

BIOLOGICAL DIVERSITY AND PROBLEMS OF ITS CONSERVATION (ON THE EXAMPLE OF THE FERGHANA VALLEY)

O. Abduganiyev

Candidate of Geographical Sciences, Associate Professor, Fergana State University,
Uzbekistan

U. Obidjonov

Lecturer at the Department of Biology, Fergana State University

S. Mominova

The 1st year student in Geography, Fergana State University

ABSTRACT

Currently, biological diversity is of paramount importance for the normal functioning of systems and the biosphere as a whole, contributes to the sustainable development of the region. Further conservation of biodiversity in the territories of the Fergana Valley requires a transition from a mono-resource approach to an ecosystem approach in nature management. The article and methodological plan consider the issues of accounting and assessment of biological diversity in the development of the creation of new protected areas.

Keywords: protected natural areas, representative, reserve, key biodiversity areas, IUCN, endemic, flora, fauna.

The Fergana Valley is an intermontane depression in the mountains of Central Asia, it is an intermontane depression bounded in the north by the Tien Shan mountain system, and in the south by the Alai and Turkestan ranges. In plan it resembles an ellipse about 300 km long and up to 170 km wide. If from a geographical point of view, the territory is a single whole, then in the political and administrative respect it is characterized by significant heterogeneity. Today, there are three regions of Kyrgyzstan - Osh, Jalal-Abad, as well as the recently formed Batken, three regions of Uzbekistan - Andijan, Fergana and Namangan - in the central part of the plain, and the southwestern part of the valley is occupied by the Sughd region of Tajikistan [8, 9].

The Fergana Valley is the most fertile and densely populated region in all of Central Asia and, in some respects; it still retains the importance it had when it lay on the ancient Silk Road. The economies of all three countries are predominantly agricultural in nature. Therefore, the general degradation and fragmentation of natural ecosystems, which are



intensified under the influence of anthropogenic impacts, have led to a reduction in the ranges and numbers of both rare and resource species. Such species have an increased risk of extinction in the wild and are recommended for inclusion in the Red Book. In the part of the Fergana Valley belonging to the Republic of Uzbekistan, there are 52 species of animals listed in the Red Book of the Republic of Uzbekistan, including 16 species of invertebrates, 7 species of fish, 7 species of reptiles, 16 species of birds, 3 species of mammals [11, 12].

Over the past decades, as a result of intensive nature management, some species of animals in the Fergana Valley have been subjected to anthropogenic impact, and therefore their ranges and numbers have decreased, some species are on the verge of extinction or have disappeared completely. The number of many animals has not yet reached a critical level, but continues to decline steadily. Degradation of habitats and direct extermination affected, first of all, large carnivores (*Ursus arctos*, *Cuon alpinus*, *Canis lupus*, *Uncia uncia*, *Vulpes vulpes*) and ungulate mammals (*Capra ibex*, *Capreolus pygargus*, *Sus scrofa*) [6, 10].

The flora of the Fergana Valley is rich in endemic, rare and endangered species. In the Fergana Valley, 45 species of plants are distributed, listed in the Red Book of the Republic of Uzbekistan. The distribution of these species is indicated in the Red Book of Uzbekistan (2019) and in separate publications [5, 7, 8]. But the overwhelming majority of data on the area of distribution, abundance, state of populations or reasons for the decline in the number of individuals is outdated and new research is required.

Population growth and the acceleration of urbanization processes lead to the loss of unique and valuable natural ecosystems in the Fergana Valley, as well as the genetic fund of plants and animals. In the Uzbek part of the valley, the situation is further complicated by the fact that there are no protected areas I, II and IV (i.e. reserves, national parks and sanctuaries), which would make it possible to restore and preserve biological diversity in the Fergana Valley. For the further implementation of effective protection of biodiversity components, a systematic approach is required; it is necessary to develop comprehensive measures both for the protection of the species themselves and for the preservation of their habitats [1, 2, 3, 4].

Therefore, the current situation requires optimization and new approaches to solving the problems of ecosystem conservation. One of the possible ways out of this situation is to identify key biodiversity areas (KBAs) that meet international standards and are important for the conservation of biodiversity on a global scale [6]. KBAs are defined by elements

of biodiversity that, globally, natural sites contribute significantly to conservation, such as endangered species or ecosystems. When identifying KBAs, several criteria and subcriteria are used, each of which has corresponding quantitative threshold values [12]. Territories are classified as KBA if they meet at least one of the following criteria [6]:

- A1: presence of a significant proportion of the global population of one or more globally threatened species;
- A2: the presence of a significant proportion of the ecosystem threatened with global extinction;
- B1-B4: presence of geographically limited (not necessarily threatened) elements of biodiversity, including individual species, associated species, species populations and ecosystem types;
- C: ecological integrity: natural sites that maintain completely intact ecological communities and the ecological processes that support them;
- D: exceptional biological processes, including demographic aggregations (e.g. seasonal aggregations for breeding or feeding), ecological shelters and initial populations required for the survival of the species;
- E: indispensable: territories recognized as irreplaceable based on quantitative analysis of complementarity, confirming very high indispensability in terms of global biodiversity.

