

History, current state and perspectives of conservation of European bison in Ukraine

Ivan Parnikoza¹, Vladimir Boreiko¹, Vladimir Sesin¹, Maryna Kaliuzhna²

¹ Kyiv Ecological & Cultural Center, Ukraine

² Schmalhausen Institute of Zoology National Academy of Sciences of Ukraine, Kyiv

Abstract: The reasons for sudden decline of the Ukrainian population of the European bison (*Bison bonasus* L.) were analyzed on the basis of historical data and current information. Described are the present status of E. bison population in Ukraine and breeding activities in zoos. Proposed are measures necessary to restore the population of this species in the country.

Key words: European bison, *Bison bonasus*, selective killing, Red Book of Ukraine

*Dedicated to the year
of European bison in Ukraine*

Introduction

European bison (*Bison bonasus* L.) is the unique species among the group of European Pliocene wild bovines that survived until now (Katalog 1981). However, more than once this unique animal was at the edge of extinction. In 1927, E. bison completely disappeared from the wild, and only 54 individuals remained in various zoos (Pucek 1987; Sosnovskij 1987; Fedorenko *et al.* 1990). Only because of enormous efforts, the species was successfully restored and returned to its former habitats. In Ukraine, large restitution program was started in 1965. In 1992, in the whole country there were 664 (according to another data source – 685) individuals (Kryzhanovs'kyj 2007; Boreiko, Sesin 2007). Because of its vulnerability, bison is protected by the International Red Book, European Red List, Bern Convention (Appendix III), Red Book of Ukraine (Parnikoza *et al.* 2005), and also by Red Books and Lists of neighboring countries: Russia, Poland, Belarus, Lithuania. On January 2007 there were 730 wild bison in Belarus, 380 individuals in Russia (350 of Lowland-Caucasian line) (Trepet 2007), which have admixtures of American bison's blood are not taken into account), and near 900 animals in Poland (Boreiko, Sesin 2007). In some other countries, the status of European bison is quite different like in Bulgaria, where this species is almost completely exterminated.

In Ukraine, the E. bison number is declining abruptly: from 685 individuals in 1992, 659 in 1995, 405 in 2002, 325 in 2004 and 303 in 2005 (Statychnyj

shhorichnyk 2006). By 2007 there were already less than 255 E. bison in Ukraine – three times less than 15 years ago (Parnikoza *et al.* 2008). Because of such dramatic tendency and since 2004 year the lack of reliable information about the status and prospects of Ukrainian E. bison population, the aim of this research was to analyze the current situation of this species, find out reasons of its diminishing, and indicate prospects for the maintenance of its population.

Extinction of European bison on the territory of Ukraine

In historical times E. bison was a common species in Ukraine, inhabiting most of its territory to the coasts of Black and Azov Sea, including the Crimean peninsula (Geptner *et al.* 1961; Krasińska, Krasiński 2004; Danilkin 2005; Kryzhanovs'kyj 2007). However, according to the map of history of E. bison disappearance in Europe in Holocene (Pucek 1991), and Catalogue of mammals of the USSR (Katalog 1981) the natural habitat of species did not include Crimea. Nevertheless, its history in Ukraine, as well as in the whole Europe, is the history of permanent pursuit, which had to have a dramatic finale. Gradually, bison became a rare species allowed to be hunted exclusively by the country elite. In the medieval cities of Belarus E. bison remains can be found mainly within former castles (Aleksandrovich 1999).

Probably two subspecies lived within the territory of Ukraine: the Bialowieza (Lowland) *Bison bonasus bonasus* and a mountain Carpathian *Bison bonasus hungarorum* (Katalog 1981). The Lowland subspecies in XVI–XVII century was probably widespread from Dniester river to Don river, forming large herds on Podolia. E. bison were quite numerous on the territory of the Kyiv province. The last information about the encounter with E. bison at forest-steppe and steppe zone comes from the second half of the XVIII century, from Podolia and Black Sea steppes. By the end of XVIII century E. bison finally disappeared from the steppe and forest-steppe areas of Ukraine. The exact date of disappearance of this species from Ukrainian Polesia is not known, but it happened not later than by the end of the XVIII century (Kryzhanovs'kyj 2007).

