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Zamin National Park of Uzbekistan

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Zamin National Park was created in 1978. The first national park in Central Asia, an area of more than 50,000 hectares located on the northern slope of the western part of the Turkestan range in the basin of the Zaminsu - Zamin Mountains, together with its natural environment, is very different from other areas within the mountain Pamir - Alai system, and it has quite clear limits. Its nature, challenges and problems will be discussed in this article.

The main objective of the organization was a park - preservation of typical, unique and relatively out of change natural complexes (landscapes) of the northern slope of the Turkestan range, but above all, the most complete and varied juniper forests presented in this part. It is the only protected area by an array of juniper in the Pamir - Alai.

Zamin National Park is located at altitudes above 1,000 m a.s.l. to 4,300 m a.s.l., and it covers all the high-altitude landscapes that are typical for the northern slopes of the Pamir - Alai mountain system from lowlands to highlands.

Geologically speaking, the Zamin Mountains are the most raised anticlinal structure of the second order. Their structure involves deposition from the Cambrian to Paleogen with the presence of limestone, shale, slate, sandstone and conglomerates of other kinds.

The northern Pamir - Alai mountain ranges belong to the zone of the Hercynian, whose set of tectonic processes manifested in the second half of the Paleozoic era, and the modern terrain formed as a result of the latest Neogen - quaternary uplift.

In the formation of the basic role played by climate, air masses of temperate latitudes prevail. In winter, they are associated with the intensive development of cyclonic activities, instability of weather, rainfall, temperature reduction. In the summer time, the air of temperate latitudes on very hot expanses of plains, and lowlands warming lead to erosion of the fronts and the weakening of cyclonic activities. As a result, the weather is relatively stable and dry.

The latitudinal extent of the Turkestan range does not create a barrier to the western and north - western air currents and forms an unprotected territory for the invasion of cold air masses from the north. Orientation slopes with respect to the cardinal points and the prevailing currents of air masses provide the climate with a number of features. It is continental, especially sharply manifested in the plain, preserved on the northern slopes of the Turkestan Range.

One of the specific features of the climate area is the mountain - valley (more precisely, the mountain - piedmont) air circulation. Mountain - valley winds help to transfer heat and moisture vertically. In the afternoon hours, in the spring and early summer, they endure the humid air of the foothills to the higher tiers of the mountains. Reaching the level of condensation, these air masses give rise to cumulus clouds and precipitation. In the evening and at night, mountain winds blowing in the piedmont plain quickly dissipate the clouds. This starts the reverse process, transfer of water vapor and aerosols. The high transparency of atmosphere is held until the late morning. The effect of descending air currents takes place on the plains at a distance of 25 miles from the base of the Turkestan range.

In the winter time, when there is the invasion of cold arctic air, strong temperature inversions are observed - lowering the temperature in the lower atmosphere. Such an inversion, depending on terrain layers, may cover up mountains at altitudes 1,000 - 1,500 m a.s.l., over the temperature distribution of a normal height.

The average January temperature in lowlands is -2.9˚ C, in midlands -5.4˚ C, in highlands -9˚ C; in July, the average temperature in these mountain layers is 23.3˚ C, 16.2˚ C and 11˚ C respectively. With the increasing altitude the difference between the average monthly temperature of the hottest and coldest months decreases. So, at the high - altitude weather station Sanzar (1,313 m a.s.l.) the annual amplitude equals 26.2˚ C, at the high - altitude weather station Kulsai (2,100 m a.s.l.) it is 21.6˚ C, and at the altitude of the Shahristan Pass (3,143 m a.s.l.) 20˚ C. The absolute minimum air temperature reaches -31˚ C in the lowlands and -34˚ C in the highlands, the absolute maximum is 41˚ C and to 25˚ C respectively. The frost - free period in the lower tier of the mountains is about 170 days, in the midlands about 135 days, and in the highlands less than 100 days (the Shakhristan Pass). The distribution of precipitation is caused by a difficult terrain area, east - west direction of the main ridge (Turkestan), the presence of numerous meridional oriented spurs, their varying steepness and exposure. The total annual rainfall in the lowlands does not exceed 400 mm,

in the midlands it is from 400 to 500 mm, and in the mountains it is about 700 mm.

