

Conservation of Biodiversity in Protected Natural Areas of the Aral Sea Region

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Abstract

In the article the questions of the modern state of biodiversity of Southern Priaralie and perspective directions of development of ecological tourism in this region. There is the intensive mastering of territory of plateau Usturt that is accompanied by influence of anthropogenic factors on the dynamics of landscape, vegetable associations and specific variety of fauna.

Keywords: *Biodiversity, Eco-tourism, Monitoring, Plateau Usturt, Southern Priaralie*

Introduction

Changes in the natural environment of Karakalpakstan under the influence of the ecological crisis have led to the degradation and transformation of all components of the region's ecosystems. Over recent decades, many species of animals and plants have disappeared and continue to disappear, while unique natural complexes are being destroyed, causing significant concern and serious apprehension.

At present, one of the key environmental protection tasks is to ensure the capacity of ecosystems for self-recovery by preventing their transformation beyond permissible limits. Despite the negative impact of human activities on the environment, the inherent ability of natural ecosystems to regenerate makes it possible to continue diverse economic activities associated with anthropogenic influence on nature.

Review of Related Literature

The Southern Aral Sea region, with its vast territory, diverse ecosystems, and rich species composition, requires the development of specialized research aimed at the inventory and assessment of biodiversity, the advancement of monitoring systems, and the formulation of principles and methods for the conservation of natural biosystems.

The issue of the state of faunal biodiversity and its dynamics under conditions of intense aridization in the Aral Sea region requires comprehensive and in-depth study. In this regard, it is necessary to conduct an inventory of the region's biological resources and to develop effective measures and strategies for their conservation.

The system of protected natural areas worldwide attracts particular attention from scientists and specialists. Since the early 1970s, environmental protection has become a prestigious field that enhances the international standing of any state. Many countries have signed international agreements aimed at conserving biological resources threatened with extinction. Protected natural areas (PNAs) provide opportunities to monitor the full diversity of natural resources that can no longer be found in anthropogenic ally transformed territories.

Objectives

The transformation of habitats leads to a reduction in species richness, population size, and the distribution ranges of many species of animals and plants. Biodiversity loss is occurring at a rapid pace. Over the past century alone, large mammal species such as the kulan and the cheetah have disappeared. Species that were once found in the hundreds of thousands—such as the saiga antelope, goitered gazelle, Asian mouflon, and, among birds, the houbara bustard—are now on the brink of extinction.

The task of preserving the diversity of flora, fauna, and soils is of great importance to humanity for various reasons. Many animal and plant species are valuable for agricultural and livestock activities. The conservation of wild species of flora and fauna is essential for enhancing the resistance of cultivated plants and domesticated animals to pests and diseases.

Methodology

A territorial approach to nature conservation should ensure the fulfilment of all functions of protected natural areas (PNAs) while minimizing restrictions on other functions necessary for sustaining human livelihoods. The selection of specific directions for the establishment of newly designated PNAs is determined by several factors, including the current state of natural territories (fauna, flora, and soils) and the dynamics of anthropogenic impact on these areas.

At the same time, the assessment of the current state of protected natural areas is carried out according to the following criteria:

- the presence or absence of large natural areas where the conservation of biota is possible;
- the presence or absence of functional connectivity between protected natural areas;
- the resilience of the natural framework, which is ultimately more significant than the complete absence of any impact on natural ecosystems.

The Ustyurt Plateau is one of the oldest deserts of Eurasia. Its surface is characterized by an elevated plateau with absolute heights ranging from 160 to 300 meters above sea level, bordered on all sides by more or less distinct escarpments, known as “chinks,” with heights of 190–256 meters. Depending on climatic features and physical-geographical conditions, patterns in the structure of vegetation cover and soil salinity within the Karakalpak part of the Ustyurt Plateau reveal the presence of gypsum, saline, and sandy deserts.

