D Germany
D 27 FLINTSBACH-HARDT, BAVARIA

Flintsbach-Hardt and the Jurassic hornstones of the Ortenburger Kieselnierenkalke in SE-Bavaria

Wolfgang Weißmüller

SE-Bavaria (Fig. 1), the region east of Regensburg, is famous for its exceptionally rich Neolithic remains (Linearbandkeramik, Oberlauterbach, Münchshöfen, Altheim — cf. Brink-Kloke 1992; Bayerlein 1983; Süß 1976; Driehaus 1960). Furthermore, there are also numerous Palaeolithic sites of more than just regional importance which have been discovered recently (in the eighties — Salching with a Perigordian-Gravettian, cf. Weißmüller 1987a; 1987b, and Hirnschnell with a leaf-point Middle Palaeolithic, cf. Weißmüller 1995; in the nineties — Vilshofen with a Middle Upper Palaeolithic and an early Magdalenian with triangle scalènes, unpublished), despite the fact that the region is poor in primary silex-sources due to its geological history. (Following French terminology — e.g., Demars 1982, the term silex is used in an archaeological sense to designate flakeable stone-material; in German terminology the term flint often is confined to designate Cretaceous silex, e.g., Nordischer
Kreide-Flint, whereas Hornstein often is confined to silex coming from formations built up by limestones — cf. Wiegers 1950). In the neighbouring northern crystalline Moldanubian basement (Bohemian Massif or Bayerischer Wald) flakeable stones have only been preserved to a negligible degree (Wolf 1974; Valde-Nowak and Weiβmüller 1994). In the Tertiary region south of the river Danube (Tertiäres Hügelland), flakeable stones are more common. Here they are of heterogeneous composition, because they have been washed together by the river Danube from different sources in the Western Alps and the Swabian-Frankonian Alb.

As a result of the sinking of the region south of the Bohemian Massif due to the upfolding of the Alps, the surface outcrops of silex-bearing rocks are confined to small blocks of Jurassic age, which are scattered along the river Danube. These silex-bearing rocks belong to the so called Ortenburger Kieselnierenkalke (Malm beta or Upper Oxfordian — for literature on the geology of the Jurassic rocks east of Regensburg see Ammon 1875 and Gröschke 1985).

The archaeological study of these raw-material sources was prompted by the discovery of the Upper Palaeolithic site of Salching (for references to the Jurassic hornstones of the Ortenburger Kieselnierenkalke in the archaeological literature

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Fig. 1. The Ortenburger Kieselnierenkalke in SE-Bavaria (triangles): 1 — Flintsbach-Hardt (D 27); 2 — Maierhof/Weng (D 13); (Moser 1980).
before 1988 see Maier 1964; Moser 1980; Engelhardt and Pleyer 1985; Petrasch 1987). A systematic survey, which was based on the existing geological literature, was carried out in 1983 (Röhling 1987). In 1988/89 it was possible to study in detail the biggest of these outcrops, the site Flintsbach-Hardt in the district of Deggendorf (Weißmüller 1991, 1993). The results of this work are outlined below.

Fig. 2 shows the distribution area of silex in Flintsbach-Hardt, which, according to the artificial shape of the pieces, has to be regarded as the result of prehistoric mining. In the area close to the northern border — today agricultural land — a trench of about 90 m length was cut (Fig. 3), the profile of which shows three layers (from bottom to top):

1. Grey, in the upper section heavily weathered sandstone with ferro-manganese concretions (in Fig. 3 documented only in m 44–63 and m 123).

2. Compact loams of different colours, with silex-nodules and smaller pieces of heavily weathered sandstone-fragments in situ.

3. A loose mixture of sandstone and loam, in it a great amount of worked silex-nodules; additionally some quartzite-hammers, remains of ferro-manganese-concretions and of heavily weathered sandstones.

According to the local geological stratigraphy (Gröschke 1985: fig. 5), the sandstones of Layer 1 correspond to the Jurassic sandstones of the so-called Flintsbach-Formation (Bajocium? to Bathonium), whereas the compact loams of Layer 2 consist of the residual-product of the silex-bearing Ortenburg-Formation (Upper Oxfordian). These loams formed the raw-material source, which was sought by prehistoric men. Layer 3 is the result of the prehistoric mining.

Layer 3 sharply cuts into Layers 2 and 1, forming irregular pits, which are about 10 m apart (see m 44, m 66, m 74, m 84, m 94 and m 101 in Fig. 3). These pits have to be regarded as prospecting pits.

The remains documented in the excavation of 1988/89 can be interpreted as follows: Firstly prospecting pits were dug in order to investigate the depth of the silex-bearing layer; these then were superficially exploited to a previously determined depth. In the course of exploitation (going against the inclination of the slope; see Fig. 4) the earlier pits were filled with the newly produced overburden.

According to mining terminology, the mining-process outlined above can be attributed to man-deep pit hollow digging (manntiefer Kuhlenbergbau) starting with prospecting pits.