All the rivers and streams of the park belong to the pool of Zaminsu - Kulsu, Kyzylmazar, Kashkasu, Ettikechu, Sharaldak, Urukli, Almaly, and Ismany. They originate in the mountains of the northern slopes of the Turkestan Range, mainly filled by melting snow, rainfall and groundwater. Floods on the rivers are in May - June, while their costs are 10 - 15 times higher than the average value.

Soils are formed on the weathering products of Paleozoic rocks: shale, sandstone, limestone. Their distribution is subject to the laws change with the altitude of soil factors: topography, exposure and steepness of slopes, moisture, nature of the underlying rocks, vegetation. The greatest accumulation of fine earth appears on the shaded northern slopes at the crest of the mountains. It is the area where snow lingers longer due to the fact that increased moisture creates a dense cover of meadow grasses. On the southern slopes of the unprotected surface stony slopes of the southern exposure, abundant rock and talus are dominant.

On the other hand, the belt of low mountains is dominated by dark gray soils, formed under dry steppes on loess - like loams. The midlands are formed by brown soils with an excellent differentiation of soil horizons with a thick humus layer. 2,500 meters under the mountain xerophytes and sparse juniper formed a thin and light brown gravelly soil, pieces of rock outcrops broken off.

According to Demurin (1975), the flora of the western part of the Turkestan range has 1,139 species of higher plants, belonging to 67 families. The area is characterized by the high species endemism of flora: number of the Central Asian endemic reaches 497, i.e. 43% of all kinds; 51 species of plants grow only in the western part of the Turkestan range.

In the belt of low mountains, the developed herbage dry steppes are widespread in the southern regions of Central Asia. Dry steppe lowlands of the Turkestan range are characterized by the predominance of wheatgrass and wheatgrass - ephemeral vegetation formations. Wheatgrass steppes are confined to gentle slopes with fine earth deposits. The basis of the vegetation is wheatgrass piliferous (*Elytrigia trichophora*), which grows under the canopy of ephemera and ephemeroidy.

With the height rainfalls increase, so the belt midlands heights at altitudes above 1,900 m a.s.l. to 2,500 m a.s.l. and sometimes up to 3,000 m a.s.l. on the wide plateau-like watersheds lateral spurs developed fescue (*Festuca sulcata*) steppes. The vegetation cover of fescue steppes differs in monotony; fescue dominates, forming a dense turf with a diameter of 10 - 15 cm and height of 25 cm. At the upper limit of its distribution fescue steppes turn into the community of upland xerophytes.

About 84% of the park area is covered by juniper and juniper forests (Fig. 1). The lower limit of their distribution lies at an altitude of 1,800 m a.s.l., the upper one of 3,000-3,200 m a.s.l.. There are three types of fir - trees: Zarafshan (*Juniperus seravschanica*), hemispherical (*Juniperus semigiobasa*) and Turkestan (*Juniperus turcestanica*). According to the expert on Central Asian flora, M.G. Popov (1960), fir - trees here (especially Turkestan) are the highest and most dense in the whole part of Central Asia.

In the mountain valleys and small canyons there are walnut, apricot, apple and other trees. Different types of juniper develop at a certain height. The most xerophytic juniper, Zeravshan (Kyzyl - fir - tree), grows on the southern slopes of lower altitude levels within 1,800 - 2,300 m a.s.l.. Individual trees may occur while ranging from 1,500 m a.s.l..

The forests of hemispherical juniper (Saur - fir - tree) occur mainly at an altitude of 2,300 - 2,600 m a.s.l. on the slopes of the eastern and north-eastern exposure. These forests are already significantly higher (up to 18 - 20 m), trees have broad crowns, growing stock has a high crown density (more than 0.5).

Fig. 1. Juniper forests in the upper reaches of the Zaminsu River.