The ancient origin and relative isolation of the plateau have led to its distinctive character and a high level of endemism among both fauna and flora. Since the 1960s, the territory of the Karakalpak part of the Ustyurt Plateau has been subject to intensive technogenic, industrial, construction, and economic development associated with the exploration and

extraction of natural gas, oil, and precious metals over many years. The climate of the region is sharply continental, characterized by hot, dry summers and relatively harsh winters accompanied by strong winds, low levels of atmospheric precipitation (70–110 mm per year), unstable snow cover, high evaporation rates, and pronounced temperature fluctuations both seasonally and diurnally.

In recent years, the intensive development of the Ustyurt Plateau has significantly increased the impact of anthropogenic factors—such as the construction of railways, gas pipelines, and related infrastructure—on landscape dynamics, plant communities, species diversity of fauna, and overall biological productivity.

From an ecological perspective, the stability of biota can be assessed using the criterion of the presence of diverse rare taxa (i.e., rare species of living organisms that differ significantly in ecological niches, trophic levels, and the spatial scale required for sustaining their populations) across the full ecological range of their habitats. For many species, such as the saiga antelope and the goitered gazelle, there has been a sharp decline in population numbers, while some species, including the cheetah and the kulan, have completely disappeared from the region's faunal complex.

These species are listed in the Red Data Book of the Republic of Uzbekistan, the IUCN Red List, and the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), to which the Republic of Uzbekistan is a party. In weakly disturbed natural communities capable of self-recovery, the vast majority of ecological niches across the full range of environmental conditions are occupied by evolutionarily co-adapted, native (indigenous) species, including rare ones. By densely filling the ecological space, these species prevent the establishment of invasive (adventive) species within the biogeocenosis. At the same time, rare native species of plants and animals play a “buffering” role, occupying portions of ecological space that become available when dominant species experience fluctuations in their populations. Thus, an indicator of the capacity of ecosystems for self-recovery—as a natural factor of ecological balance stability—can be the nativeness of biodiversity, that is, the richness of indigenous species.

On the other hand, rare species of flora and fauna are the first to disappear from ecosystems under conditions of more significant disturbance, which makes them useful indicators for assessing the state of natural communities.

Analysis

At present, comprehensive measures are being systematically implemented in the Republic to establish a network of protected natural areas aimed at conserving unique natural complexes, preserving the genetic diversity of flora and fauna, preventing anthropogenic pressure on the environment, and supporting the study of natural processes, environmental monitoring, and ecological education and awareness among the younger generation. New categories of protected natural areas have been established, including state biosphere reserves and комплексные (ландшафтные) заказники, which contribute to the conservation and restoration of landscapes, plant and animal species—including rare and endangered species listed in the Red Data Book of the Republic of Uzbekistan—as well as other natural objects and complexes. These measures also support the improvement of environmental conditions and the rational use of natural resources.

In accordance with Presidential Resolution No. PP-4247 dated March 20, 2019, “On measures to improve the system of public administration in the field of protected natural areas,” and the Resolution of the Cabinet of Ministers No. 707 dated November 11, 2020, “On the establishment of the South Ustyurt National Nature Park,” a national nature park named “South Ustyurt” was created. According to this resolution, in order to improve ecosystem conditions within the park, and to conserve and restore unique species of plants and animals, the South Ustyurt National Nature Park was established with a total area of 1,447,443 hectares in the Kungrad district of the Republic of Karakalpakstan.

Findings and Discussion

The National Nature Park functions as a structural unit of the State Committee for Ecology and Environmental Protection of the Republic of Uzbekistan and holds special significance in terms of nature conservation, environmental education, and recreation, as a unique natural complex characterized by rich biodiversity of flora and fauna.