Biodiversity and natural ecosystems are concentrated in remote mountainous areas, where state borders often pass. Therefore, many key biodiversity areas are cut apart by boundaries. This means that the best approach to their protection is bilateral or regional cooperation. Long-term conservation of nature requires the protection of landscapes and geocological corridors. This is especially important for the conservation of large-scale ecological and evolutionary processes, as well as for the conservation of species with large ranges, low natural population density and migration instincts. In addition, such corridors facilitate cross-border cooperation between KBAs that are ecologically similar but can be separated by borders. Conservation corridors can also be an effective tool for integrating environmental concerns into land-use plans, contributing to the conservation of biodiversity in the use of cultural landscapes such as cropland, grassland and forestland [6, 10].

In the part of the Fergana Valley belonging to the Republic of Uzbekistan, the provision of the territory with nature protection objects is low. The region is characterized by a high degree of anthropogenic transformation of the territory, mainly due to plowing and small

values of the areas of natural geosystems. The high degree of preservation of natural geosystems corresponds to mountainous regions and partly to Central Fergana. Separate areas with natural vegetation have survived on the Chatkal and Kuramin ranges, in the foothill and mid-mountainous parts of the Alay and Turkestan ranges and in the flat part of Central Fergana [2, 3, 4] (Table 1).

In the Uzbek part of the Fergana Valley, there is an urgent need to increase the areas of protected areas, according to the results of the assessment of key biodiversity areas according to the criteria developed by IUCN (2016). Currently, there are several natural monuments, water protection zones and zones of fresh groundwater deposits as protected areas. However, they are not able to ensure the conservation of the region's biodiversity in the long term, if measures are not taken to reliably preserve it throughout the region outside the protected areas.

Therefore, it is required to give certain areas the status of a protected natural area, subject to the confirmed presence of globally endangered species or narrowly endemic species found in only one KBA. Due to the complex physical and geographical conditions of the hotspot and the high concentration of biodiversity in areas remote from human settlements, many KBAs are located along state borders and require concerted action on both sides.

Key areas of biological and landscape diversity of the Fergana Valley

Table 1

№	Territory	Administrative districts	KBA criteria	Rare and endemic species	Existing protected areas	Promising protected areas
1	Upper part of the Akhangaran river basin	Pap	B1	Flora: <i>Aconitum talassicum</i> Popov, <i>Hedysarum angrenicum</i> Korotkova, <i>Iridodictyum winklerii</i> (Regel) Rodionenko, <i>Achoriphragma kuramense</i> (Botsch.) Sojak, <i>Tulipa kaufmanniana</i> Regel.	Not	National parks
2	Kuraminsky ridge	Pap	B1, C, A2	Flora: <i>Acantholimon laxiusculum</i> , <i>Acantholimon margaritae</i> , <i>Allium praemixtum</i> , <i>Allium pskemense</i> , <i>Astragalus dolonus</i> , <i>Astragalus nucleosus</i> , <i>Astragalus pseudoamygdalinus</i> , <i>Bunium angreni</i> , <i>Cicer mogoltavicum</i> , <i>Eremurus korovinii</i> , <i>Rindera fornicate</i> , <i>Salsola titovii</i> , <i>Tulipa mogoltavica</i> , <i>Tulipa vvedenskyi</i> . Fauna: <i>Cuon Alpinus</i> , <i>Ursus arctos</i> , <i>Canis lupus</i> , <i>Cicindela galatea</i> Theime, <i>Alsophylax loricatus</i> Strauch, <i>Gypaetus barbatus</i> , <i>Gyps himalayensis</i> Hume, <i>Gyps fulvus</i> Hablizl, <i>Aegypius monachus</i> , <i>Columba eversmanni</i> Bonaparte, <i>Ursus arctos</i> Linnaeus, <i>Vormela peregusna</i> , <i>Ciconia nigra</i> , <i>Terpsiphone paradisi</i> , <i>Capra ibex</i> , <i>Sus scrofa</i>	Protected forests	State reserve
3	Chatkal ridge	Pap	B1, C, A2	Flora: <i>Aconitum talassicum</i> Popov, <i>Ferula czatkalensis</i> M.Pimen, <i>Iridodictyum winklerii</i> (Regel) Rodionenko, <i>Dorema microcarpum</i> Korovin, <i>Lomatocarpa korovinii</i> Pimenov, <i>Achoriphragma saxifraga</i> (Botsch. et Vved.) Sojak, <i>Tulipa kaufmanniana</i> Regel, <i>Allochrusa gypsophiloides</i> (Regel) Schischk. Fauna: <i>Uncia uncia</i> , <i>Canis lupus</i> , <i>Marmota menzbieri</i> zachidovi, <i>Cicindela galatea</i> Theime, <i>Alsophylax loricatus</i> Strauch, <i>Gyps himalayensis</i> Hume, <i>Gyps fulvus</i> Hablizl, <i>Aegypius monachus</i> , <i>Columba eversmanni</i> Bonaparte, <i>Marmota menzbieri</i> , <i>Ursus arctos</i>	Protected forests	State reserve

