostan DECREES:

1. To declare the Kushtau mountain in the Ishimbai and Sterlitamak municipal districts of the Republic of Bashkortostan the Kushtau Mountain natural monument of republican significance.

2. To approve the attached borders and the regime of special protection of the territory of the Kushtau Mountain natural monument of republican significance.

3. To recommend to the administrations of the Ishimbai and Sterlitamak municipal districts of the Republic of Bashkortostan, in the territory of which the Kushtau Mountain natural monument of republican significance is located, to develop comprehensive schemes for land management and regional planning, taking into account the regime of the specially protected natural area.

4. B.V. Belyaeva, Deputy Prime Minister of the Government of the Republic of Bashkortostan, Minister of Housing and Communal Services of the Republic of Bashkortostan, shall be responsible for the control over the execution of this resolution.

Head of the Republic of Bashkortostan R.F. Khabirov

Seal /Central Office of the Government of the Republic of Bashkortostan, Department of registration of legal acts/

Approved
by resolution
of the Government
of Republic of Bashkortostan No. 529

dated September 2, 2020

BORDERS AND REGIME

of the special protection of the territory of the Kushtau Mountain natural monument of republican significance

Section 1

1.1. Borders and location of the territory of the Kushtau Mountain natural monument of republican significance

1.1.1. Name of the natural monument: Kushtau Mountain.

1.1.2. Location of the specially protected natural area:

Ishimbai and Sterlitamak municipal districts of the Republic of Bashkortostan, the Kushtau Mountain natural monument of republican significance with the buffer zone are located on the lands of the state forest fund between the Belaya River, the Shikhany village, the Belskoye village and the highway connecting these settlements.

1.1.3. Profile of a specially protected natural area:

a complex natural monument of republican significance.

1.1.4. Site area (+/- amount of error in determining the area), ha:

the area of the monument is 325.30 ha or 3,252,972 sq.m, ± 5.34 ha (with a protected zone of 575.95 ha, or 5,759,456 sq.m).

1.1.5. The organization that protects the area and implements the measures for the protection of the natural monument in accordance with the protection obligation:

administrations of the Ishimbai and Sterlitamak municipal districts of the Republic of Bashkortostan.

1.1.6. Description of the boundaries of the Kushtau Mountain natural monument of republican significance:

Border crossing		Description of the border crossing
from point	to point	
1	2	3
Cluster 1 Characteristic point 1 is located at the turning angle of cadastral allotment 02:28:070101:9, 33 meters to the west - southwest of the pumping station of the ski complex and 5 meters north of the northwest of the earth-road side		

1.2. The regime of special protection of the Kushtau Mountain natural monument of republican significance

1.2.1. The Kushtau Mountain natural monument of republican significance is a cluster site that consists of two land plots (clusters). The ski complex with a water supply system was included into the protected zone of a natural monument.

1.2.2. Protected species and objects:

ancient reef formations of the Permian period, containing the richest localities of fossil reef builders and reef communities of high geological, paleontological, scientific and educational value;

denudation slopes of the spurs and peaks of the Kushtau Shikhan, which have a high recreational and aesthetic value;

rare and endangered plant and animal species listed on the Red Books of the Republic of Bashkortostan, the Russian Federation and the International Union for Conservation of Nature.

1.2.3. Any activity that entails a violation of the preservation of the natural monument is prohibited in the territory of the natural monument, including:

geological study of the subsoil, including exploration and evaluation of mineral deposits;

exploration and production of minerals;

drilling, blasting and mining operations;

construction of capital facilities, linear facilities;

laying of roads, pipelines, installation of antennas, towers, lifts;

construction of non-permanent buildings and structures, with the exception of the arrangement and maintenance of the existing roads and footpaths, the equipment of observation platforms, safe stairs and rest areas, warning and information signs (banners) on tourist routes;

damage to geological outcrops, collection of paleontological items, herbarization of plants and trapping of animals, with the exception of collections for scientific and educational purposes;

driving and parking of motor and electric vehicles;

provision of land plots for quarrying, placement of industrial and other production facilities and complexes, organization of horticulture, housing, dacha, garage construction projects;

