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ABSTRACT BOOK

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The exploitation of mammoth in the Swabian Jura (SW-Germany) during the Aurignacian and Gravettian Periods

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In this presentation, we aim to give an overview on the exploitation of mammoth in the Ach and Lone valleys in the Swabian Jura (SW-Germany). Both valleys are former tributaries of the Danube River. Almost all the caves have revealed mammoth remains in different quantities, but there is a striking difference between the Aurignacian (42-34 ka cal BP) and the Gravettian period (34-30 ka cal BP) concerning the exploitation of mammoth for diet and raw materials, which we would like to discuss, along with some aspects of their ecology.

A continuous stratigraphic transition from Aurignacian to Gravettian is well documented in the caves of the Ach Valley, especially at Geißenklösterle and Hohle Fels. In the Lone Valley, where the Aurignacian assemblages are well represented, hardly any archaeological remains were assigned to the Gravettian. A very small Gravettian assemblage is known from Bockstein-Törle.

For the Ach Valley we focus on the caves of Hohle Fels,

Geißenklösterle and Brillenhöhle. Here the first excavations started in Hohle Fels by Oscar Fraas 1870/71. Later in the 1960s the University of Tübingen conducted excavations in the Brillenhöhle, and during the 1970s Joachim Hahn excavated in Geißenklösterle and Hohle Fels. Since 1997 Nicholas Conard conducted yearly excavations in Hohle Fels. For the Lone Valley we focus on the caves of Vogelherd, Hohlenstein-Stadel and Bockstein-Törle. In the Lone Valley the research history also started by Oscar Fraas in 1862. In the 1930s the Vogelherd cave was excavated by Gustav Riek and the Hohlenstein-Stadel by Robert Wetzel. Between 2005 and 2012 as well as 2009 and 2013 recent excavations took place in the backdirt of the Vogelherd and inside the Hohlenstein-Stadel.

Hunted Game and Diet: The faunal composition during Aurignacian and Gravettian is quite constant (Münzel and Conard, 2004a, b; Conard et al., 2013). The caves of the Swabian Jura revealed species characteristic for the