				Linnaeus, Vormela peregusna, <i>Terpsiphone paradoxa</i> , <i>Capra ibex</i> , <i>Sus scrofa</i> .		
4	Sokh	Sokh	B1, C	Flora: <i>Astragalus auratus</i> , <i>Astragalus dianthoides</i> , <i>Calligonum calcareum</i> , <i>Calligonum elegans</i> , <i>Ferula vicaria</i> , <i>Tulipa ferganica</i> . Fauna: <i>Tetrax tetrax</i> , <i>Columba eversmanni</i> Bonaparte, <i>Falco naumanni</i> Fleischer, <i>Hieraaetus fasciatus</i> , <i>Hieraaetus pennatus</i> , <i>Canis lupus</i> , <i>Capra ibex</i>	not available	National parks
5	Upper reaches of the Chadak and Chorkesar rivers	Chadak	B1	Flora: <i>Acantholimon laxiusculum</i> , <i>Dracocephalum komarovii</i> , <i>Euphorbia mucronulata</i> , <i>Kuramosciadum corydaliifolium</i> , <i>Tulipa dasystemon</i> , <i>Tulipa dasystemonoides</i> , <i>Tulipa dubia</i> .	Protected forests	Order reserve
6	Papal adyrs	Pap	B1	Flora: <i>Allium haneltii</i> , <i>Allium isakulii</i> , <i>Allium kuramense</i> , <i>Anthochlamys tianschanica</i> , <i>Astragalus austroferganicus</i> , <i>Astragalus pseudodianthus</i> , <i>Dorema microcarpum</i> , <i>Mogoltavia sewerzowii</i> , <i>Salsola drobovii</i> , <i>Tulipa intermedia</i> , <i>Tulipa scharipovii</i> . Fauna: <i>Alsophylax loricatus</i> Strauch.	not available	Order reserve
7	Karatag	Qurghontepa	B1	Flora: <i>Acantholimon nabievii</i> , <i>Allium filidentiforme</i> , <i>Mogoltavia sewerzowii</i> . Fauna: <i>Aegyptius monachus</i> , <i>Alsophylax loricatus</i> Strauch	not available	Natural parks
8	Ungortepa	Chartoq	B1	Flora: <i>Allium filidentiforme</i> , <i>Allium tatyanae</i> , <i>Allium viridiflorum</i> , <i>Tulipa ferganica</i> . Fauna: <i>Alsophylax loricatus</i> Strauch	not available	Natural Monuments
9	Chartak adyrs	Chartoq	B1	Flora: <i>Acantholimon nabievii</i> , <i>Hedysarum gypsaceum</i> , <i>Lamyropappus schakaptaricus</i> , <i>Mogoltavia sewerzowii</i> . Fauna: <i>Alsophylax loricatus</i> Strauch.	not available	Natural Monuments
10	Central Fergana deserts (Sands Yazyavan and Akkum)	Yazyavan and Mingbulok	B1, C	Flora: <i>Astragalus rubellus</i> Gontsch, <i>Astragalus subauriculatus</i> , <i>Astragalus austroferganicus</i> Kamelin et R. M. Vinogr, <i>Calligonum elegans</i> Drobow. Fauna: <i>Reduvius fedtschenkianus</i> Oshanin, <i>Phrynocephalus strauchi</i> , <i>Cercinthus lehmanni</i> Kolenati, <i>Scarites turkestanicus</i> Heyden, <i>Lethrus</i>	Natural Monuments	State reserve
				<i>bispinus</i> B. Jakovlev, <i>GlaucoPsyche charibdis</i> , <i>Phrynocephalus strauchi</i> Nikolsky, <i>Phrynocephalus helioscopus</i> (Pallas, 1771) ssp. <i>saidalievi</i> Sattorov, <i>Teratoscincus scincus</i> (Schlegel, 1858) ssp. <i>rustamowi</i> Szczerbak, <i>Eremias scripta</i> (Strauch, 1867) ssp. <i>pherganensis</i> Szczerbak et Washetko, <i>Varanus griseus</i> .		
11	The sources of the Syrdarya river and tugai forests	Balikchi, Pap, Turakurgon, Mingbulok, Besharik, Dangara	B1, C, A2	Flora: <i>Calligonum plicatum</i> , <i>Ephedra lomatolepis</i> , <i>Prangos equisetoides</i> , <i>Saussurea robusta</i> . Fauna: <i>Cottus spinulosus</i> , <i>Hirudo medicinalis</i> Linnaeus, <i>GlaucoPsyche charibdis</i> , <i>Acipenser nudiventris</i> Lovetzky, <i>Pseudoscaphirhynchus fedtschenkoi</i> , <i>Abramis sapa</i> , <i>Aspiolucius esocinus</i> , <i>Barbus brachycephalus</i> Kessler, <i>Barbus capito</i> , <i>Ciconia ciconia</i> (Linnaeus, 1758) ssp. <i>asiatica</i> Severtzov, <i>Platalea leucorodia</i> Linnaeus, <i>Marmaronetta angustirostris</i> , <i>Aythya nyroca</i> , <i>Sus scrofa</i>	not available	Complex (landscape) reserves
12	Teshiktash adyrs	Andijan	B1	Flora: <i>Salsola drobovii</i> , <i>Tulipa ferganica</i> . Fauna: <i>Alsophylax loricatus</i> Strauch, <i>Varanus griseus</i> , <i>Falco naumanni</i> Fleischer, <i>Hieraaetus fasciatus</i> , <i>Hieraaetus pennatus</i> .	not available	Natural Monuments
13	Chilustun and Kyrtashtau mountains	Khuzhaobod	B1	Flora: <i>Allium alaicum</i> , <i>Astragalus rhacodes</i> , <i>Ferula vicaria</i> , <i>Salsola drobovii</i> , <i>Tulipa ferganic</i> . Fauna: <i>Alsophylax loricatus</i> Strauch, <i>Varanus griseus</i> , <i>Falco naumanni</i> Fleischer, <i>Hieraaetus fasciatus</i> , <i>Hieraaetus pennatus</i>	not available	Natural parks
14	Shahimardan	Fergana	B1, C	Flora: <i>Acantholimon katrantavicum</i> , <i>Acantholimon muchamedshanovii</i> , <i>Acantholimon schachimardanicum</i> , <i>Allium backhousianum</i> , <i>Allium isakulii</i> , <i>Allium schachimardanicum</i> , <i>Astragalus auratus</i> , <i>Astragalus borissianus</i> , <i>Astragalus dianthoides</i> , <i>Astragalus rhacodes</i> , <i>Fergania polyantha</i> , <i>Fumariola turkestanica</i> , <i>Iskandera alaica</i> , <i>Lepidium curvinervium</i> , <i>Lonicera paradoxa</i> , <i>Salsola drobovii</i> , <i>Salvia margaritae</i> , <i>Tulipa dasystemon</i> , <i>Tulipa ferganica</i> . Fauna: <i>Valvatamnicola archangelskii</i> , <i>Valvatamnicola schachimardanica</i> Izzatullaev, <i>Rhinolophus hipposideros</i> , <i>Capra ibex</i>	not available	Natural parks

