

## Research Needs

The most serious problems facing European bison, which need further study, were formulated some 25 years ago (Pucek 1967) and later supplemented in many other articles (including, Pucek *et al.* 1996a). These papers serve as guidelines for numerous studies on bison biology and ecology during the last decades predominantly in Białowieża Forest but also elsewhere. At present, research is focusing on the problems concerning European bison genetics and health. This chapter lists the problems that remain important for furthering our knowledge of this protected species, its recovery and management, and aims to encourage bison specialists to solve them. Some problems are divided into groups, indicating the areas where further scientific research is essential.

Undoubtedly, studies on the **genetic variability** of the world population should take precedence. As previously stressed, the fundamental problem for *Bison bonasus* is the very low level of original genetic variability. There is a serious need to assess the present genetic variability for the whole world population. Until now, the main method for such studies was by genealogical analysis, which is not sufficient for the whole population due to the lack of pedigree data. A genetic study must be completed with the analysis of genetic markers (molecular and/or biochemical) for the whole population to supplement the genealogical analysis. The results of these genetic studies should be included in breeding programmes aimed towards saving the genetic variability of the contemporary species. Such a coordinated programme already exists for some zoos (EEP – European Endangered Species Programme) but

should be extended to all captive herds. There is also a need for genetic studies to help plan reintroduction and re-stocking programmes.

The need for programmes to save genetic variability is also very important because of the probability of increasing homozygosity in European bison, which seems to be correlated with a lowered resistance in the species. Therefore, studies on recent European bison **diseases and parasites** need to continue and intensify in order to find the pathogens responsible. Application of these studies should lead to the elaboration of a programme for health protection and prophylactics.

Studies on European bison **ecology** are of particular importance. At present, there are not the sufficient scientific grounds for establishing the principles of rational planning for new reintroductions, re-stocking, and enlargement of the geographical range. Investigations on ecology, genetics, behaviour and management of bison populations are therefore required. Great progress has been made in this field during the last decades, concerning forest habitats and bison populations in Białowieża Forest. However, little information is available on populations inhabiting other environments such as the Caucasus Mountains (Russia) or the Carpathians (Poland, Slovakia, Ukraine). Therefore it seems necessary to conduct systematic studies on the ecology of free-ranging populations in other regions (mountains, forest-steppe zone, northern ranges of Europe) and in particular the animals from the Lowland-Caucasian line. Special attention should also be paid to those habitats where no supplementary winter-feeding is provided.



European bison enjoy wallowing in sandy spots.

M. Hławiczka

Standard **demographic and population characteristics** for the European bison are needed for habitats not yet studied, particularly in mountains. These should also include studies of daily and seasonal activity rhythms, seasonal migration and habitat preferences. Special attention should be paid to the behaviour of European bison towards people, forestry and agricultural activity, particularly in densely populated areas.

An important problem for the future concerns the **enlargement of the bison's range** in Europe, as well as its acclimatisation in new areas, both within and beyond the historical range of this species. Studies are required to determine the most suitable habitats for this species within and outside the limits of its contemporary geographical range. In particular, observations of reproduction, condition parameters, and the **behaviour** of free-living populations are important for future extension of the species range.

The **place and role of European bison as a component of the ungulate community** in forest ecosystems of the temperate zone should be determined based on extensive studies of their habitat preferences, foraging behaviour, food and energy requirements, etc., in relation to age, seasonal and geographic aspects. Habitat evaluation and utilisation by European bison in different ecosystems is needed. The effect of European bison feeding on tree stands or agricultural systems has also to be determined and damages estimated/evaluated.

Details of the increase in European bison populations should be continuously monitored both in captive and free-ranging populations. Models for the regulation of European bison numbers in different ecosystems are necessary for forecasting the effects of culling on world and local population dynamics.

Problems of **reproduction biology** are well understood in enclosed breeding centres (reserves), but less so in free-

ranging herds. Knowledge of the variation in the reproduction potential in different parts of the species reconstructed range and habitats, is required for estimating an increase in bison population numbers and their optimal density. For the future of any conservation programme, the study of reproduction is very important.

Due to the fragmentation of captive and free-ranging herds, there is a serious need for the application of modern technologies in the reproduction process; in particular, **sperm collection and freezing**, artificial insemination, and *in vitro* fertilisation. The establishment of a European bison Gene Resource Bank could be very important for the future of the species.

Research on the rational diet for European bison in captive and free-living herds and the role of supplements in different conditions is important; in particular, studies to determine if **supplementary winter-feeding** is necessary, in which regions, habitat conditions or season, and what kind of forage is most appropriate, if necessary, for the European bison in winter.

Studies on the **zoological characteristics of this protected species** should continue. Much has already been done in bison morphology (especially anatomy), and in some respects it is better known than the anatomy of cattle. However, we are still waiting for a monographic description of European bison morphology and development, as well as its variability in the contemporary range. These studies should be continued and material collected.

The recent *Outline of European bison physiology* (Gill 1999) indicates how much has been achieved during the long-term study of this species in Poland. More studies are necessary, to understand the bison's adaptations to different habitats; however, this would require access to representative data for the entire contemporary range of the species.



European bison on cultivated fields in Knyszyńska Forest, Poland.

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