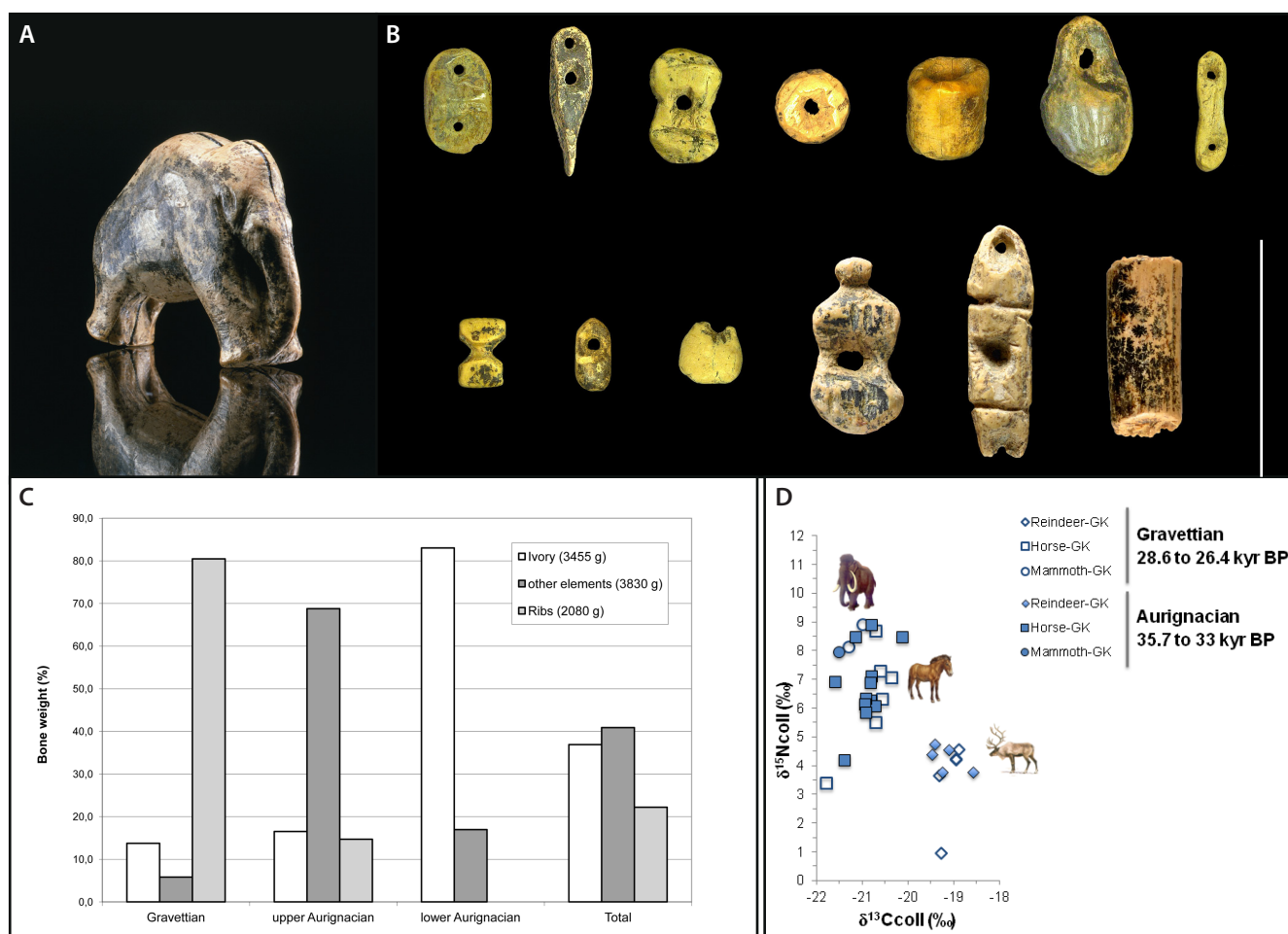


Fig. 1. A, Aurignacian ivory figurine of a mammoth from Vogelherd cave (length: 3,7 cm). Foto: J. Lipták, copyright University of Tübingen; B, Aurignacian jewelry from Hohle Fels (scale bar equals 3 cm). Fotos: S. Wolf, H. Jensen, copyright University of Tübingen; C, Skeletal element composition of mammoth in Geißenklösterle cave, Ach Valley; D, Carbon-13 and nitrogen-15 abundances of mammoth, horse and reindeer. The overlapping between mammoth and horse reflect the occupation of the expected mammoth habitat by horse.

mammoth-steppe environment, such as woolly mammoth, woolly rhinoceros, wild horses and reindeer. There is, however, a difference in the number of cervid species between the two periods. During the Aurignacian, four different cervids were present in the Ach Valley, namely giant deer, red deer, roe deer and reindeer. Each of these cervids has different nutritional needs and represents a different ecological niche. During the Gravettian, however, only reindeer and red deer remained. This indicates a climatic deterioration from the Aurignacian to the Gravettian and toward the upcoming Last Glacial Maximum.

Mammoth remains are present in all the cave sites, and butchering marks indicate a careful processing of the game. However the skeletal element representation is biased towards ivory and ribs (Münzel, 2005) and Aurignacian and Gravettian people had clear preferences in the use of raw materials (Fig. 1C): While ivory was an important raw material during the Aurignacian for all kinds of everyday tools, such as chisels, retouchers, and projectile points, as well as for personal ornaments (Fig. 1B), figurative art (Fig. 1A), and flutes, the Gravettian people rarely used any ivory that was mainly chosen for the production of personal ornaments. However, the ivory beads in the Gravettian are accompanied by an increased number of pendants made from teeth, which are rare in the Aurignacian assemblages. Furthermore during the Gravettian, projectile points and other tools have been exclusively made from bone, most often mammoth ribs.

Raw material ivory: Differences also occur between the caves of Ach and Lone valleys concerning the procurement of ivory. During the Aurignacian, people treated and used ivory differently at each of the sites. While already prepared smashed parts of the tusk were brought into Hohle Fels and people worked with fresh ivory there, in other caves, such as Vogelherd and Hohlenstein-Stadel, whole tusks were stored (Wolf, in press).

Ecology of mammoth: The question of the density of mammoth population over time in the Swabian Jura needs also to be considered. The specificity of the ecological niche occupied by the woolly mammoth is clearly reflected by their distinct stable isotope signature in collagen (Fig. 1D). The abundances of carbon-13 in mammoth collagen are comparable to those of other grazers like horse, while the nitrogen-15 abundances are significantly higher (about 3‰) than the other herbivores. This enrichment, comparable to the one expected for a carnivore, is attributed to the consumption of mature grasses from disturbed areas (Bocherens, 2003). In Geißenklösterle, the mammoths delivered the expected stable isotope signature, but the nitrogen-15 of horses showed an unexpected overlap with those of the mammoth. A change in the habitat of mammoth would affect the pattern in another way, with nitrogen-15 abundances of mammoth collagen as low as those of horse (Drucker et al., in press). Thus, we hypothesize that during Gravettian the ecological niche of mammoth was intact but

not occupied intensively by mammoth due to a decline in their population. This decline could be tentatively explained by human pressure through hunting. In this scenario, the interspecific competition between horse and mammoth would be replaced by an intra-specific one among horse individuals, some of them occupying the niche vacated by mammoth.

After the LGM, the exploitation of mammoth plays a minor role. Mammoth populations seemed to have already decreased during the Gravettian based on the stable isotope results, which show that mammoths might have been slowly replaced by horse already prior to the LGM.

This raises the question: what caused the change in mammoth exploitation? Mammoth infant remains are present in both periods (Münzel, 2005), indicating that adult mammoth cows persisted in the region providing both ivory and bones. Thus, we suggest a cultural break in raw material use and a change in technology from the Aurignacian to the Gravettian against a mammoth population already numerically reduced by human exploitation well before the LGM.

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