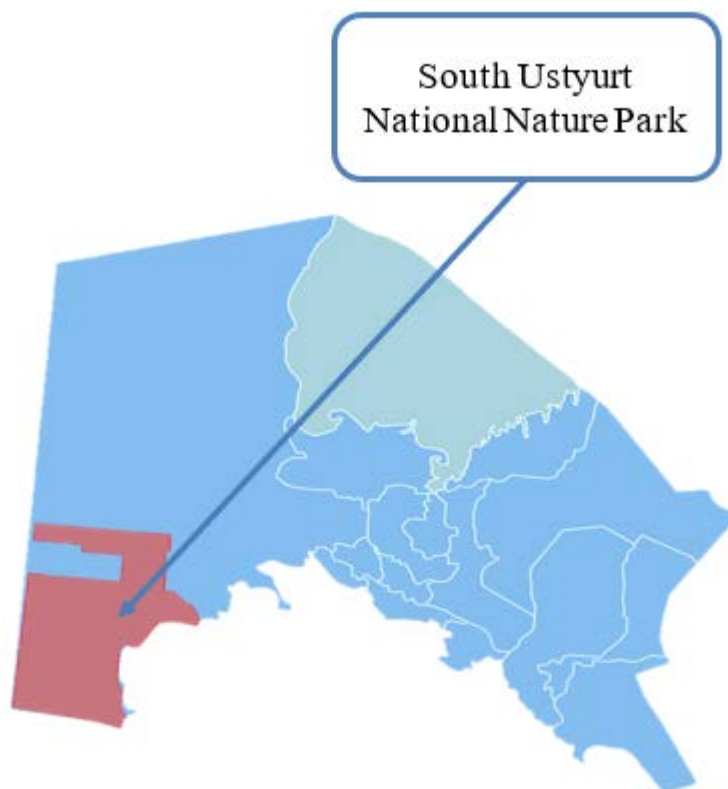


Fig. 1. Schematic map of the location of the South Ustyurt Protected Natural Area

The South Ustyurt region is characterized by a gently undulating plain, locally disrupted by smooth wave-like slopes and wide depressions (solonchaks and takyrs). The soil cover consists of brown soils with varying degrees of salinity, gradually transitioning into sierozem soils, accompanied by a corresponding distribution of vegetation. According to scientific data, 426 plant species belonging to 41 families and 225 genera have been recorded in this area. Dominant (edificatory) species such as biyurgun, boyalysh, keyreuk, and wormwood occupy vast territories.

Researchers and specialists also note that the clay-desert plains with wormwood–saltwort vegetation, which cover extensive areas of the plateau, are inhabited by 35 species of mammals, many of which are common. Rodents constitute nearly half of the mammalian species composition. In some areas, there is a high population density of comb gerbils, midday gerbils, and the yellow ground squirrel. A relatively poor but distinctive fauna characterizes Solonchaks, deep depressions, and takyr. A total of 19 mammal species inhabit these environments, although the population size of most species remains low.

The principal threats to the biodiversity of the Ustyurt Plateau include the reduction and fragmentation of habitats, disruption of migration routes, unsustainable use of pastures, and intensified industrial development—such as exploration and extraction of natural gas, and the construction of railways and paved roads.

Under these conditions, the study of structural changes in terrestrial vertebrate communities and the impact of technogenic factors on biodiversity acquires significant scientific, theoretical, and practical importance. The decline in population numbers of rare species and their disappearance from occupied biotopes generally occur at relatively early stages of ecosystem degradation, when such changes are still reversible and many functional properties of natural communities have not yet been entirely lost.

Conclusion

Therefore, in the South Ustyurt region, less degraded areas still remain, which are of considerable interest for the establishment of protected natural areas—both for the conservation of rare species and, in particular, for the preservation of biome-forming species. The protection of such territories represents an important and necessary task.

The unfavourable status of rare species of flora and fauna can serve as an early indicator for diagnosing disturbances in ecological balance.

Thus, based on scientific and innovative technologies that enable ecological monitoring of animal migration routes and wintering sites, it is considered necessary to utilize newly established protected natural areas as research bases for training young specialists and for the further development of ecotourism.

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