In order to learn more about the character of the distribution of silex in Flintsbach-Hardt, four additional smaller trial trenches were excavated in the area (today woodland) south of the profile trench (Fig. 5). In Trenches 3 and 4, the amount of worked silex is very similar to that which was found in the sample taken from the profile trench. We can therefore suppose that the mining activities in the area of Trenches 3 and 4 were similar to those documented in the profile trench.
Fig. 2 Flinsbach-Hardt. The distribution of silex with the position of the profile trench and the trial trenches 1 to 4 of the years 1988/89. The valley system west of the silex distribution is the Flinsbach.
Fig. 3. D 27 Flintsbach-Hardt. Profile in the trench of the excavations 1988/89 seen from the north. Scale 1:200. Layer 1: “Sandstein” (sandstone); Layer 2: “Knollenführende Lehme” (hornstone-nodules-bearing loams); Layer 3: “Prähistorische Eintiefung” (traces of the prehistoric mining activities).
Fig. 4. D 27 Flintsbach-Hardt. View of the prospecting pit in m 66 (compare Fig. 3) taken from the west in August 1989.

Fig. 6 shows the flaking concept overwhelmingly present at Flintsbach-Hardt: a simple unipolar flaking for the production of blade-like flakes without edge-abrasion (Tixier 1972; Weißmüller 1986), being adjusted to the mainly spheroid shape of the nodules and to their rather small size (10 — 15 cm). This simple concept is, as is the mining method, typical of the Neolithic period. A $^{14}$C-date obtained from the profile trench (Hv 17011) of 3635 ± 160 BP supports this chronological setting. The sample was taken from a dense charcoal band, which was about 40 cm long and was found at a depth of 110 cm in m 63 (compare Fig. 3). In regard to the size and shape of this charcoal band one can deduce that it was once a large piece of wood (possibly a plank), which was most likely deposited at the time of the mining-activities. The date of 4460 cal BC (calibrated by the method proposed by Stuiver and Reimer 1993) places the mining-activities, as documented by the profile trench in 1988/89, at the end of the Middle Neolithic (younger Oberlauterbacher Gruppe; see Petrasch 1990). Due to the rareness of primary raw-material sources in the region, it is not surprising, that in the area of Flintsbach-Hardt older finds of the Palaeolithic age were also discovered (Middle Palaeolithic with leaf-points, Upper and Late Palaeolithic and even Mesolithic — Weißmüller 1995), which show much more complicated flaking concepts. Finds of younger periods (Eneolithic and possibly Bronze Age) were also present.
Fig. 5. D 27 Flintsbach-Hardt. Sediment-samples from the area of distribution of silex. **Sample A:** geological sample of the undisturbed raw material-source in the residual-loams of layer 2 in m 89 of the profile trench 1988/89 (see Fig. 3); **95/63 III:** sample of mining overburden in m 63 of the profile trench 1988/89 (see Fig. 3); 1–4: sample of Trenches 1−4 in the area of the superficial outcrop of silex (see Fig. 2); profile width: 50 cm. Pie-charts: large white sector = weight of loams; black sector = weight of silex; small white sector = weight of other rock material (quartzite-hammers, sandstones and ferro-manganese-concretions). Histograms: relation of natural (or not clearly worked) silex and clearly worked silex (cores, flakes and chips). Numbers: relation of bulbs to remnants of striking platforms (butts).

Fig. 6. The flaking concept overwhelmingly present at Flintsbach-Hardt.
The structure and composition of the distribution of silex in Flintsbach-Hardt on the whole must, therefore, be regarded as the remains of mining activities dating from different prehistoric periods. The climax, however, must be attributed to well organised activities of the Middle Neolithic, as was detected by the profile trench. Numerous enterprises of a smaller and more individual scale prior and after this period are responsible for the present situation.

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The silex-nodules of the Ortenburger Kieselnierenkalke usually are of spheroid shape. If taken out of their primary source (the unweathered limestone rock), they have a dark-grey to black-grey colour and the cortex is very thin or non-existent. Their characteristic appearance is first seen in their secondary deposition, which may be a residual-loam or an archaeological layer: the colour changes to light-brown or bluish-grey, numerous fossils become visible and the natural surface of the nodules is transformed to a thick light-coloured cortex.

On account of their cryptocrystalline structure and their transparency, the silices of the Ortenburger Kieselnierenkalke could be called "jasper" — as did Moser 1980. But according to the terminology of the geologists and archeologists in Bavaria it is named "Jurassic hornstone" ("Jura-Hornstein"). For a more narrow classification, the term "Jurassic hornstone of the Ortenburger Kieselnierenkalke" is proposed.

Due to their small diameter, the Jurassic hornstones of the Ortenburger Kieselniernenalke were probably not of interregional importance; it would be, however, necessary to verify this assumption by future investigations. Especially in Bohemia and Upper Austria one would expect hornstones of the Ortenburger Kieselniernenalke; even in Lower Austria and Moravia single specimens are imaginable. The author will be pleased to send samples of Flintsbach-Hardt for comparisons to interested institutions.

The Jurassic hornstones of the Ortenburger Kieselniernenalke do, however, because of their characteristic appearance and their confined outcrops, offer the ideal possibility to study the circulation of a raw material variety within a given region. Such a study on a microregional scale has already been published (Schötz 1988; see also Grillo and Schopper 1992); a more comprehensive survey, the dissertation of A. Grillo (Tübingen), should appear shortly.

REFERENCES