any felling of forest plantations, with the exception of the implementation of measures for protection and reproduction of forests and their patrolling as part of the federal state forest and fire supervision programme. Measures for protection and reproduction of forests are carried out in accordance with law;

hunting;

harvesting and collection of non-timber resources (except deadwood), collection of medicinal and food plants;

placement of cattle burial grounds, cemeteries, places of burial and storage of production and consumption waste, radioactive, chemical, explosive, toxic and poisonous substances;

use of toxic chemicals, radioactive substances;

pollution of the area with solid municipal, construction, industrial and other waste and garbage;

farming, haymaking and grazing;

holding public events;

burning brushwood, forest floor, dry grass and other combustibles;

hydro-reclamation;

setting up of bivouacs, tents, making fires;

damage or destruction of warning and information signs (banners).

1.2.4. The following is allowed in the territory of the natural monument:

carrying out scientific geological and environmental studies, as well as scientific and educational activities, including the collection of paleontological, mineralogical, zoological, botanical collections;

recreational and educational activities.

1.2.5. Information about the site

Item No.	Characteristics of the site	Description of characteristics 1
1	Site location	Republic of Bashkortostan, Ishimbai and Sterlitamak districts
2	Site area +/- amount of error in determining the area (P +/- Delta P)	325.30 ha, or 3252972 sq.m, ± 5.34 ha
3	Other characteristics of the site	The boundaries of the specially protected natural area are established in subsection 1.1 of this section. The regime of protection of the specially protected natural area is established in subsection 1.2 of this section

ANNEX B8

HEAD OF THE REPUBLIC OF BASHKORTOSTAN

DECREE

On the Toratau Geopark

Taking into consideration the World Heritage Convention (Convention Concerning the Protection of the World Cultural and Natural Heritage), in order to preserve the geological, biological, historical and cultural heritage of the Republic of Bashkortostan, as well as to develop tourism, I hereby decree:

1. To instruct the Government of the Republic of Bashkortostan:

to create the Toratau Geopark in the territory of the Ishimbai and Sterlitamak districts of the Republic of Bashkortostan with the natural monuments of republican significance, the Toratau Mountain, the Yuraktau Mountain and other objects of geological, biological, historical and cultural value, in its composition;

to develop, in cooperation with the Academy of Sciences of the Republic of Bashkortostan, the Ufa Federal Research Center of the Russian Academy of Sciences, and approve an action plan for the inclusion of the Toratau Geopark into the UNESCO World Heritage List;

to issue a resolution on renaming of the Congress Hall State Budgetary Institution of the Republic of Bashkortostan into the Toratau Congress Hall Budgetary Institution of the Republic of Bashkortostan;

to determine the volume and sources of financing the costs associated with the implementation of this Decree.

2. I shall personally supervise the implementation of the Decree.

3. The Decree comes into force from the date of its signing.

Acting Head of the Republic of Bashkortostan R. Khabirov
Ufa, House of Republic
December 12, 2018

Seal /Administration of the Republic of Bashkortostan, Department of legal acts and control/

№ UG-308

ANNEX B9

ACTION PLAN FROM THE MANAGEMENT PLAN OF THE TORATAU GEOPARK FOR 2024 - 2028

1. Development priorities

The Bashkir Shikhans clearly demonstrate that the geological heritage is the basis of all ecosystems. Comfortable conditions will be consistently created on the basis of the nominated property, taking into account its complex value, in order to develop **links between the geological and other aspects of the natural and cultural heritage of the region.**

The Bashkir Shikhans project will be particularly focused on **the formation of an environmentally conscious human behavior, environmental learning projects and enlightenment** (designed primarily for the younger generations), **popularization of science.**

It is assumed that the further history of the development of the nominated property will be a good example of the implementation of a sustainable development project with the broad and creative **participation of the local population, aimed at reviving the historical and cultural identity of the region.**

Mid-term plan for the development of the territory of the nominated property for 2024-2028 involves focusing efforts on five strategic areas.

