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NEWS

OF THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
of the Institute of Plant Biology and Biotechnology

**БИОЛОГИЯ ЖӘНЕ МЕДИЦИНА
СЕРИЯСЫ**



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БИОЛОГИЧЕСКАЯ И МЕДИЦИНСКАЯ



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**CONSERVATION AND RESTORATION OF BIODIVERSITY
OF FLORA AND FAUNA ON THE TERRITORY
OF THE TURKESTAN REGION**

Abstract. This scientific work takes into account the development of activities in the field of protection and sustainable use of biological diversity, which includes a wide range of measures for the protection of habitats and species in the natural environment, as well as the formation of an integrated system of specially protected natural areas. To create an integrated system of planning activities for the protection of biological diversity, assistance for the conservation and sustainable use of biological diversity.

Key words: biological diversity, habitat, conservation, ecosystem, fauna, population, reserve.

The problem of reducing biodiversity is often used to draw attention to environmental problems. It can be closely related to the health of ecosystems (for example, the loss of only one species can be manifested very differently - from the extinction of the species to the complete collapse of the ecosystem itself) and the health of mankind (food derived from natural products and raw materials for the preparation of medicines). Today, as never before, there is a great threat to the existence of species and ecosystems. The disappearance of species caused by human activities continues at a threatening rate, as the present rate of extinction of species is the highest for the last 60 million years, since the disappearance of dinosaurs. According to the forecasts of studies conducted under the auspices of the United Nations, about 25% of the existing mammal species and about 12% of bird species should disappear in the next 30 years. Some scientists believe that due to the destruction several tens of thousands of species of tropical rain forests die out and disappear in the near future. In connection with the above facts, "Convention on Biological Diversity" was adopted in 1992. At the beginning of the twentieth century, the scientific community of Europe compelled governments to pay attention to the problem of preserving at least small areas of fauna. Then in all countries of the world reserves began to be created. In the world practice, there are cases when the creation of reserves on the contrary accelerated the extinction of the species. As the Turanian tiger disappeared from the face of the earth for 34 years after the opening of the Tigrovaya Balka reserve, the leopard in the territory of the Caucasian reserve disappeared for 24 years. In these cases, the animals persisted for some time outside the reserves. The time of existence of an endangered species has reduced the isolation of the reserved space. This same isolation can influence in another way, for example, such a danger as inbreeding. Due to this, the Przewalski horse was killed in the French reserve. However, the other side is also known: if the species is not restricted in the settlement space, the biological species can begin its population even with a dozen individuals. Only five individuals of muskrats brought to Europe gave rise to the population. Grizzly bears lived in the Yellowstone National Park. They have not disappeared, but scientists have noticed that for five generations, bears began to noticeably shrink. It is possible to draw an analogy: island forms of biospecies are always smaller than continental forms. For example, dwarf species of the rhino, buffalo are known on the islands of the Sunda archipelago, while even dwarf species of African fauna on the Mediterranean islands, [1-2].

Aim of the work is "Development of methods for preserving the diversity of natural biosystems of the Turkestan region at a level ensuring their sustainable existence and sustainable use, as well as the conservation of biodiversity of domesticated and cultivated forms of living organisms and human balanced natural and cultural complexes at the level providing for the development of an efficient economy and formation of an optimal environment for sustainable livelihoods".

In the process of biodiversity development there is a mixture of local native flora with planting of introduced species. For example, there are more than 90 imported plant species in Moscow. In general, the flora of cities has hundreds of species: in Kazan - 914, in Poznan - 551, in Birmingham - 547. In Voronezh, there are 780 species of plants. It now becomes apparent that the conservation of biodiversity is possible only if the ecosystem is preserved. Thus, it is necessary to care of maintenance of habitats of animals and the plants, close to natural conditions. This corresponds to the model of the "ecological framework" of urbanized areas, which should be guided in assessing the state of natural components [3]. Natural complexes included in the ecological framework of the urbanized territory should serve as reserves for large colonies of birds and mammal communities. Artificial planting and surrounding area, natural ecosystems should be connected with the core of the framework by "green corridors", this gives the whole system a holistic character and increases its stability. To restore these links - the "green corridors" - it is necessary to change some rules for caring for greenery: not to mow the grass before flowering, not to burn leaf litter, exclude the anxiety factor for animals by night illumination, restore roadside green zones and similar measures. It is necessary to restore local species of vegetation and protect the remaining natural areas that cannot be replaced by artificial plantations, which do not provide shelter and forage resources for settling animals [4]. In large cities in Europe over the past 300 years, the increase in the number of species of flowering plants due to introductions exceeds their level of disappearance [5]. In the process of aviary breeding during repatriation, the pressure by specialized predators is small, and the quantity and availability of feed is much higher. There the average life expectancy of birds and mammals grows, the success of reproduction during the season decreases, but the role of caring for the offspring and its survival increase, thereby the population size increases [6]. The scientific novelty of the project is the complex conduct of ecological monitoring of the current state of biodiversity of the region under investigation in solving problems of conservation and restoration of species of living organisms. The research work of this project is aimed at maintaining the biodiversity of the Turkestan region, preserving the evolutionarily formed natural environment, improving the ecological situation, introducing species whose numbers are being reduced due to their inordinate exploitation, creating a genetic database, preserving in-situ populations of domestic animals and crops, maintaining local populations in the initial conditions of occurrence and formation of rare species, breeds or forms.