It is known from the 1717 year records of Kantemir, that the Carpathian form of bison lived until beginning of the XVII century (Bandarenka, Haetski 1999). Turanin in 1972 stated that the last bison in Marmarosh Carpathians was killed in year 1814, but this report still remains unconfirmed. According to Bandarenka, Haetski (1999) the last bison in Carpathians was shot in 1762. Other sources indicated that final disappearance of mountain subspecies was in 1790 (Kryzhanovskij, Samchuk 2004; Krasińska, Krasiński 2004). The Romanian sources however testify that in Bukovyna, E. bison were present until the beginning of XIX century (Kryzhanovs'kyj 2007).

Brief history of bison restoration in Ukraine

The first attempts to restore bison in Ukraine took place before the I World War. Then, to the hunting park of Count Józef Potocki “Pylyavyn” (Novograd Volyn district of Zhitomir region) Lowland subspecies of bison from Białowieża Forest along with some American bison were imported (Kryzhanovskij, Samchuk 2004). Also, in winter of 1913 pure blood Białowieża bison (1 male and 3 females) were brought to the enclosure of “Crimean Royal Hunt” (at present it’s Crimean reserve), but animals did not feel there well and began to lose weight, so they were released in 1914. By 1917 there were 9 individuals (Dulickij 2001). Both groups of bison vanished in the revolutionary events.

Subsequent attempts to restore European bison were based on the experiments of hybridization with American bison that were conducted in Askania Nova and repeated import of animals in 1937, to present Crimean reserve. In 1941 the herd of hybrids counted more than 14 individuals; however during the war-time it was exterminated by invaders and partisans (Rozanov 1931; Dulickij 2001).

Because of the fact that territory of Ukraine lies within the historic home range of the species since 1965 several attempts were undertaken towards the creation of a free living population in the country. Animals from Białowieża and Prioksko-Terasny and Okskiy breeding centers at Soviet Union, were reintroduced to various places of Ukraine. Bison herds were created in Lviv, Rivne, Volyn, Kyiv, and Chernivtsi regions of Ukraine (Kryzhanovs’kyj 2007). Unsuccessful was the attempt to restore bison in Crimea. Released on the north slopes of the Crimean mountains, in Bakhchisaray district, animals caused numerous conflicts, so in 1980 they (20 heads) were transferred to the Chernihiv region (Dulickij 2001; Kryzhanovs’kyj 2007). Between 1976–1986 new populations were created in Ivano-Frankivsk, Vinnitsia, Lviv (Lopatyn population), Sumy, and Khmelnytskyi regions ((Kryzhanovskij, Samchuk 2004, Kryzhanovs’kyj 2007). Thus, until the beginning of 1990 bison number steadily increased. All free living Ukrainian populations consist of Białowieża-Caucasian line of bison, except of Lopatyn population, which is situated on the territory of state hunting husbandry “Styr” in Brody district of Lviv region.

Dynamics of quantity of established populations

By the end of 1990th the number of bison populations began to decline rapidly (Fig. 1) (Gerus, Kryzhanovs’kyj 2005). Totally disappeared herds in Ivano-Frankivsk (Nadvirnyanska population), Rivne (on territory of Klevanske hunting husbandry), and Khmel’nytskyi regions (group of individuals of Ulady subpopulation which migrated from Tsumanska forest) (Kryzhanovskij, Samchuk 2004). However, the reasons of this event were not sufficiently