	Priority areas
1	Preservation of natural, historical and cultural complexes
2	Environmental education and training
3	Conducting scientific research and popularization of science
4	Promotion of heritage and development of partnership
5	Involvement of local residents in the development of the territory

2. Strategic projects

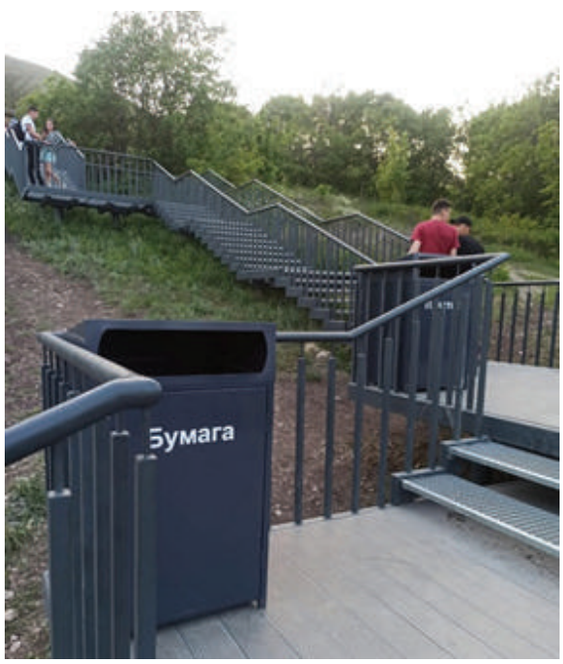
The mid-term management plan provides for the implementation of a number of strategic projects that are aimed at solving complex problems of the territory and forming a meaningful context for its development.

2.1. The Miras Project

Project objective:

Protection of natural heritage and biodiversity through the creation of conditions for safe civil tourism and the introduction of mechanisms for tourist flow management.

Description:



Unregulated recreation creates a negative impact on the Bashkir Shikhans natural complex.

Today, a number of mechanisms for tourist flow management have already been introduced, for example, registration of tourists, partnerships with tour operators, alternative routes for visits, and eco-paths.

Further efforts to protect the nominated property are about conditions for regulated educational tourism, nature-saving infrastructure, the number and behavior of tourists on the paths, tourism education, visual navigation and creation of tourists' awareness.

Schedule:

N	Main activities	Schedule				
		24	25	26	27	28
1	Arrangement of eco-paths (stairs) to the top of the Yuraktau Mountain	•	•	•		
2	Completion of the 2nd stage of the eco-paths (stairs) to the top of the Toratau Mountain	•				
3	Improvement of the foothills of Yuraktau and Kushtau, arrangement of public toilets	•	•			
4	Retrofitting routes with navigation and information elements	•	•			
5	Organization of a visitor center and parking near the Kushtau Mountain	•				
6	Construction of a capital visitor center near the Toratau Mountain	•	•	•		
7	Development of the Excursion Rules and Tourist Guides	•				
8	Marking security zones and equipping them with information boards	•	•			

2.2. The Treasures of the Ural Ocean Project

Project objective:

Development of science for popularization of knowledge about the Earth, promotion of scientific and educational projects and popular science tourism.

Description:

The Bashkir Shikhans are a natural museum that reveals global events of the past, a natural laboratory available for study by both specialists and all nature enthusiasts. The project is focused on scientific research available for everyone, including children and youth.

The project will also provide the opportunities for additional examination and description of scientifically significant objects and phenomena, organization of scientific and educational events at the national and international levels with the involvement of a wide range of scientists and media coverage.

The project will involve the activities aimed at the creation of a museum space, development of special programs for students and schoolchildren in partnership with the Faculty of Earth Sciences and Tourism of the Ufa University of Science and Technology, arrangement of a branded popular science tour.

Schedule:

N	Main activities	Schedule				
		24	25	26	27	28
1	Organization of the Stone Museum	•	•	•		
2	Organization of the Treasures of the Ural Ocean science tour			•	•	•
3	Development of the Field Practice Program for students	•	•			
4	Development and implementation of research projects for children and youth		•	•	•	•

2.3. The Children's Environmental Accelerator Project

Project objective:

Development of children's environmental movement under the auspices of UNESCO to educate the future generation with new environmental thinking.

Description:

The Shikhans have already shaped new environmental thinking in children, adolescents, and youth. The next step is the launch of the children's environmental movement and assistance in the implementation of environmental projects.