The formation of Turkestan juniper (apricot - juniper) occupies the upper altitude zone in the interval of 2,600 - 3,000 m a.s.l. Turkestan juniper has an interesting feature - its lower branches are able to take root, and after the death of the main stem they form a kind of nest of 5 - 8 young trees. The stand is quite thick with the undergrowth of Tien - Shan mountain ash. Above 3,000 m a.s.l., juniper elfin acquires its form.

The upland - xerophytic vegetation occupies the driest habitats of the watershed - part of the Turkestan Range. The basic form of life here represents the prickly cushion, which creates conditions for the plants to survive in a dry and cold climate of high mountains. Thanks to the reduced evaporating surface of the whole plant, evaporation takes place only with the surface of the pad. Considerably less water is evaporated inside the branches, isolated from dry air, and located close to one another. This feature - a reduction of the evaporating surface - also applies to individual organs of plants. Thus, the leaves lose record and change into a thorn. Inside the cushion, there is a relatively constant temperature, which means that there is no sudden temperature fluctuations characteristic of the environment. According to scientific observations, at the daily amplitude of air temperature 28° C inside the cushion, it is in the range of 3 - 5° C, while the sainfoin remains constant around the clock. These cushion plants are home to various insects and small animals. The upland xerophytes (tragatnic) are represented by the following formations: akantholimon (*Akantelimon alatavicum*), onobrychis (*Onobruchis echidna*), cousinia franchetic (*Cousinia franchetic C. splendida*). The diameter of the blue - green cushions sainfoin is of 1 m and height of 30 - 40 cm (Fig. 2).

Of the 27 species of mammals and 90 species of birds that are found on the northern slopes of the Turkestan range, the national park in Uzbekistan is a home for 18 and 70 species respectively.

Most of the animals are also found in the low mountains and on the plains outside the park and in other zones of the Zamin Mountains. Perhaps only porcupines, Turkestan rats and some reptiles (mountain agama Turkestan gecko, copperhead snake, colored runner) and birds (greenfinch, mountain porridge, quail, and skylark) can be considered more or less typical for the low - mountain belt.

Fig. 2. The surface of the cushions of acantholimnos.

The fauna of midlands with their varied terrain and landscapes is richer than other zones, especially in case of many mammals here (wild boar, the Tien - Shan brown or white - clawed bear, fox, polecat, wolf, *Ferghana ermine*, hare - tolai, Turkestan lynx and others), and birds (juniper grosbeak, Turkestan wood pigeon, lesser kestrel, tit crested, rock ptarmigan, starlings, black stork). Of reptiles, there are glass - lizard, viper, and copperhead. The streams and rivers are inhabited by fish Marinka.

The fauna of the harsh rocky landscape subalpine zone is not so rich and diverse. With respect to mammals, it is a home for snow leopards, Siberian goats, wild sheep Tajik, white - clawed bears, wolves (in the summer), and as far as birds vare concerned, there are golden eagles, Himalayan snow cocks, partridge rocks, stone sparrows, and the rock nuthatch.

Meanwhile, a considerable number of species of plants and animals in the national park are listed in the IUCN's red book lists and Uzbekistan. Among these species there are: the Tien - Shan brown or white - clawed bear (*Ursus arctos isabellinus*), Turkestan lynx (*Felix lyus isabelina*), ligation (*Vormela peregusna*), snow leopard or ounce (*Uncia uncia*), black stork (*Ciconia nigra*), golden eagle (*Aquila chrysaetos*), bearded vulture (*Gypaetos barbatus*), qom or snow vulture, (*Gyps himalayensis*), Himalayan mountain turkey (*Tetraogallus himalayensis*), and 28 species of plants.

So, the Zamin territory of the national park is a region of unique landscapes, floral, faunal, and geo - morphological identity. To develop a comprehensive environment system that would enable to measure all this wealth is one of the main tasks of the national park. Another important and closely related task is to save the juniper forests. This objective was set in the organization of the park, so it has become the core area of Zamin national park.