All territories promising for the creation of protected areas are distinguished according to the corresponding groups of criteria (landscape diversity, biodiversity, soil, geological diversity,

valuable natural areas with high recreational significance), which are characterized by a certain specificity of the protected object. As part of the creation of a system of protected areas at the regional level, it is impossible to preserve all the valuable natural objects of the Fergana Valley. For the development of protected areas of regional significance, it is recommended to carry out comprehensive studies to create an ecological framework. This methodology implies an assessment of the representation of geographic diversity, an analysis of the availability of protected areas in the area under consideration according to the basin principle, an assessment of the information security of protected areas, their ecological and cognitive functions, and consideration of the problem of regulatory support. Only in the case of joint development of protected areas networks at all levels (global, regional, local) it is possible to create an effective system of specially protected natural areas.

The landscape approach involves the integrated management of land, water and biological resources, which ensures a balance between environmental objectives and the goals of sustainable use of resources. When expanding the modern system of protected areas, it is necessary to take into account the degree of landscape diversity of the area and the ecological cores should coincide with the cores of landscape diversity, this will achieve the main goal of all nature protection schemes - the preservation of landscape and biological diversity.

Based on the analysis of the key biodiversity areas of the Fergana Valley and the prospects for the creation of protected natural areas, the following conclusions can be drawn. In order to develop the protected areas system, 14 sites have been identified that are promising for the creation of new protected areas. The existing protected areas system according to the laws of Uzbekistan is represented by 7 categories. At the same time, the category "state reserve" of the Fergana Valley is being introduced for the first time. The prospective network of protected areas is representative of the geographical diversity and ensures the ecological balance of the Fergana Valley. Additional recommendations for optimizing the protected areas system: creation of a state nature reserve, an integrated (landscape) sanctuary and a natural park, in areas with a combination of natural and recreational value and the development of protected areas of local importance.

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