UNESCO associated schools will be actively involved in the project. University students, young scientists, enthusiasts of environmental movements will be able to act as mentors for children who initiate projects. The implementation of children's environmental initiatives will become possible through grant support for socially responsible companies and foundations.

It is assumed that the project office will be located in the building of the village club in the Urman- Bishkadak village, where local teachers have been successfully working on environmental education for a long time.

Schedule:

N	Main activities	Schedule				
		24	25	26	27	28
1	Development of the Children's Environmental Portal on the geopark website	•				
2	Creation of the Children's Environmental Accelerator in the Urman-Bishkadak Village	•	•	•		
3	Organization of the Fund for Support of Children's Environmental Initiatives		•	•		
4	Involvement of partners for comprehensive support of children's initiatives		•	•		
5	Development and implementation of a mentoring system for project implementation		•	•	•	
6	Organization and holding of the Children's Environmental Congress				•	
7	Development of partnerships with environmental accelerators in Russia		•	•	•	
8	Development of international partnership in the field of Children's Environmental Initiatives				•	•

2.4. The Stone of Clans Project

Project objectives:

• Reproduction of the cultural codes of the territory, preservation of the links between generations and counteraction to cultural depersonalization;
• Support for centers of preservation and reproduction of local traditions, customs, cultural phenomena, traditional folk crafts;
• Involvement of local communities in the management of the territory.

Description:

Above all, the Shikhans have been revered by local residents for centuries as sacred places and symbols of national unity. They demonstrate the mental connection of the local population with the surrounding nature, preserved from ancient times.

Constant discussions in the media by scientists of the value of the Shikhans, speeches by ethnographers, historians and other experts have formed a stable understanding of the necessity for careful attitude to these objects, local history and culture in society.

The management plan for the Bashkir Shikhans assumes their development as a significant historical and cultural educational platform designed to preserve and popularize the rich intangible heritage of the Bashkir people. The involvement of local communities and individual enthusiasts is seen as the driving force behind the project.

Schedule:

N	Main activities	Schedule				
		24	25	26	27	28
1	Construction of the Stone of the Bashkir Clans memorial complex	•				
2	Improvement of the territory and creation of an ethnocomplex near the Toratau Mountain	•	•			
3	Improvement of the Shikhan village	•	•	•		
4	Formation of a local initiatives pool for heritage conservation	•	•			
5	Development of support measures and assistance for implementation of local initiatives		•	•	•	•

3. Aggregate operation plan

N	Priority/Key Activities	Years					Owner
		24	25	26	27	28	
1	**Preservation of natural, historical and cultural complexes**						
1.1	Completion of arrangement of nature-saving infrastructure	·	·	·			ANO
1.2	Completion of improvement of the foothills of the Shikhans	·	·				ANO
1.3	Retrofitting of the navigation and tourist information system	·	·				ANO
1.4	Implementation of comprehensive monitoring, including:						
	• flora and fauna monitoring and stock-taking	·	·	·	·	·	UFRC RAS
	• ongoing monitoring of the shikhan karst processes	·	·	·	·	·	UFRC RAS
	• assessment of the state of the natural complex, risks and threats			·	·		UUST
	• geological heritage objects stock-taking	·	·	·	·	·	UUST
	• current monitoring of the state of natural complexes	·	·	·	·	·	MNRE RB
2	**Environmental education and training**						
2.1	Coordination of the plan of interaction with UNESCO schools	·					Committee, MNRE RB
2.2	Development of an eco-educational program for schoolchildren	·	·	·			
2.3	Preparation of content and printing of educational materials	·	·	·	·	·	ANO
2.4	Conducting excursions and lectures for schoolchildren	·	·	·	·	·	ANO
2.5	Carrying out family intellectual games	·	·	·	·	·	ANO
2.6	Organization together with partners of summer eco-camps	·	·	·	·	·	ANO
2.7	Development of special tours with educational content		·	·			ANO
3	**Conducting scientific research and popularization of science**						
3.1	Creation of a resource base for scientific research	·	·				UFRC RAS
3.2	Approval of the Unified Plan for Scientific Research on Shikhans	·	·				UFRC RAS
3.3	Introduction of a branded popular science tour			·	·	·	ANO, UUST
3.4	Implementation of the climate change study program	·	·				UUST
3.5	Coverage of research activities in the media	·	·	·	·	·	ANO
3.6	Compiling a schedule of science communication events	·					ANO
3.7	Development of partnership in the field of scientific activity	·	·	·	·	·	ANO
4	**Promotion of heritage and development of partnership**						
4.1	Development of a promotion strategy for the nominated property	·					ANO
4.2	Current promotion of the property in accordance with the media plan	·	·	·	·	·	ANO
4.3	Updating the event schedule and holding events	·	·	·	·	·	ANO
4.4	Presentation of the property at different levels	·	·	·	·	·	ANO
4.5	Implementation of co-branding projects with local companies	·	·				ANO
4.6	Implementation of joint projects with UNESCO territories in the Republic of Bashkortostan		·	·	·		ANO
4.7	Initiation of projects for international cooperation				·	·	ANO
4.8	Expansion of the network of partners at the national and local levels	·	·	·	·	·	ANO
4.9	Participation in grant competitions	·	·	·	·	·	ANO
5	**Involvement of local residents in the development of the territory**						
5.1	Development of mechanisms for the participation of local communities in management	·	·	·			ANO
5.2	Regular meetings with residents on current development issues	·	·	·	·	·	ANO, LSG
5.3	Creating a profile with local initiatives, supporting projects	·	·	·	·	·	ANO, LSG