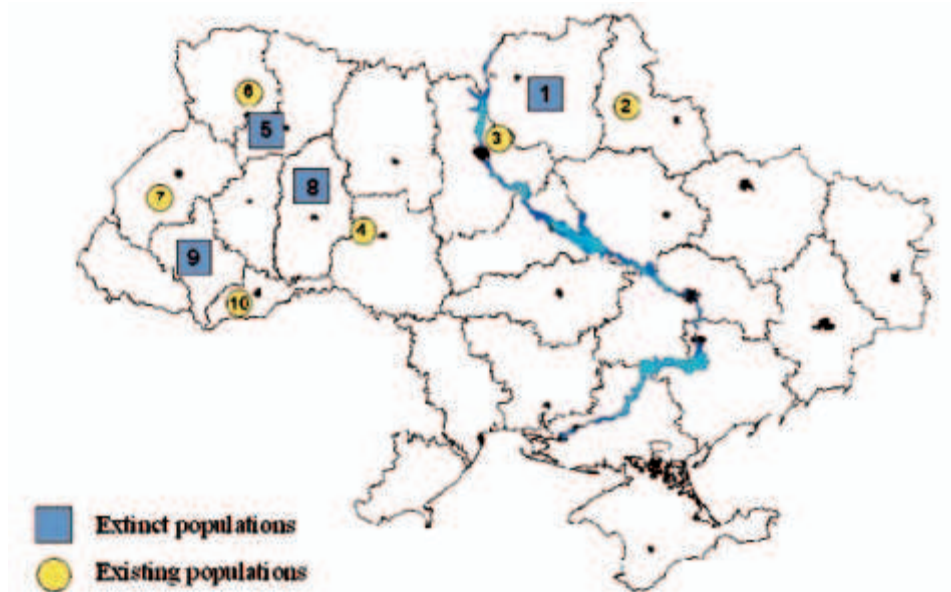


Figure 1. Population of free living bison populations in Ukraine with its size.

Populations: 1. Danivska, 2. Konotopska, 3. Zaliska, 4. Uladivska, 5. Rivnenska, 6. Tsumanska, 7. Lopatinska, Styrska and Skolivsko-Beskydska**, 8. Khmel'nitska, 9. Nadvirnjanska, 10. Bukovynska.

Information about bisons quantity presented in the form of "n) x/y:a:b" have follow

Information about E. bison numbers presented in the form of "n) x/y:a:b" have following meaning: n – number of the region on the map; x/y – maximal number of heads/year; a – population number at 01.01.2008 according to official hunting report (2-tp "Hunting"); b – population number at 01.04.2007 according to independent data.

- | | |
|---------------------------------|------------------------------------|
| 1) 110/1991–92:0:0 | 6) 205/1991:24:8 |
| 2) 39/2005–08:39:26* | 7) 45/1994 th :20:10–16 |
| 3) 20/1980 th :19:21 | 8) 23/1995:0:0 |
| 4) 126/2002–03:77: near 60 | 9) 26/1990–91:0:0 |
| 5) 20/1980 th :0:0 | 10) 225/1994:79:64–85 |

* Visually observed from the helicopter in the winter of 2009 during the inventory.

** In June 2009 3 males and 3 females from Germany were added.

analyzed and similar trend leading to a sharp reduction of bison number in two major populations (Uladivska and Bukovynska) took place, as well as the decline of Tsumanska population in Volyn region to the limits of its survival. In recent years totally disappeared also the Daniv population in Chernihiv region.

Causes of dramatic reduction of E. bison populations in Ukraine

Present situation of E. bison in Ukraine results from termination of the state attention to the issue of E. bison conservation, development of poaching, and also the commercial hunting for bison under the guise of selective shooting, organized by State Committee of Forestry of Ukraine.

In all neighboring countries, where the population of E. bison is increasing, the government programs are focused on bison protection. These programs are

financed from the state budget or nongovernmental funds. In Poland in 2007 the “Strategy for European bison conservation in Poland” was approved by Ministry of Environment. On the regional level the project “Land of bison” was launched. For this initiative from the funds of European Union 956 thousands of euros are allocated. In Russia in 1997, the Interregional Program for bison preservation was approved; in 1998 the Working Group on the E. bison was established, and this group adopted the «Bison conservation strategy in Russia». In Belarus “The State program on resettlement, conservation and use of E. bison in Belarus” was approved in 1998 (Bartoshevich 2003). In Ukraine, only one joint decree of the Ministry of Environmental Protection and State Committee of Forestry of Ukraine “On approval of the Plan of Action for the conservation of bison in fauna of Ukraine” was developed (Kryzhanovs’kyj 2007). However it cannot be regarded seriously, as it does not include specific implementation dates, specific executors, and doesn’t guarantee any funding. In addition, the development of State financed program for E. bison protection finds no support in the Ministry of Environmental Protection.

The E. bison is desirable and fashionable trophy game for wealthy hunters. Even a threat of severe penalties (up to 1700 UAH), reimbursement (up to 2500 UAH), or imprisonment for up to three years is not stopping the poachers. In reality, poaching remains completely unpunished. A separate issue is also a complete lack of bison protection outside forest lands.

