

Conservation of Biodiversity of the Transboundary Territories of Russia and Kazakhstan in Western Siberia Under Conditions of Climate Change

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Abstract—This article is devoted to analysis of authors' expeditionary data, as well as literature and departmental materials on the problem of monitoring and protecting biological diversity in the transboundary territories of the Russian Federation and the Republic of Kazakhstan in the south of Western Siberia. It is concluded that the state of animal populations (including rare species) is affected not only by anthropogenic, but also by natural factors, which are in particular associated with changes in the global and regional climate. Ways to increase the effectiveness of environmental measures to preserve biological diversity by creating a unified cluster network of specially protected natural areas in the border areas of Russia and Kazakhstan are proposed. We propose a unified approach to compiling registers of species that are in need of conservation, taking into account the state of their populations in the adjacent territories that are their major habitat.

Keywords—*biodiversity, transboundary territory, Western Siberia, Russia, Kazakhstan.*

I. INTRODUCTION

An inventory of the fauna, monitoring of the populations of individual species and their communities, development of measures for the conservation of rare species are currently included in the priority areas for the rational use of natural resources in most developed countries and at the international level. However, state borders are often a significant obstacle not only for development of international projects, but also for implementation of national programs in territories included in the border zone of both states that make up the so-called transboundary territories. The possibility of certain events is limited in these zones, on the one hand, but border control objectively creates a kind of "specially protected natural area", where the anthropogenic pressure on communities and the risk of poaching for certain species are reduced, on the other hand. Moreover, state borders are almost never the natural boundaries in the distribution of species along their migration paths; or even pass through landscapes that are habitats of common faunal complexes. In this regard, the objective is to develop common approaches to the conservation of biological diversity in the process of nature management of both neighboring states or even to adjust some national strategies. The length of the state border between Russia and the Republic of Kazakhstan is 7598.6

km, and this determines the importance and relevance of biological diversity conservation that is considered in this article.

II. LITERATURE REVIEW

The UN Convention on Biological Diversity was adopted in Rio de Janeiro in June 1992 and has since been updated every 10 years at international summits. Hence, the 2002 World Summit on Sustainable Development concluded in Johannesburg, which was attended by 104 heads of state, supported the initiative to end global biodiversity loss by 2010. The Russian Federation (RF) has signed and ratified this international document. Currently, the UN Convention on Biological Diversity, signed in 1992 and ratified in 1994, is also in force in the Republic of Kazakhstan (RK). In connection with this document, the National Strategy and Action Plan for the conservation and balanced use of biological diversity of the RK were developed and approved in 1999 [1]. However, analysis and experience in the implementation of these documents shows a lack of a systematic approach to a number of problems. But, despite this, actions aimed at identifying ways to conserve and manage biodiversity of fauna are being taken in the RK, including in transboundary areas with the RF [2-3].

Optimization of environmental measures to preserve the species diversity of animals in transboundary lands, of course, requires the development of a unified Program for the Conservation of Transboundary Wetlands (WBU), by analogy with the creation of a similar Program for the Conservation of Transboundary Wetlands in Russia, Belarus and Ukraine in 2008, funded by Dutch Ministry of Agriculture, Nature and Food Quality (BBI MATRA 2005-2008) [4].

At the regional level, the WBU state in the south of Western Siberia is determined, for example, by Order of the Head of the Administration of the Tyumen Region N 628-r dated September 2, 1996 "On the Wetland of the Tobolo-Ishim Forest-Steppe". The southern border of these lands coincides with the state border of Russia and Kazakhstan in some sites. However, this unique territory does not have such a status in Kazakhstan, although Kazakhstan joined the Ramsar Convention in May 2007. To date, the Ramsar List of the World Bank of International Importance in Kazakhstan includes the territory of the Tengiz-Korgalzhyn system of lakes, located much south, although documents for the

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creation of another 16 wetlands in Northern Kazakhstan have been prepared.