Juniper forests represent the basis of mountain forests in Central Asia. One or two thousand years ago they almost entirely covered the central part of the southern Tien Shan and the north of the Pamir - Alai. For centuries the peoples of Central Asia have used fir - trees as valuable building and ornamental materials, used them for producing medicine, but most of all they were used as fuel - wood. As a result, the once solid juniper belt midlands remained by the beginning of this century, in what is now considered as Central Asian republics and Kazakhstan, a little more than 1.5 million hectares of juniper forests. The reduction of juniper continued, only from 1949 to 1974 it was cut down to the area of 711 thousand hectares. Currently juniper forests occupy 574,100 ha, or 52% of the area of mountain forests of Central Asia. The above mentioned was going hand in hand with the expansion of pastures, which were appearing within juniper arrays.

Unfortunately, the degradation of juniper forests has not ceased to this day, and the effects of deforestation of mountain slopes appear more noticeable. After taking root almost everywhere, juniper roots firmly fasten the thin layer of soil, even on

very steep slopes. Chain effects caused by the reduction of junipers are simple: on the bare slopes of enhanced flatness there is erosion of the surface layer. As the erosion is accelerating and spreading, more avalanches and mudflows appear, and in the end, there are major landslides and huge landslides.

So, the above mentioned problem described in detail here, concerning juniper forests, typical for the mountain regions of Central Asia, relates to Zamin National Park. The only prospect to solve the problem of juniper forests is to develop and implement effective measures to preserve the existing juniper fund and to restore artificially the juniper forests. Both of these are connected with great difficulties.

The difficulties are primarily due to the need to have distant pastures. The continuation to expand their area within mountain juniper arrays causes the mindless destruction of this valuable species in many respects, and this contributes to extremely adverse environmental impacts.

The suspension of the development of this trend is possible, if we enter a pasture turnover (just as the crop rotation is used to restore soil fertility) and determine its capacity to establish and strictly observe the grazing rate. It would seem that taking care of the pastures is not related to the national park. In fact, far from it; the territory, which became the national park in 1978, was always grazed by sheep and goats and it has continued even after 1978. It was only limited to 12 thousand by their number. To restore juniper forests requires special research in the area of juniper biology and ecology to improve existing methods of artificial reproduction and cultivation in different ecological conditions. These two directions in the juniper study are found in the main scientific and experimental activities of Zamin National Park. The work on the studies and restoration of tree species, mainly the juniper species, was launched in 1928 by the employees of the Central Asian Research Institute of Forestry. For this the Kulsay stronghold was organized, which still exists today (its territory is part of the holdings of the national park). It is a reference point where it is possible to grow juniper seedlings, which are then planted on terraced slopes. Such artificial plantations on non - forested slopes are already represented in Kulsay by 200 hectares.

Fir - trees in the woods - these are, as a rule, trees that are 5 - 10 m tall, but there are also 25 - meter instances. In the upper zone of the mountains, they get the elfin form, creating a huge flattened cushion half a meter high. Juniper represents a long - living tree: in some places one can find trees, whose age is about 2 thousand years old. Middle - aged juniper forests (100 - 200 years old trees) occupy the largest area in the national park. The area under the young juniper trees is about 10% of all juniper forests.

In many national parks of the world, there is hiking, skiing developed and this requires sports facilities, housing, communications, and although the construction of residential buildings, communication facilities, roads, railways and other structures that violate the integrity of parks are prohibited in national parks, for all that has to do with tourism, this is an exception. With respect to Zamin national park, tourism is just beginning. It is necessary to develop routes of varying difficulty, to device selected sites and huts. The organization of other kinds of recreational activities, i.e. short excursions is also one of the aspects of the activities in the national park. So that visitors can see the sights and the park of nature it is necessary to mark educational and informative trails, to build viewing platforms and popularize ecological knowledge by the means of the creation of a museum of nature and local history exhibits, and to train qualified guides. In this respect, the park has already been done.