Kryzhanovskiy (2007) in process of explaining the reasons for the rapid reduction of the bison numbers relied on the official information about the selective shooting, and that’s why he made a conclusion about insignificant influence of this factor. A necessity of selective shooting of E. bison in Ukraine was officially scientifically grounded (Pererva *et al.* 1991). Article 19 of the Law of Ukraine “About the Red Book of Ukraine” allows, as an exception, acquiring Red Book species for breeding and scientific purposes (Zakon 2006). Instruction on the selective shooting of game animals, approved by State Committee of Forestry of Ukraine, determines that “*selective shooting is conducted in the case of the sick, injured animals, old animals with clear signs of degradation, underdeveloped two-years-old young animals, animals with uncharacteristic colour ... Shooting of healthy animals, which have no clear anomalies is strictly prohibited*” (Instrukcija 2006). All decisions regarding the selective shooting must be approved by the Commission of the Red Book. However, the first such agreement was achieved only in 2007, so during all this time such ”selective” shooting has been committed illegally. In addition, since 2000 the Committee of Veterinary Medicine has not issued any permission for the export of bison trophies (Letter of the State Committee of Veterinary Medicine 15–3–1–12/851, dated 26.02.2009).

Shooting of rare animals for profit attained its culmination after 2002, when State Committee of Forestry accepted an order «About the statement of limits of prices on hunting trophies, which are obtained by foreign citizens, and limits of tariffs on services, which they obtain» (Boreiko, Sesin 2007). This

document defined payment for services connected with commercial hunting on two species of animals listed in the Red Book of Ukraine: a bear (*Ursus arctos*) and the E. bison. According to this price list, for getting a trophy bison, which obtains a gold medal by the assessment of CIC, a foreigner had to pay 3100–3600 UAH, silver medal – 2600–3100 UAH, bronze medal – 2100–2600 UAH, for killing a female bison – 1100–1300 UAH, and young animal – 800–1100 UAH (www.svshunt.com).

Besides the Ministry of Environmental Protection has issued a «Regulations on the order of accounting, certification and issuance of permits for the relocation, getting (capture, shooting) E. bison for selection» dated by 19 of December 1991. This document was used only to attract foreign hunters for «selective shooting» of bison, take payments and use killed bison as a trophy.

It should be noted that the selective shooting of individuals incapable for reproduction, or those who have signs of genetic degeneration is consistently applied in Poland and Belarus (Kozlo, Bunevich 2007; Krasieńska, Krasieński 2004).

Since even animals with disabilities may sometimes have horns of trophy quality, they may be used to organize hunts for wealthy people, as it happens in Borecka Forest (Bozik 2008, Zoch 2008 – pers. comm.). Obtained in this way funds go for the support of E. bison breeding and purchase of additional forage. A quality of infrastructure for bison breeding in Poland convinces that it is really the case.

However unlike Poland, in Ukraine selective hunts were only a cover for shooting of any desired bison that brought substantial profits to organizers of such events. A characteristic sign is the lack of inventory data for E. bison and the loss of the original passport documents of Ukrainian population during the relocation of the Ministry of Environmental Protection to another building.

Original passports of founder animals we were able to find only in Zvirivske hunting husbandry for Tsumanska subpopulation.

The present status of E. bison populations in Ukraine

Until now E. bison survived only in Sumy, Kyiv, Vinnytsia, Volyn, Lvyiv and Chernivtsi regions. Their inventory was performed at the request of environmental public organizations; results are presented in table 1.

In May 2009 six bison (3 males and 3 females) were transferred from Germany to supplement the Skolivsko-Beskydska subpopulation.

Generally, in the Ukrainian population of E. bison, visible is a dominance of females over males (tab. 1). On one hand, males are more vulnerable to diseases including those associated with the consequences of inbreeding depression. However since the *balanoposthitis* occurred only in one herd (Nadvirnyanska subpopulation), which is now fully eliminated (Kryzhanovskii 2004), this imbalance is an evidence of VIP-poaching, under a cover of selective shooting, focused on males with horns of trophy quality.

Table 1. Sex and age structure of recent free living and semi-free (Zaliska subpopulation) E. bison populations in Ukraine

Name of subpopulation	Gender-age groups			
	to 1 year old	2–4 years old	Adult males	Adult females
Uladvivska	9	21	27	32
Kontopska ¹	2	13	17	7
Tsumanska	3 (3) ²	4 (4) ²	3 (3) ²	13 (5) ²
Lopatinska (Lowland line)	1	3 (2) ³	6 (2) ³	6 (4) ³
Styrska	2 ⁴	4 ⁴	5 ⁴	4 ⁴
Skolivsko-Beskydska	–	1	4	2
Bukovyńska	–	4	16	28
	2	6	7	12
Zaliska ⁵	4	4	4	9

¹ During visual observations from helicopter in winter 2009 only 26 individuals were observed.

