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The flint-mine of Sümeg-Mogyorósdomb

Erzsébet Bácskay

The mine is situated in the western part of Hungary (Transdanubia) in Veszprém county, at the SW end of the Transdanubian Mid-Mountains, a range running diagonally across the central part of Transdanubia (N 46° 59', E 17°), on a hill-slope about 2 km S from the town of Sümeg. Geographically it has a very favourable position, being at the contact area of various geographical regions; the mountains, the lowland of the River Marcal to the W a few km away meets a hilly region. Before its establishment as a Nature Conservation Area at the beginning of the eighties, the site was a rather barren pasture for a long time.

HISTORY OF RESEARCH

The mine was discovered in 1958–59 during geological mapping (Fülöp 1964:120). In 1960–61 L. Vértes (Hungarian National Museum) made excavations in that part of the hill which later proved to be the northern part of the mining area. He described the basic mining methods, tools and determined the age of the site as well as its place among the European mines (Vértes 1964). His work was supplemented by zoological and botanical investigations (made by M. Kretzoi, M. Miháltz-Faragó and M. Járai-Komlódi as well, respectively, cited by L. Vértes (1964:211) as well as by studies made by J. Stieber (1964:214–5) on the palaeobotany of the charcoal. The first radiocarbon date for the mine was also yielded by a charcoal sample originating from Vértes’ excavation (Damon and Long 1964:212–5).

Between 1963 and 1976 the Hungarian Geological Institute conducted systematic mapping of the whole area combined with the aid of trial trenches (Fülöp 1971, 1973:72). These works were directed by J. Fülöp. After 1976 excavations were made for the purpose of better knowledge of mining in various (northern, central and southern) parts of the area concerned. The thorough knowledge of the whole site was possible by the excavation of complete or near complete exploitation units. By 1986 a complete gallery in northern part and longer sections of several ones in the central and southern parts were unearthed (Bácskay 1978:391–2, 1979:413, 1980:180). Southern and eastern boundaries of the mining area were located in 1980 when
geophysical measurements were also made. (Erkel et al. 1979:65; Pattantyús and Simon 1986:123–4). The mining area has an extension of approximately 300 x 50 m, about a one-fifth of the whole area is excavated so far (Fig. 1). After 1986 there has
been no major excavation in the mine; efforts were concentrated on field surveys of the Mogyorós hill near the mine and in the environment of the site, the aim of which was to detect possible traces of workshops or of miners’ camps, etc. (Bácskay 1987:17–21, 1989:478–9).

GEOLOGY AND THE CHARACTERISTICS OF THE RAW MATERIAL MINED

In certain parts of the Mogyorós domb there are flint-bearing Tithonian–Berriasian–Valanginian (Lower Cretaceous) calcareous marl layers in an almost vertical position of tectonic influence between two fault lines (Fülöp 1964a:213–4, 1964b:120, 1984:5–6). This position made it relatively easy to reach and extract the raw material. Fig. 2 shows part of a gallery cut into these layers. The boundaries of the mining area roughly coincide with this tectonically disturbed area.

Tithonian and Upper Berriasian flint was mined. In the eastern part of the mining area the flint appears usually either in the form of 40–50 cm wide lenses or even more

Fig. 2. H 2 Sümeg-Mogyorósdomb. Part of an open-air gallery cut into flint-bearing calcareous marl layers of nearly vertical position in the N part of the mining area (part of the 1976 excavation, trench E 6/2. Photo: E. Bácskay.
frequently in the form of irregular nodules of 15 cm length. The quality of flint here is rather poor, being spongy, and crumbling. In the western part, however, flint appears usually in the form of nodules, the raw material here is much more hard and compact, more suitable for making tools, than the other type. Mining activity therefore concentrated first of all on the western part. The mined “flint” is a radiolaritic chert, it is from light to dark grey, but in some places also a brown and a pinkish variety occur.