In 2006, 131 Key Ornithological Territories (KOTR) registered in an international base were allocated in Western Siberia. At the same time, by May 2007, only the first 34 out of the 57 key ornithological territories (described at that time in Kazakhstan as a whole) were officially confirmed by the International Union for the Conservation of Birds.

The Federal Law of the Russian Federation dated March 14, 1995 N33 FZ "On Specially Protected Natural Territories" and the Law of the Republic of Kazakhstan dated 07.07.2006 N175-3 "On Specially Protected Natural Territories" regulate the legal status of Specially Protected Natural Territories (SPNA), but unfortunately the key ornithological territories are not assigned to them. In this regard, the inventory of KOTR, significant for the conservation of birds in the world community, is only the first step. The next step will be to preserve them (now about 30% of them are included in the system of specially protected territories). In the future, the developers of the program plan to carry out work to include the remaining 70% in the system of specially protected areas.

As an effective joint project between Russia and Kazakhstan in transboundary territories, one can cite the example of creating the Altai protected area in the eastern part of the transboundary territory: within the framework of the Katan-Karagai State National Natural Park and the West Altai State Natural Reserve (RK) and the Katun Biosphere reserve (RF).

Another problem is that both Russia and Kazakhstan have signed only some of the agreements (for example, the African-Eurasian Migratory Waterbird Agreement (AEWA)) under the Bonn Convention of the Convention on the Conservation of Migratory Species of Wild Animals (open for signature in Bonn in Germany June 23, 1979 and entered into force November 3, 1983), not being its parties. Some other important Memoranda of Understanding (MoU) were concluded under this Convention. They are aimed at the conservation of such bird species as Siberian crane (*Grus leucogeranus* Pallas, 1773), slender-billed curlew (*Numenius tenuirostris* Vieillot, 1817) and meadow birds. This significantly limits the possibilities for effective cooperation between Russia and Kazakhstan on the conservation of birds on migration routes passing through this territory.

The next important problem is the organization of monitoring the faunistic and genetic diversity of terrestrial vertebrate animals of the transboundary lands of Russia and Kazakhstan, only on the basis of which can an idea of the state of populations and the stability of animal communities in this territory be made. Here we can talk, for example, about monitoring rare species of animals for inclusion in the regional Red Books of the Russian Federation and the Republic of Kazakhstan, taking into account the status of the populations of these species in adjacent territories [5-6].

The second important area of biodiversity conservation that is of direct practical importance is the conservation of specific rare species in international transboundary lands through joint projects. A good example of such work is the program for monitoring the population of the steppe eagle (*Aquila nipalensis* Hodgson, 1833) in the western part of the transboundary zone of Russia (Orenburg region) and Kazakhstan (Aktobe and West Kazakhstan regions).

III. RESEARCH METHODOLOGY

Due to the fact that the group of terrestrial vertebrates (herpeto-, avifauna, and theriofauna) has the most adequate methods for studying the characteristics of the fauna state and monitoring the status of both populations of individual species and their communities, due to the geographical location of this territory. It was the study of terrestrial vertebrates in the transboundary lands of Russia and Kazakhstan in Western Siberia that we took as a basis. Given the changing of global, and in this case regional climate, the results of such studies are of considerable interest not only from a theoretical, but also from a practical point of view.

For the implementation of these tasks, employees of the Institute of Biology of the Tyumen State University conducted many years of field work. The expedition routes and permanent trial plots covered all the major biogeocenoses of the subzones of the middle and southern forest-steppes of the Russian Federation (Tyumen and Kurgan regions) and the Republic of Kazakhstan (North Kazakhstan and Kokchetav regions).

In addition to the analysis of field research materials, in the preparation of this article, existing departmental materials and literary sources on the problem under study were analyzed.

IV. RESULTS

Since 2000, employees of the Tyumen State University have been conducting monitoring studies of the fauna of terrestrial vertebrates in different types of natural zones and depending on climate dynamics on the transboundary territory of Russia and Kazakhstan [7-8].