² According to the inventory list of Tsumanska subpopulation in 2007.

³ According to the inventory list of Lopatinska subpopulation (Lowland line) at 16.02.2009.

⁴ According to the inventory list for subpopulation Zubr “Styr” as at 16.02.2009 year.

⁵ According to current information (27.06.09) there is a group of 19 bison and 2 old single males in Zalissia state residence consisting. Calves up to 1 year old – 2, youth 2–4 years old – 5, adult males – 6, adult females – 8.

Despite of present decline of E. bison populations they are represented in the majority of natural zones of Ukraine: Polesia, Carpathian mountains and forest-steppe. Currently E. bison populations in Ukraine live in quite large patches of woodlands, which are represented mainly by mixed coniferous-deciduous stands under various levels of exploitation. However for their survival in the winter time important are also meadow ecosystems and agrocenoses.

Because the majority of bison groups live on the territories of hunting enterprises, in winter they have an access to additional forage, which is prepared for other game animals.

E. bison populations at Bukovyna and National Park “Skolivski Beskydy” provide opportunity for the creation of transboundary herds of bison in cooperation with Romania, Poland and Slovakia.

During the end of 2008 and beginning of 2009 some animals belonging to Lowland-Caucasian line were introduced to the area of Lopatinsk herd, that was the last remnant of a pure Białowieża genetic line in Ukraine. This was done according to the Action Plan for Ukrainian E. bison conservation.

Protection of bison habitats in Ukraine

Currently bison are protected only in the National Park “Skolivski Beskydy” (Lviv region, 35684 ha), and in local reserves “Zubr” (Volyn region, 2732 ha) and “Zubrovtsyia” (Chernivtsi region, 11700 ha).

Bison live also on the territory of State hunting husbandry “Styr” within Lahodivske and Zabolotsivske Forestry, where their home range is 9563 ha. E. bison migrate or temporary stay at protected areas “Lahodivske” (6,2 ha), “Zabolotsivske” (46,2 ha), botanical reserve “Kempa” (10 ha), and hydrological reserve “Ponykivsky” (112 ha). Konotopska population remains within a regional landscape park “Serednoseymsky” (planned to convert into a national park) with total area of 53400 ha. The state residence “Zalissia”, which is the location of semi-free living herd, is planned to be transformed into a national park.

Condition of bison breeding in Ukrainian zoos

Unfortunately not all zoos of Ukraine have conditions for successful reproduction of E. bison, often exhibited are only single, old animal.

A survey in Ukrainian zoos showed that the acquisition of new animals is very difficult. It is almost unreal to receive the permit for capturing bison for zoo from the wild. In this situation it was much easier to buy American bison. As a result, one of the largest zoos in Ukraine – Kharkiv zoo – does not have E. bison at all, and breeds only the American species (Table 2).

Unfortunately, in state residence “Zalissia” and in Ukrainian zoos records of E. bison genealogy are questionable. In addition living conditions in Ukrainian zoos for E. bison are not good. Because of carelessness of zoo personnel, some animals have starved to death, e.g. the case of pregnant female in Cherkasy zoo.

Measures for improving the situation

The period between 1990th and 2000th have been unusually harsh for the population of E. bison in Ukraine. By that time the country ceased to be the leader regarding the numbers of this rare animal. The remnants of free living subpopulations have improper sex and age structure, and cannot survive without human intervention. In order to improve this situation we suggest to follow the experience of Poland, which now has the largest in the world population of this animal. Measures for the recovery of bison population should be based on scientific research, and include a change of law, secured financial support and educational activities. Let’s consider them one by one:

Scientific research. Created should be a scientific group consisting of zoologists, breeders from zoos, representatives of public organizations, which are engaged in work with bison, and representatives of the regional offices for environmental protection. Such research group could be associated with the Commission of the Red Book, and work in close cooperation with the Ministry of Environmental Protection. Such group should be in contact with European Bison Conservation Center and EB Friends Society (Olech 2008). Its primary tasks would be a reliable inventory of all subpopulations of E. bison with defined origin, and passing the data to the European Bison Pedigree Book (EBPB 2007).