But while speaking about tourism and excursions, important aspects of national parks, the multi - sport organization, which is considered to be a specific direction in Zamin National Park, can be hardly seen as compatible with the status of national parks. The development of the sports planned for the national park and its main arena consider Plateau Sup, one of the most beautiful places, a true monument of nature (see Fig. 3). This will require massive constructions, which can not be combined with the task of national parks - to keep the natural landscape intact. It is hard to imagine also the construction of rest houses, pioneer camps and their operations in the existing natural park, as well as agricultural land on its territory, and the highway that connects the two district centers of the Jizzakh region and passes through the park along the rivers Zaminsu, Urikli and Sharillak, and then passes into the central part and crosses several tracts, including the tract of Sup.

This is apparently due to the fact that on the territory, which was reserved for the possession of the national park, there are several settlements where agricultural land does not quite match the standard rules of the park zoning, although, of course, planning takes into account the need to balance the requirements of nature protection with recreational loads.

As it is usual in national parks, in Zamin National Park three zones are marked: reserved, buffer and peripheral. The conservation area, an area of about 22 thousand hectares, is attributed to the former Zamin mountain forest reserve and Kulsay reference point. In this area any economic activity is prohibited, tourism, excursions, research and development work is carried out only with the permission of the Ministry of Forestry of the Republic and the Park Directorate. In the buffer zone, or limited use zone, an area of approximately 32.7 thousand hectares includes former centuries pastures and agricultural areas. However, the land use as well as tourist visits are strictly regulated here. In the economic area, an area of about 1.9 thousand hectares, there are several settlements and surrounding farmland.

Although the zones correspond to the normal gradation of national parks, their location is different from the usual because through the entire central part of Zamin Park and adjacent areas of the buffer zone passes a pretty busy highway. It interspersed with three small portion of the economic zone and the buffer zone is located on the periphery of the park. In connection with this the full protection of landscapes and animals is difficult not only in auxiliary areas, but also in the nature reserve. In fact, still, poaching cannot be stopped: juniper forests are harvested by poachers and their bullets kill wild boars, Siberian goats, Himalayan snow

Fig. 3. General view on Plateau Sup.

cocks and other animals. In addition, the fauna and flora get poorer not only due to direct destruction. It has long been known that where herds of goats and flocks of sheep are, the herbaceous vegetation disappears and forests are dying. Although the employees of the National Park try to exert much effort to shield it from the 12,000 grazing goats and sheep there - this seems to be the disaster of mountain areas. Zamin National Park is in many ways one of the most interesting mountain areas of the Asian continent. Will it save natural values at the recreational load, which it is scheduled to be seen?

The most characteristic features of the natural environment of Zamin National Park defining the features of the natural - geographical environment of its natural complexes (landscapes) and high - altitude areas derive from the fact that there is a large possibility of the recreational use of the pool. Here are all the landscaped areas of Central Asia - from the typical arid to subalpine and Alpine. The study shows that the main factors for the use of recreational resources and the development of tourism in the Zaminsu basin are favorable climatic conditions: mountainous and highland areas with mountain spruce forests and Alpine meadows, dry climate and clean air, ozone and volatile production of volatile compounds that cleanse air from a variety of pathogens. Duration comfortable temperature conditions and sunshine, optimal for the body relative humidity and other climatic factors on which the potentials of the recreational Zaminsu River basin are not inferior to the famous Mediterranean, created here an opportunity for the organization of major recreation. The nature of the Zaminsu River basin is rich in attractive tourist sites - mountain plateau, picturesque gorges, interesting forms of weathering, caves, springs, and others. The territory of the northern slope of the Turkestan range within the Zaminsu River basin has an exceptionally great opportunity for the development of local tourism. The nature of Turkestan Mountains has a great diversity of landscapes and brightness, from the lowlands with mild climate and lush meadow-forest vegetation to harsh high mountains (the top of Shaukaratau - 4,100 m a.s.l.) with snow and opposite the background of dark rocks nival zone, from the bottom, green juniper forests set off. According to the expert of Central Asian flora, M.P. Popov (1960), the fir - trees are tall and thick in the whole Central Asia. It is only protected by the array of juniper in the Pamir - Alai.