In 2000 and 2002 expeditions were carried out in the forest-steppe regions of the south of the Tyumen region; these materials formed the basis of the first edition of the Red List of Threatened Species of the Tyumen region. These works were continued in subsequent years: areas of the Siverga and Yakushi lakes located in the territory of two countries (Russia and Kazakhstan) were examined; common problems in the state of terrestrial vertebrate populations in these areas were revealed [9]. But if the protected areas of regional importance are located on these lakes from the Tyumen region, then on the adjacent territory of Kazakhstan, the habitats of rare species do not have a conservation status. In May 2012, an expedition was conducted along the route of Academician P.S. Pallas in 1771 – from Chelyabinsk to Omsk. The route of this expedition passed along the modern border of Russia and Kazakhstan. During route surveys, 100 species of terrestrial vertebrates were noted: 2 species of reptiles, 87 species of birds and 11 species of mammals. In May-June 2017, we carried out reconnaissance zoological surveys of six sites on the territory of the Tselinny district of the Kurgan region in the border areas with Kazakhstan, along the route of the expeditions of P.S. Pallas and J.P. Falk in the 18th century, for the presence of rare species of vertebrates included in the Red List of the Kurgan region, in particular mammals and birds. 122 species of mammals and birds were noted – 11 species of birds and 8 species of mammals are rare and in need of conservation and are mentioned in the Red List of the Kurgan Region; most of these species have habitats in the adjacent territory of Kazakhstan, which means measures to protect them should be consistent in national strategies.

In August 2010, we carried out route for accounting the birds along the Tyumen-Astana highway with a length of about 1000 kilometers [10]. From the materials of the expedition we see that the largest relative number of birds is confined to the border territories of Russia and Kazakhstan, where it is explained by only a few numerous species, for example, rook (*Corvus frugilegus* Linnaeus, 1758). Moreover, community diversity indices are not the largest here, and the species abundance index is generally minimal. The highest values of diversity indices are found in the southern regions of the Tyumen region – on the territory of the “Tobolo-Ishim forest-steppe” wetlands. The bird communities of these lands can be characterized as the most sustainable: they are the key link in the conservation framework in the studied region and deserve increased attention during monitoring, however, from the side of Kazakhstan in the border areas the wetlands are not legally registered and are not specially protected.

However, not only the biodiversity studies were of transboundary nature. Due to animal biology, which determines both the distribution of habitats of species to the border areas of different regions and states, as well as the roaming or migration of many species across these borders, the phenomenon of biodiversity at the beta and gamma levels has a transboundary character (for example, migration of true and black geese through the territory of Northern Kazakhstan and the south of the Tyumen region [11-12], among which there are such protected species as lesser white-fronted goose (*Anser erythropus* Linnaeus, 1758) and red-breasted goose (*Branta ruficollis* Pallas, 1769) studied by a postgraduate student of Tyumen State University I.A. Zubanem. This should also be taken into account when planning environmental measures at the national or international levels, for example, while studying the fauna in the southern regions of the Kurgan and Tyumen regions, we discovered trends in the movement of more southern species to the north. These processes were of a one-time or temporary nature; for example, the mass migration of Siberian roe deer from Kazakhstan to the south of the Tyumen, Kurgan and Chelyabinsk regions, which we recorded in the winter of 2012 [13], and acquired the character of constant trends. If in the first case roe deer migrations were associated with a temporary seasonal decrease in the forage quality of the Kazakhstan lands [14], then in the latter case we observe a steady expansion of the range boundaries in the north for a number of species (northern mole vole (*Ellobius talpinus* Pallas, 1770), southern birch mouse (*Sicista subtilis* Pallas, 1773), little ground squirrel (*Spermophilus pygmaeus* Pallas, 1778), great jerboa (*Allactaga major* Kerr, 1792), European bee-eater (*Merops apiaster* Linnaeus, 1758), steppe eagle (*Aquila nipalensis* Hodgson, 1833), long-legged buzzard (*Buteo rufinus* Cretzschmar, 1827), lack-winged stilt (*Himantopus himantopus* Linnaeus, 1758), South Russian tarantula (*Lycosa singoriensis* Laxmann, 1770), European black widow (*Latrodectus tredecimguttatus* Rossi, 1790), etc.).