Subsequent efforts should be aimed at identifying sites suitable for creating new free living populations of *E. bison*, including habitat type, access to drinking water etc. and focus on remote places with underdeveloped network of settlements (Kryzhanovs'kyj 2007). Also the conditions for the creation of transboundary populations should be studied that could lead to creation of several large herds numbering not less than 1000 heads, which will guarantee long-term survival of the species (Sipko, Kazmin <http://bp21.org.by/ru/art/zubrsipl.html>).

Because of vulnerability of *E. bison* to diseases, a routine veterinary control for all *E. bison* populations must be introduced, involving scientific veterinary institutions of Ukraine.

Legal measures. It is necessary to increase the protection category of *E. bison* in Red Book of Ukraine to the second category – vulnerable species. However, in the near future the species may be classified as «endangered», if the present trend would be continued. A crucial issue is the creation of legal mechanism for civil compensation of losses in agriculture caused by the bison (crop damage, destruction of fences, etc.), and the establishment of a possibility of state aid in the form of forage for additional feeding of the bison, to farmers and hunting enterprises having *E. bison* on their land. Also, a paragraph concerning the protection of *E. bison* should be added to the decree of the Cabinet of Ministers of Ukraine «On the list of activities related to environmental activities» (September 17, 1996 – 1147), to allow for easier allocation of financing from regional environmental funds for various purposes (additional feeding, relocation, etc.) related to *E. bison* conservation.

Organizational measures. Currently in Ukraine there is no state financed long-term program related to the whole bison population. There is only a joint document of the Ministry of Environmental Protection and State Committee of Forestry of Ukraine «Program of European bison (*bison*) reintroduction in the Skolivski Beskydy (Ukrainian Carpathians) until 2015», which was approved on 25 of October 2007.

Also, under the influence of environmental organizations, the Fund for Environmental Protection «Formation of National Ecological Network» is financing until 2011 a research project «Certification of subpopulations and development of the plan for *E. bison* resettlement in Ukraine based on the current state, the feeding base and optimal numbers; development and implementation of measures for its preservation, including informational and educational actions». The project with budget of 840 000 UAH is run by the Shmalhausen Institute of Zoology NAS of Ukraine. Such, few separate initiatives are of course not sufficient. It is necessary to follow the experience of neighboring countries i.e. to develop and approve the state financed program for protection and breeding of *E. bison* based upon the strategy for the conservation of the species. Important will be also the involvement of environmental non-governmental organizations and media.

Table 2. Situation of E. bison held at Ukrainian zoos

Zoo location	Numbers	Description	Plans
Kyiv	3	Female 17 years old, male 6 years old, and female 4 years old	No conditions for breeding more animals
Kharkiv	0	Only American bison	No plans
Odessa	1	Female	Purchase male
Mykolaiv	1	Old female	A desire to resume breeding of E. bison
Askania-Nova	0	Last old female died in 2008	A desire to resume breeding of E. bison
Rivne	0	-	A desire to begin breeding of E. bison
Vinnitsia	2+1	A calf was born in 2008	Continuation of E. bison breeding
Cherkasy	?	The recent death of pregnant female	Continuation of E. bison breeding
Mena (Cherniv region)	0	0	No data
Crimea zoos	1 (in Simferopol)	?	No data

Current situation in forestry and game management requires the creation of new or relocation of existing populations of E. bison from hunting enterprises (which are not interested in their protection) to nature reserves and national parks. It is necessary to actively promote the creation of new nature reserves in E. bison habitats, like a national park "Tsumanska Pushcha" in Volyn region, national park "Serednoseymsky" in Sumy region, special reserves for E. bison in Vinnitsya forestry and hunting enterprise "Stir", as well as provide expansion of existing protected areas: reserve "Zubrovitsya" in Chernivci region and "Zubr" in Volyn region.

Due to the significant problems connected with transportation of E. bison from abroad, it is time to create breeding stations for E. bison in Ukraine, similar to Pryoksko-Terasny reserve (Russia). The best place for it seems to be the state residence – and in the future national park – "Zalissia", which owns the necessary infrastructure.

Solved should be also the issue of bison breeding and the access to new animals by Ukrainian zoos, which if they will meet required standards, may become an additional source of animals to supplement populations in the wild. Similarly, it would be advisable to return to bison breeding in the steppe zone on the basis of available infrastructure in the biosphere reserve "Askaniya Nova".