The nature of Zamin National Park is original in the landscape of its area; the amazing geological - geomorphological picture of valleys, breakages that expose rocks of different composition and age. More than 70 years ago, the well - known geologist A.P. Markovsky (1937) wrote about the rock Zamin Mountains: "… within this part of the Turkestan range it is exceptional for the variety of its buildings, the Kyzylmazar area, an area of 400 square kilometers, there are all strata of Cambrian to Upper Paleozoic horizons, as well as the Paleogen and Neogen. This is one of the most interesting places of the western part of the Alai mountain system." Such are the gorges Chortangi, Sharyllak, Kashkasu, Kyzylmazar, Urukli and many others. These gorges can justifiably be regarded as a kind of monuments of the earth's geological history.

The slopes and gorges of Sup Kulsai together with the Zamin Mountains were studied by the famous geographer, Professor of Moscow State University, N.G. Gvozdetski (1981), who first described the field (the initial stage of development of karst) with grooves and forms that branched and connected, switched to rather steep sides rare for a non - tropical area of the wall ditches (Fig. 4).

Fig. 4. Rarely found karst phenomenon in arid zones.

One of the most interesting parts of the Zaminsu River basin is the tract "Kirk - Kiz" ("Forty girls"), the cluster of vertical pillars of bizarre bright red Neogen clays and sandstones conglomerates (Fig. 5). One of the most beautiful landscapes of the Zaminsu basin is Plateau Soup, located on the upper reaches of the Zaminsu River at altitudes of 2,300 - 2,500 m a.s.l., in the form of two layers, with the sloping plateau, undulating surface, speckled with caves and open caves, a true monument of nature. A special picture is provided by the gorge where the river breaks through Kulsai.

Rocky, at the bottom of the steep gorge collars reaching 300 - 400 m, Kulsai is barely visible from above. These landscapes with narrow, amazingly beautiful gorges and numerous waterfalls, which are usually barely heard, represent a usual type of landscape of the upper midlands band. And yet, among them there is one amazing place - the Chortangi Gorge, crevice with many small waterfalls. The Chortangi Gorge is located relatively far from the road crossing Bahmal - Zamin, the plateau of Sup, and it is easily accessible for a visit.

Truly, the Zamin territory of the national park is a region of unique landscapes floral, faunal, geomorphological identity. In the Plateau Sup plans there are efforts to build a large sports complex, because the climate and topography of the plateau makes it the best place for training and competition for many types of winter sports: Alpine skiing, cross country skiing, biathlon, luge and speed skating, ice hockey and figure skating, ski jumping. In addition, in the vicinity of the plateau there are extremely favorable conditions for various types of mountaineering, rock climbing, mountaineering and orienteering. According to experts, landscape conditions of Plateau Soup surpass many centers of winter and mountain sports, both in the CIS and in the alpine countries. In future, the recreational potential of the national park and the Zaminsu basin could acquire international importance. Successful combination of the proximity of the railway and

Fig. 7. Variable stone statues (Forty girls).

road system (55 km to the city of Dashtobod) and the enchanting scenery of mountains attract a large number of foreign tourists. International experience shows that the most profit and return of assets, along with the sea, are brought by mountain resorts. Thus in the Borjomi region of Georgia, located at altitudes of 800 - 2,500 m a.s.l., the national income per capita is higher than in most other ones, including Georgia's low-lying areas. The high level of the productive forces of the region was formed on the basis of the multifunctional, regional and territorial recreational system (Kobakhidze 2004).

The world fame was gained in conditions similar to the Zamin Mountains, the famous alpine resorts of Santa Fe in the US Rocky Mountains and Lardzhiling in India. However, climatic conditions, terrain, and the unique complex of natural conditions of Plateau Soup, located within the park and in the Zaminsu basin are far superior to most of the existing world mountain-sports centers. Thus, the current state of the organization of environmental protection, eco-educational and scientific work in Zamin National Park is in need of radical improvement. It should be noted that with the development of the recreational Zamin Mountains and the development of tourism in Uzbekistan the issues of scientific support for the development of this direction should be at the same time resolved in the coming future. These issues, in addition to economic and social problems, include the evaluation of future works, the definition of recreational landscape resilience to stress, determining the capacity of recreational areas and others.

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