Here are the most interesting faunal finds of some of the above species that we made on the territory of the Tyumen region bordering Kazakhstan. Great jerboa – *Allactaga major* widely inhabited in the past a variety of open areas of the forest-steppe zone of the Tobolo-Ishim interfluvium in the Tyumen region. The species has always been a few, but the intensive development of the forest-steppe zone led to a significant fragmentation of its range to isolated narrow foci, which, according to local residents, was in the late 80s of the

last century. Thus, according to our data, great jerboa was noticed at abandoned farms near the villages of Prokhorovo, Vyalkovo, Dankovo and Kalmak in the Armizon district; at the solonchaks and near the lakes Okunevo and Tundrovo in the Berdyuzh district, on pastures near the villages of Yeltsovo in Kazan and Novoaleksandrovka in Sladkovsky areas; near the village of Kizak in the Uporovsky district. Most of the places where a great jerboa is currently preserved are located outside the territories of the existing protected areas, which impose certain obligations when planning additional conservation areas. The northern mole vole – *Ellobius talpinus* was insignificantly known in separate isolated areas at the end of the 19th century in the south of the Tyumen region within the forest-steppe zone, where it was found in the steppe regions of the Tobolsk province and in Shadrinsky district. And in the early 60s of the 20th century V.V. Popov found a settlement of this species in the floodplain meadows of the Ishim River near the village of Afonkino. The northern point of discovery of the northern mole vole in the Tyumen region, not noted later in the literature, is given without actual data for the village of Chirki in the Kazan region. It became interesting that the mole vole prefers meadows and steppes on the northern border of its range, including hayfields, clearing edges, roadsides, in contrast to the more southern or western regions, where mole vole populates agricultural arable lands. During our research, we were able to confirm the safety of this species on the Afonkinsky mounds. Hence, the fluctuation of the species is possible along similar mounds extending along the floodplain terrace of the Ishim River. So, we found a small settlement of the species north of the village of Afonkino, about 35-40 km, near the village of Bol. Chencher, further north. Trails of a mole vole were found at a completely new place along the extreme border of the Tyumen region within the Berdyuzh district near the village of Staroryamovo with the Chastozozersky district of Kurgan region. The question of the possible safety of these species settlements in the Uporovsky district of the Tyumen region (formerly Shadrinsky district) was resolved during our trips in August 2017 and August 2018, when the mole settlements were found in the Kizak village area. The abundance of species here is estimated as 2-4 towns per 1 ha. Also to the north, on the border of Zavodoukovsky and Uporovsky district, already in the sub-taiga subzone, we found a local settlement of mole voles in August 2017. Thus, the mole vole currently inhabits the entire south of the Tyumen region, where natural untouched steppe lands have been preserved. As an indicator species of natural steppe ecosystems, the mole vole was included in the new edition of the Red List of the Tyumen region. The southern birch mouse – *Sicista subtilis* – is a new species in the mammalian fauna of the Tyumen region, first caught by us on May 19, 2016 near the village of Afonkino in the Kazan region. Earlier, the northernmost location of this species in the Trans-Urals was known in the area of the village of Makushino, Kurgan Region, where its typical habitats are areas of the virgin steppe and birch-aspen outliers. Consequently, the three abovementioned species of mammals can be peculiar indicators of changes in the steppe faunistic complexes during monitoring of the biological diversity of the transboundary territories of Russia and Kazakhstan.

