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**The Evolution and Fossil Remains of
the European Bison****Bisoniana XVII**

The author discusses the evolution of species of the genus *Bison* H. Smith, dealing in greater detail with the origin of *Bison bonasus* (L.). The fossil remains of this species indicate that it was connected with the deciduous forest zone and did not appear in Central Europe until the late Holocene.

The genus *Bison* H. Smith appeared in the Pliocene of south and east Asia, where three species are known from this period: *B. sivalensis* (Falconer), *B. palaeosinensis* (Teilhard de Chardin et Piveteau) and *B. hanaizumiensis* Matsumoto et Mori. These forms have all the characters of the genus *Bison*, but are distinguished by the smallness of their body dimensions in comparison with the later representatives of this genus.

In the Early Pleistocene the genus *Bison* spread over Asia and reached Europe. In the Middle Pleistocene (and probably once again during the Late Pleistocene) it penetrated over the land connection at the Bering Strait to America, where its range extended as far as Florida and Mexico. It never spread as far as South America or Africa.

Monographs of the genus *Bison* are based so far only on part of the existing materials. Hilzheimer (1910; 1918) examined material from West Europe, Gromova (1935) from the Soviet Union and Skinner & Kaisen (1947) from North America. No defined evolutionary tendencies have been found within the genus. Teeth do not exhibit specific differences. Body dimensions vary, particularly the dimensions and shape of the horns. There would appear to be little justification for the distinction made by Skinner & Kaisen (*l.c.*) of numerous subgenera and species within the genus *Bison* in view of the established fact that the present-day forms readily crossbreed and that these systematic units differ only as to the shape and dimensions of the horns.

In Europe the genus *Bison* appeared in the Oldest Pleistocene (Villafranchien) first in the east, then also in the west of the continent. This

is a small form named *B. schoetensacki* Freudenberg. During the glacial period Mindel European bisons became larger and their horns more massive. During the Riss and Würm glaciations in Europe (together with England) and also in Asia as far as Manchuria the very large species of bison with powerful horns, known as *B. priscus* (Bojanus) occurred. It is one of the components of the Pleistocene steppe-tundra fauna and accompanies such species as the mammoth, woolly rhinoceros, horse and cave bear. Towards the end of the Pleistocene this species appears to have become dwarfed and in Denmark, according to Degerbol & Iversen (1945), a form is present similar to the present-day European bison, called by the two authors *B. bonasus arbustotundrorum*. The *B. priscus* line finally died out during the Dryas period towards the end of the Pleistocene.

There are two hypotheses as to the origin of the contemporary European bison, *Bison bonasus* (Linnaeus). Hilzheimer (1918) and after him the majority of zoologists in Western Europe, assume that there were two independent lines of development over the whole of the Pleistocene. One of them, including the small forest forms, leads from *B. schoetensacki* straight to *B. bonasus*. The great-horned *B. priscus*, inhabitant of steppe-tundra formed during the older glacial periods, developed independently and died without leaving progeny at the end of the final glacial period.

In Gromova's opinion (1965) there is only one line of development among bison in the Pleistocene of Europe, leading from *B. schoetensacki* through *B. priscus* to the extant *B. bonasus*. In cold periods such bisons were larger, and during warmer periods — smaller.

The fact that *B. bonasus* is connected with deciduous forests and does not appear in Central Europe until the Late Holocene, several thousand years after the extinction of the steppe-tundra form, *B. priscus*, indicates that the present-day bison was formed at any rate earlier than in the postglacial period, possibly during the final glaciation in one of the forest regions in Southern Europe.

In view of the absence of *B. bonasus* in the Iberian Peninsula and to the south of the Appenine Peninsula it is most probable that this took place in the Caucasus Mountains region. The bison did not expand its range to the north and west from this region until the late post-glacial period.

Remains of *Bison priscus* from the final glaciation period, or not exactly dated, have been found in Poland. Complete skulls of this species have been described by Niezabitowski (1948) and Krysiak (1952). Remains of *B. bonasus* are few in number and in general not dated (Niezabitowski, 1931; 1938); they have been found in Pomerania, in the Wielkopolska district, in the Rzeszów and Podhale regions. Bochenek (1955) described remains of the bison from the 13th century castle at Szaflary in the Podhale region. The list given by Paaver (1965) shows that the bison did not appear in Lithuania or Latvia, that is, to the north of Poland, until the beginning of the present era, and that it is more numerous in the second millenium of our era. The European bison never penetrated as far as Esthonia, beyond the

limit of deciduous forests.

There is an urgent need to obtain a knowledge of the remains of *Bison bonasus* from Europe, especially those which can be dated by the radioactive carbon method, pollen analysis or by their connection with traces of human culture. This will make it possible to obtain a picture of the process of the postglacial expansion of this species, and then of its disappearance as the result of human activities. For the purposes of the paleontology of the genus *Bison* it would be useful to obtain a knowledge on recent material of allometry in the skull of the contemporary bison, which would then facilitate evaluation of the value of characters considered of systematic importance.

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EWOLUCJA I SZCZĄTKI KOPALNE ŻUBRA

Streszczenie

Omówiono ewolucję gatunków rodzaju *Bison* H. Smith, zajmując się szerzej pochodzeniem *Bison bcnasus* (L.). Szczątki kopalne tego gatunku wskazują, że był on związany ze strefą lasów liściastych i w Europie środkowej pojawił się dopiero w późnym holocenie.