Conservation of biodiversity by conserving populations in the case of a minimal viable population (MVP) for a particular species in a specific habitat is the best alternative, with 99% chance of remaining for 1000 years, despite the predicted impact of demographic, natural and accidental genetic disasters. One of the best examples of the definition of MVP refers to the populations of 120 snow sheep (*Ovis montanus*), living in the deserts of the southwest of the United States. Some of these populations were observed for 70 years. The study led to striking results. It turned out that 100% of populations numbering less than 50 animals died out within 50 years, while practically all populations including more than 100 individuals survived for the whole period. To create new populations of animals and plants, a basic approach is used, for example, the reintroduction program provides for the release of captive-born or trapped animals in the area of their historic range where this species no longer occurs. The goal of the program for the reintroduction of gray wolves into the Yellowstone National Park in 1995 was to restore the balance between predators and herbivores that existed in this region before human intervention. In order to use their genetically fixed adaptation to a particular environment, animals are usually released at or near the place where they or their ancestors were caught. And sometimes animals are released in other places within their range. This has to be done when creating a new protected area, if the existing population is facing a new threat and cannot normally exist in its current location, or when there are natural or artificial barriers to the natural spread of the species. The best strategy for long-term protection of biological diversity is to conserve natural communities and populations in the wild, i.e., in situ conservation. If the population is too small to survive the only way to prevent species extinction is to maintain a view under artificial conditions under the supervision of a person. This strategy is called ex situ. There are

already a number of animals extinct in the wild, but preserved in captivity, for example the deer of David (*Elaphurus davidianus*). The beautiful tree of Franklin grows only in nurseries and no longer occurs in wild conditions [7]. In Kazakhstan, with the assistance of the GEF, UNDP, UNEP, the World Bank, the World Wildlife Fund, projects are being implemented to conserve the biodiversity of the Western Tien Shan, wetlands, Siberian cranes, saiga, predators and waterfowl birds, snow leopard, saiga. Projects are being implemented to conserve mountain agrobiodiversity, forests of the Altai-Sayanecoregion. More than 30 NGOs (Non-governmental organizations) are engaged in the reproduction and restoration of biodiversity, environmental education, the development of the foundations of ecotourism. In 2007, the Biodiversity Conservation Fund of Kazakhstan was established within the framework of the United Nations Development Program in Kazakhstan, the Global Environment Facility and the Government of the Republic of Kazakhstan "Integrated conservation of priority globally significant wetlands as habitats for migratory birds: a demonstration in three project areas." At present, UNDP in Kazakhstan is implementing the following major projects: • Conservation and sustainable use of biological diversity in the Kazakhstan part of the Altai-Sayan Ecoregion (2007-2012) The project is being implemented in the East Kazakhstan region • In-situ conservation of mountain agrobiodiversity in Kazakhstan (full-scale project) (2006-2011) The project is being implemented in the Almaty region • Integrated conservation of priority globally significant wetlands as habitats for migratory birds: demonstration at three sites (2003-2010) The project is being implemented in three pilot areas - the eastern part of the Northern Caspian with the estuaries of the Volga and the Ural rivers, the Korgalzhin and Alakol lake systems [8-12].

The Turkestan region is located in the South-Kazakhstan region, which is rich in natural complexes, which have a special ecological, scientific and aesthetic significance. Specially protected natural areas - the reserves of Aksu-Jabagly, Karatau, Sairam-Ugam National Park are the centers of attraction of scientists, ecotourists, cultural figures from all over the world. A special place in this row is occupied by the territory of Turkestan, included by the world community in the list of two hundred regions that are of global significance from the point of view of the richness of biological diversity - as a place of concentration of an exceptional number of species of flora and fauna spread on the globe only at this point. In the conditions of the acutely arid climate of this zone, the problem of species conservation is the determining factor in the way of life, economic activity of the local population, the preservation and prosperity of fauna resources. The basis for maintaining ecological balance and conservation of biological diversity can serve as a developed network of specially protected natural areas [13]. Restoration of the incidence and spatial structure of populations generates their smallest quantitative indexes. In fact, traditional forms of situational conservation, such as the emergence of special onesprotected areas, the improvement of environmental legislation, the strengthening of environmental propaganda, etc., prove to be ineffective. It is necessary to develop and implement large-scale programs for the introduction of various species of living organisms into nature. It now becomes apparent that conservation of biodiversity is possible only if the ecosystem is preserved. At the same time, in the region, care should be taken to maintain the habitats of animals and plants close to natural conditions. This corresponds to the model of the "ecological framework" of urbanized areas, which should be guided when assessing the state of natural components in the area, as well as when constructing artificial plantations.