An analysis of the results of our studies conducted over the entire Holocene period showed that they are most often not anthropogenic but natural and are associated with global or regional climate changes [15-16]. Although, we point out that in some cases we noted a catastrophic reduction in the number

of individual species in the entire area precisely as a result of human action, an example is yellow-breasted bunting (*Emberiza aureola* Pallas, 1773), which almost disappeared in our region by the beginning of the 21st century [17]. A separate interesting example is the situation with such a species as flying squirrel. In his monograph S.I. Ognev [18] provides a separate subspecies – *Pteromys volans betulinus* Serebrennikov, 1929, living on the transboundary territory of Russia (Novosibirsk Region, Altai Krai) and Kazakhstan (Pavlodar Region). Our attempts to find solid or documentary evidence of the habitat of this subspecies on a transboundary territory over the past half century have failed. The reasons for the disappearance of this subspecies are still unclear, but from the point of view of the biology of the species [19], they can be associated with both natural and anthropogenic factors and need to be studied in the border territories of both states.

Taking into account differences in the causes of changes in the state of populations of individual species, their number and ranges in general, of course, is a necessary condition; for example, when deciding to include them in the lists of rare and in need of conservation in the national Red Lists with the obligatory taking into account the state of the population of the species in adjacent territories. So, only 3 species of terrestrial vertebrates are included in the current Red List of Kazakhstan (tundra swan (*Cygnus bewickii* Yarrell, 1830), common crane (*Grus grus* Linnaeus, 1758) and European pine marten (*Martes martes* Linnaeus, 1758), also living in Russia – only the first one is included in the Red List of Russia, because the state of the population of the other two species is not in danger in Russia, within the limits of the main range. Similarly, in the Red List of Russia there are 14 cross-border species and only one of them is included in the Red List of Kazakhstan. It is logical to assume that this list should be adjusted in terms of the state of populations in the adjacent territory.

The analysis of the territory of the Tyumen region, bordering with the Republic of Kazakhstan, showed that the work on creating specially protected areas in the forest-steppe zone, carried out at the turn of the 20th and 21st centuries, was mainly aimed at preserving the hydrophilic fauna, and mainly birds, within the framework of international agreements on migratory species (Bonn Convention) and wetlands (Ramsar Convention). At the same time, representatives of the steppe fauna, avoiding irrigated areas, were left without noticing, which led to a significant fragmentation of their ranges, and as a result, the inclusion of these species in the Red Lists of the region. Although their habitat here, on the northern borders of the range, has not only environmental, but also historical significance (according to a number of paleontological studies), no special protected areas have been created to protect the steppe and forest-steppe fauna of arid habitats. In this regard, we propose the organization of a cluster forest-steppe reserve in the south of the Tyumen region.

V. CONCLUSION

In connection with the aforementioned analysis, we single out the most integrally preserved parts of the forest-steppe zone in the south of the Tyumen region, as potential places for creating central sites of a comprehensive protected area (forest-steppe reserve in the south of the Tyumen region): “Vyalkovo” – a forest-steppe massif, 1-2 km northwest of the village Prokhorovo on the western shore of the lake Vyalkovo (Armizon district), an area of 450 hectares; “Kalmakskoye” – steppe pastures and meadows, including the water area of

lake Bolshoe Kalmakskoe, on the Kurgan region border (Armizon district), an area of 1500 hectares; “Kushluk” – steppe meadows, 2-3 km north-west of the village of Uktuz (Berdyuzh district), an area of 2400 hectares. The conservation effect will certainly be higher if protected areas will also be organized on the border territory of Kazakhstan, within the framework of international cooperation, that will make up a single network of protected areas for the conservation of rare species (both migratory and native).

We propose another border territory for inclusion in the unified cluster transboundary network of protected areas – it is a section along the border Uy river from the Kazakhstan side in the Kostanay region, which will supplement the complex of territories of the Uysky (Chelyabinsk region) and Kurgan (Kurgan region) nature reserves.

The second important issue, arising from our research, can be the need to adjust the national Red Lists of Threatened Species from the point of view of biodiversity stability and the state of populations of individual animals in the greater territory of their ranges, and not only in peripheral areas (especially in the case of expanding areas).

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