5.4	Current professional development and certification of geoguides	·		·		·	ANO
5.5	Development of the volunteer institution	·	·	·	·	·	ANO, LSG
5.6	Improvement of the infrastructure of nearby settlements	·	·	·	·	·	LSG

Conventions and abbreviations:

ANO – Geopark Toratau Center of Science, Education, Ecology, Culture and Tourism, Autonomous Non-profit Organization

Committee - Committee of the Republic of Bashkortostan for UNESCO

MNRE RB - Ministry of Nature Management and Ecology of the Republic of Bashkortostan

ME RB - Ministry of Education of the Republic of Bashkortostan

LSG - local self-government bodies

UFRC RAS - Ufa Federal Research Center of the Russian Academy of Sciences

UUST - Ufa University of Science and Technology

ANNEX B10_1

Summary

of the results of public hearings on the inclusion of the natural and geological site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau, in the UNESCO World Heritage List

Shishki eco-complex, Shikhan village (Ishimbai district, Republic of Bashkortostan) 26 April 2023

Attendees: 56 persons

Having listened to the information about the inclusion of the site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau, in the UNESCO World Heritage List, *Having learned* about the main advantages and features of the inclusion of the site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau, in the UNESCO World Heritage List,

After getting acquainted with the procedure for including the site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau, in the UNESCO World Heritage List

Having listened to the opinions of local residents,

Decided:

Give their free, prior and informed consent on the rights of the local population to the inclusion of the site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau, in the UNESCO World Heritage List;

To provide assistance for the inclusion of the site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau, in the UNESCO World Heritage List.

Accept for consideration the proposals of local residents on the conservation of the site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau.

List of attendees on 5 sheets is attached hereto

Rafikov Mikhail Borisovich /signature/ 26.04.2023

Minnibayeva Aigul Khalitovna /signature/ 26.04.2023

Mukhamedzhanova Ruzina Radzhabovna /signature/ 26.04.2023

ANNEX B10_2

LIST

of participants in public hearings on the inclusion of the natural and geological site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau, in the UNESCO World Heritage List

Shishki eco-complex, Shikhan Village (Ishimbai district, Republic of Bashkortostan) 26 April 2023 , 14.00