Operational measures. Poaching, which is at the moment the main threat for

E. bison in Ukraine should be effectively dealt with, including the use of well-equipped specialized units for the protection of bison herds, and the thorough investigation of all known cases of E. bison poaching.

Public awareness and educational activities. Important component in the conservation of E. bison in Ukraine is a change in people's attitude towards this species. This can be done by developing and implementing educational programs for students in areas of with free ranging herds of E. bison, and dissemination of informational materials through Ukrainian hunting organizations and game magazines. Followed could be Polish experience in environmental education of students and tourists, or programs of Russian office of WWF "Adopt bison" and "Bison under good protection". People or institutions significantly contributing to E. bison protection could be awarded with a special medal similar to Polish Medal "Friend of the bison". An example of already started initiatives is the announcement of the year 2009 – The Year of Bison in Ukraine by the coalition of Ukrainian environmental organizations, including the Ukrainian Theriological School, under support of the Ministry of Environmental Protection.

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References

- Aleksandrovich N. P. 1999. Zubr (*Bison bonasus bonasus* Linnaeus, 1758) v ohotnichej dobyche naselenija srednevekovyh belorusskih gorodov (X-XVII vv.). In: Belovezhskaja puscha na rubezhe tret'ego tysjacheletija. Materialy nauch.-prakt. konf., posvjaw. 60-letiju obrazovanija gosudarstvennogo zapovednika "Belovezhskaja puscha", 22–24 dekabnja 1999 g., p. Kamenjuki, Brest. obl. (A. I. Luchkov ed.). BGU, Minsk: 245–246.
- Bandarenka V. D., Haetski P. B. 1999. Reaklimatyzacija zubra w zahodnym regyjone Ukrainy. In: Belovezhskaja puscha na rubezhe tret'ego tysjacheletija. Materialy nauch.-prakt. konf., posvjasch. 60-letiju obrazovanija gosudarstvennogo zapovednika "Belovezhskaja puscha", 22–24 dekabnja 1999 g., p. Kamenjuki, Brest. obl. (A. I. Luchkov ed.). BGU, Minsk: 251–253.
- Bartoshevich S. 2003. Kuda uhodjat zubry. In: Sovetskaja Belorussija (22 of March), „ 54 (<http://bp21.org.by/ru/art/a030322.html>).
- Boreiko V.Å., Sesin V.Å. 2007. Istreblenie zubrov v Ukraine, Belarusi, Polshe i Rossie. Materialy nezavisimogo rassledovaniä. Kyevisky ekologo-kulturny centr, Kyiv: 80 pp.
- Bozik K. 2008. Zubry w Puszczy Knyszynskiej. European Bison Conservation Newsletter 1:125–131.
- Danilkin A. A. 2005. Polorogie (Bovidae). In: Mlekopitajushie Rossii i sopredel'nyh regionov. T-vo nauchnyh izdaniy KMK, Moskow: 550 pp.
- Dulickij A. I. 2001. Mlekopitajushie Kryma. Krymskoe uchebno-pedagogicheskoe gosudarstvennoe izdatel'stvo, Simferopol: 178–179 pp.
- European Bison Pedigree Book. 2007. Bialowieza: 6–7 pp.
- Fedorenko A. P., Rogatko I. V., Lysenko V. I., Kotenko T. I., Volovnyk S. V. 1990. Tvaryny Chervonoi' knygy. Urozhaj, Kyiv: 56–57 pp.
- Geptner V. G., Nasimovich A. A., Bannikov A. G. 1961. Parnokopytnye i neparnokopytnye. In: Mlekopitajuwie Sovetskogo Sojuza. T.1. Moskow: 775 pp.