Research methods. Monitoring biodiversity at the regional level is a method of monitoring. At the first stage of research, first of all, taxonomic diversity is revealed, that is, species composition of the main groups of plants and animals, as well as various indicators of diversity, dominance indices, levels of alignment, etc. In the second stage, dominant species are identified, their functional role is revealed, their biomass is estimated, then the number of main species is determined, the role of abiotic factors in population dynamics is determined, and the most important energy flows are determined. One of the real effective ways to preserve the biodiversity of rare species can be breeding under controlled conditions (introduction). Cultivation of rare plants is not only a measure that guarantees their conservation as endangered species, but also an effective way to protect and restore their natural populations. The development of cultivation methods and the introduction of wild decorative and other useful plants into the culture allow to satisfy the need for these species, which will help to prevent the complete destruction of their stocks in the natural environment. In modern ecological research, methods of bioindication and biotesting will be used. The method of bioindication is based on the biological information obtained by studying the species composition of a particular ecosystem. Biotesting is an experimental method, the

essence of which is the rapid and generalized determination of the quality of the environment when it acts on laboratory cultures of test organisms. Biotesting methods are promising for rapid integrated assessment, which is useful in reconnaissance studies and is a good complement to the bioindication method.

The ecological framework should be formed as a closed integrated system capable of self-reinforcement and self-restoration. At the same time, it is necessary to preserve or restore the main types of habitats, provide migration routes and shelters for animals. Garden and park ensembles should be designed as integral ecosystems, with such selection of artificial landings that could ensure its self-maintenance. In such an artificial ecosystem, the module consisting of a phytocenosis, a stable complex invertebrates and ornithocomplex. Insects provide pollination plants, and the necrophils and soil invertebrates utilize the dead plant mass. Birds and some mammals play a key role in the resettlement and restoration of planting, as the seeds of many plants germinate only by visiting the digestive tract of animals. This project is also designed to justify the need to preserve the fauna of the republic as a source of financial resources. It should be emphasized that this is not a direct assessment of biological resources, but a calculation of the cost of environment-forming functions of natural ecosystems by analogy with services in the non-productive sphere of the economy—the so-called "ecosystem services". Omitting the theoretical justification for these calculations, we note that taking into account the "ecosystem services" provided by natural ecosystems can fundamentally change the gap between rich and poor regions, preserve the natural potential in underdeveloped regions, redistribute funds received in industrialized regions to where it is beneficial to preserve intact ecosystems.

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**ТҮРКІСТАН АУМАҒЫНДАҒЫ БИОАЛУАНДЫЛЫҒЫН
ҚАЙТА ҚАЛПЫНА КЕЛТІРУ МЕН САҚТАУ**

Аннотация. Бұл ғылыми жұмыста биоалуандылықты орнықты пайдалануды табиғи ортадағы түрлердің мекені мен оларды қорғау бойынша шаралардың кең көлемін қамтиды және ерекше қорғалатын территориялардың бүтін жүйесін қалыптастырады. Биологиялық алуантүрлілікті қорғау бойынша шараларды жоспарлаудың бүтін жүйесін әзірлеу, сақтау және орнықты пайдалануды қарастырады.

Түйін сөздер: биоэралуандылық, тіршілік ортасы, сақтау, экожүйе, фауна, популяция, қорық.

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**СОХРАНЕНИЕ И ВОССТАНОВЛЕНИЕ БИОРАЗНООБРАЗИЯ ФЛОРЫ И ФАУНЫ
НА ТЕРРИТОРИИ ТУРКЕСТАНСКОГО РЕГИОНА**

Аннотация. Данная научная работа учитывает разработку деятельности в области охраны и обеспечения устойчивого использования биологического разнообразия включающего широкий круг мероприятий по охране мест обитания и видов в природной среде, а также формирование целостной системы особо охраняемых природных территорий. Создать целостную систему планирования мероприятий по охране биологического разнообразия, содействие по сохранению и устойчивому использованию биологического разнообразия исследуемого региона.

Ключевые слова: биоразнообразие, обитаемая среда, сохранение, экосистема, фауна, популяция, заповедник.

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