No.	Surname, name, patronymic
1.	Minnibayeva Aigul Khalitovna
2.	Khamitova Nelya Fanirovna
3.	Petrov Dmitry Evgenievich
4.	Urazaev Alexey Maratovich
5.	Khafizova Elvira Rashitovna
6.	Andreeva Nella Fedorovna
7.	Khamitova Nelya Fanirovna
8.	Kharisov Ravil Anvarovich
9.	Evstafieva Olga Arsentievna
10.	Safina Gulnara Zinatullovna
11.	Shaimardanov Emil Rauilevich
12.	Nikolaeva Tatyana Petrovna
13.	Khakimov Marsel Ravilievich
14.	Sergeeva Renina Anatolievna
15.	Nikolaev Mikhail Gavrilovich
16.	Yakupov Saifulla Shagidullovich
17.	Iontsev Nikolay Alekseevich
18.	Kovaleva Alfiya Zakharovna
19.	Rayanova Fania Borisovna
20.	Sagidullin Robert Sayakhovich
21.	Sagidullina Fvuziya Salakhetdinovna
22.	Mukhamedzhanova Ruzina Radzhabovna
23.	Iskandarova Zukhra Minnibaevna
24.	Zakharova Ilvira Garifovna
25.	Musavarov Rais Shakirovich
26.	Kuzmenko Fedor Fedorovich
27.	Kuzmenko Tamara Antonovna
28.	Abdrakhmanov Rafail Uzbekovich
29.	Tagirov Ildar Munirovich
30.	Aminev Ruslan Fanirovich
31.	Uzbekov Vener Airatovich
32.	Kutushev Ainur Minigaleevich

33.	Khabibullina Tamara Nikolaevna
34.	Galim Ramilya Khamityanovna
35.	Abdrakhimov Ruslan
36.	Rafikov Mikhail Borisovich
37.	Ponomarenko Gulnara Talgatovna
38.	Latypov Airat
39.	Bavarskaya Alsu Salimovna
40.	Yakovleva Tatyana

List of experts, participating in public hearings on the inclusion of the natural and geological site, the Bashkir Shikhans of Toratau, Yuraktau and Kushtau, in the UNESCO World Heritage List

Shishki eco-complex, Shikhan Village (Ishimbai district, Republic of Bashkortostan) 26 April 2023 , 14.00

No.	Surname, name, patronymic	Job title
41.	Galimova Eleonora Ildarovna	Deputy Head of the Administration for Economics, Investments and Entrepreneurship – Business sheriff of the Sterlitamak municipal district of the Republic Bashkortostan
42.	ABDULLIN Ramil Miniakhmetovich	First Deputy Head of Administration of the Ishimbai municipal district of the Republic of Bashkortostan for industry and agriculture
43.	IDELBAYEV Artur Mirasovich	General Director of the Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism, Autonomous Non-profit Organization
44.	BUTORIN Alexey Andreevich	Director of the Natural Heritage Protection Foundation, researcher at the Institute of Geography of the Russian Academy of Sciences
45.	MARTYNENKO Vasily Borisovich	Head of the Federal State Budgetary Scientific Institution, Ufa Federal Research Center of the Russian Academy of Sciences
46.	GATAULLINA Elina Vinerovna	Executive Director of the Committee of the Republic of Bashkortostan for UNESCO
47.	BELAN Larisa Nikolaevna	Professor of the Department of Geology, Hydrometeorology and Geoecology, Ufa University of Science and Technology
48.	LUKMANOVA Renata Razifovna	Director of the ESG models of growth of new eco-territories Center, Federal State Budget Educational Institution of Higher Education, Ufa University of Science and Technology
49.	FROLOVA Irina Vasilievna	Deputy Director of the Institute of History and Public Administration of the Federal State Budget Educational Institution of Higher Education, Ufa University of Science and Technology
50.	BOGDAN Ekaterina Alexandrovna	Associate Professor of the Department of Geology, Hydrometeorology and Geoecology of the Ufa University of Science and Technology, Specialist of the New Environment for Life Non-state Educational Establishment

51.	DEMICHEVA Anastasia Sergeevna	Leading Specialist of the Scientific and Organizational Department of the Institute of History and Public Administration, Ufa University of Science and Technology
52.	YAYKAROVA Aliya Azatovna	Specialist of Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism, Autonomous Non-profit Organization
53.	BAINAZAROV Fail Rafailovich	Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism, Autonomous Non-profit Organization
54.	ADAGAMOVA Elena Anatolyevna	Toratau Geopark Center for Science, Education, Ecology, Culture and Tourism, Autonomous Non-profit Organization
55.	RAZYAPOV Shamil Ildarovich	Committee of the Republic of Bashkortostan for UNESCO
56.	SUBOCH Daria Andreevna	Committee of the Republic of Bashkortostan for UNESCO