- Gerus K., Kryzhanivskyj V. 2005. Suchasnyj stan populacij zubra v Ukraini. In: Visnyk Lvivskogo universytetu. 39: 110–113 pp.
- Glunz R. 2008. Bluetongue disease at European bison – symptoms, section results, treatment, vaccination. In: Konferencija zubr w sieci “Natura 2000” in Cisna on 15–16.09.2008: 18–19 pp.
- Instrukcija pro selekciynij vidstril myslyvskyh tvaryn. 2006. In: Posibnyk dlja posadovyh osib korystuvachiv myslyvskyh ugid, upovnovazhenyh na ohoronu derzhavnogo myslyvskogo fondu Ukrainy, Donec’k: 202–205 pp.
- Katalog mlekoopitajuwih SSSR (pliocen-sovremennost). 1981. (I.M. Goromova and G.I. Baranovoj eds.). Nauka, Lviv: 380–383 pp.
- Kozlo P.G., Bunevich A.N. 2007. Individualnaja identifikacija zubrov po morfologicheskim, morfofiziologicheskim i etologicheskim priznakam v tseljah vybrakovki, eliminacii i upravlenija chislnostju subpopulacij. Minsk: 45 pp.
- Krasińska M., Krasiński Z. A. 2004. Żubr – monografia przyrodnicza. Warszawa-Białowieża: 312 pp.
- Kryzhanovskij V. I. 2004. State of contemporary existing European bison populations and the strategy of forming new free-ranging herds in Ukraine. In: Proc. Conf. “European Bison Conservation” (M. Krasińska, K. Daleszczyk. eds.) Białowieża: 78–82.
- Kryzhanovskij V. I., Samchuk I. G. 2004. Perspektyvy sohraneniya suschestvujuschih i sozdaniya novyh volnih populacij zubra v Ukraine. In: Problemy sohraneniya i vosstanovleniya zubra. Sbornik nauchnyh trudov. Danki: 5–11 pp.
- Kryzhanovskij V. I. Plan dij po zberezheniju zubra (*Bison bonasus* L.) v fauni Ukrainy. Zatverdzheno nakazom Minpryrody ta Derzhkomlisgospu Ukraïny «Pro zatverdzhennja Planu dij shhodo zberezhenija zubra (*Bison bonasus* L.) v fauni Ukrainy» vid 8.05.2007 r. – 231/163. (<http://who-is-who.com.ua/bookmaket/hunting2006/2/10/7.html>). Hunting and Fishing in Ukraine (special issue). – 2006. – P. 1–9.
- Olech W., Bielecki W., Bołbot A., Bukowczyk I., Dackiewicz J., Dymnicka M., Hławiczka M., Krasiński Z.A., Nowak Z., Perzanowski K., Raczyński J., Tęsiorowski W., Wyrobek K. 2008. Hodowla zubrów. Poradnik utrzymania w niewoli. Stowarzyszenie Miłośników Zubrów. Warszawa: 100 pp.
- Parnikoza I. Ju., Godlevskaja E. V., Shevchenko M.S., Inozemceva D. N. 2005. Ohrannye kategorii fauny Ukrainy (I. V. Zagorodnjuk ed.). Kievskij ekologo-kul’turnyj centr, Kyiv: 60 pp.
- Parnikoza I., Boreiko V., Sesin V. 2008. Dramatyczny spadek liczebności populacji żubra na Ukrainie: przyczyny i konsekwencje. In: Konferencija naukowa Żubr w sieci „Natura 2000”, Cisna, 15–16.09.2008: 44–46.
- Pererva V. I., Litus I. B., Kryzhanovskij V. I. 1991. Sostojanie pogolov’ja zubrov na Ukraine i perspektivy ego racional’nogo ispol’zovanija. In: Vestnik zoologii. 5:11–15 pp.
- Pucek Z. 1991. History of the European bison and problems of its protection and management In: Global trends in wildlife management (B. Bobek, K. Perzanowski, W. Regelin eds.) Trans. 18th IUGB congress in Kraków. Świat press, Kraków-Warszawa: 19–39 pp.
- Rozanov M. P. 1931. Opyt pereselenija belovezhskogo zubra v gory Kryma. In: Sbornik rabot po izucheniju fauny Krymskogo goszapovednika. Moskow: 60–62 pp.
- Sipko T. P., Kazmin V. D. Sovremennye problemy sohraneniya zubra i ih reshenie v Rossii (<http://bp21.org.by/ru/art/zubrsip1.html>)
- Sosnovskij I. P. 1987. Redkie i ischezajuwie zhivotnye: Po stranicam Krasnoj knigi SSSR. Metallurgija, Moskva: 367 pp.
- Statychnyj shhorichnyk Ukrainy. 2006. Konsul’tant, Kyiv: 182 pp.
- Trepet S. 2007. Gornye zubry Kavkaza. OOO «Kachestvo», Majkop: 60 pp.
- Zakon Ukrainy «Pro Chervonu knygu Ukrainy». 2006. In: Instruktyvni materialy iz zapovidnoi spravy Ukrainy (V. Borejko ed.), KEKC, Kyiv. T. 1: 114–127.