MINING METHODS AND EXPLOITATION UNITS

Mining methods were determined by the geological conditions (Vérites 1964:190–7; Fülöp 1975:72). The process was reconstructed by Vérites; according to him after removing the soil-cover the miners extracted the nearsurface nodules by expanding and breaking the layers of laminated calcareous marl with antler tools. They developed a system of open-air galleries parallel to each other driven along the strike of the strata. They left the spoil in the mined galleries and later the abandoned galleries were usually filled in by the spoil of other ones. This had happened several times and, between the periods of these dumpings, soil was formed in the galleries. The result of all these processes is an infilling in which calcareous marl and flint debris layers alternate with humus layers. The average depth of galleries in the northern part is about 2 m, their width is between 2.5 and 3 m, with various lengths (Fig. 3). The northern part of the mine represents the more advanced type of mining on the site. Where bigger or better quality nodules were found at a greater depth, underground vaulted galleries (adits) were made. Also some double galleries and “stepped” passages leading down to galleries were observed by Vérites (1964:194). In the central part of the mine simpler, shallower galleries were deepened and in the southern part the extraction was made in rather shallow pits usually joined together, forming shallow “galleries”, often 7–8 m wide. The activity was irregular over the mining area. Where only poor quality flint was found and/or the flint layers were not rich enough only shallow trial pits were made. Some of them were unearthed at the northern margin of the site. It seems that the basic rules of mining remained practically unchanged during the whole time-span of the mine because they were determined by geology and lithology. The application of more advanced techniques in the northern part may be attributed to an improvement of technology in the course of time. Maybe it reflects some inner periodization which is supported also by the difference of radiocarbon dates for the N and S parts of the mine (some 1000 years’ difference; the S part is the older — BácsKay 1986:13).
Fig. 3. H 2 Sümeg-Mogyorósdomb. Cross-sections of some pits and galleries in the N part of the mine:
1 — humus; 2 — light brown or reddish brown clayey infilling with mining debris; 3 — mining debris without cementing material. Drawn by J. Fülöp
Fig. 4. H 2 Sümeğ-Mogyorósdomb. Some characteristic mining tools made of red deer antler: 1 — maul; 2 — expanding wedge; 3 — “hammer”-head; 4 — pick.
MINING TOOLS AND OTHER FINDS

More than 500 antler implements and 800 quartzite pebbles with traces of use were found so far in the mine. Antler tools were made of the antler of *Cervus elaphus* L. (red deer). They are mostly mauls (Fig. 4:1), wedges, expanding wedges (Fig. 4:2), picks

![Images of mining tools and antler fragments.](image)

Fig. 3. H 2 Süme-Mogyorósdomb. 1–2 — Quartzite pebbles used as “hammerstones”; 3 — andesite axe with shaft-hole; 4 — antler fragment with incised decoration.
(Fig. 4:4). Some perforated pieces, usually called "hammer-heads" occur, too (Fig. 4:3), though they could be also sockets for other tools. Most probably the calcareous marl was attacked by mauls (beams of antlers) and expanding wedges were made from the tines of the antler to help reach the nodules. Tines were used to pick out flint nodules. With the numerous quartzite pebbles (Fig. 5:1–2) the calcareous crust or the remains of the parent rock were removed from the nodules. Some of them were most probably used as "hammer-stones" to break up bigger nodules. Heavier ones were used as hammers to drive antler wedges in. The determination of tools was made by Vértes (1964:190–204) who gave a detailed description of both the tools and the mining techniques.

The author of the present paper may add the observations of her experiments; she needed basically two "types" of antler tools to extract flint; a maul and an expanding wedge (if the tines were left on the antler this "composite" tool is the best to work with). An alternate use of the beam (pounding) and of the tine (expanding) helped her to extract about 1 m³ material (marl and flint together) during an hour. The antler tools were suitable to work both at the end of an abandoned adit and in a shallow pit where flint was near the surface. These experiments again proved the high efficiency and suitability of antlers for this type of work. It is highly probable that as in other flint mines at Sümeg some tools made of perishable materials (wood, leather, etc.) were used, too. Flint and stone picks were absent from Sümeg and there are only a very few other tools and finds as well; a rough basalt hammer and an andesite axe with a shaft-hole (Fig. 5:3) were found as sporadic finds. Some antler tool fragments with incised geometric decoration as rather unique finds in the inventories of flint mines (one of them is shown in Fig. 5:4) can be mentioned.

Some remains of domesticated animals were found in the mine (horncores of goat, bones of cattle and some small ruminants) as well as a few bones of red deer, horse, aurochs, bones and antlers of roe deer. They were food-garbage, except roe deer antlers which show some wear and tear traces of use (Vértes 1964:211; Bácskay and Vörös 1980:45; Vörös 1985). On some antlers excavated by him Vértes (1964:190) observed traces of fire which he interpreted as proof of a fire-setting method used in the mine. Later investigations, however, have not furnished new evidence for this.

QUANTITY OF OUTPUT

A tentative appraisal based on the yield of an "average" gallery (12.5 x 3 x 1.5 m) in the northern part produced the possible bulk of 11,600 m³ (i.e., 30,000 tonnes) extracted flint for the total mining area. One third of the whole quantity of material extracted was considered as net quantity of flint directly usable (Bácskay 1986:12).
PALAEOECOLOGICAL DATA

The favourable geographic and ecological conditions of the Sümeg area are mentioned above. The analysis of plant remains found in the mine suggests that earlier the vegetation of the Mogyorós hill was denser owing to better soil conditions and climate. The undergrowth was rather thick (mostly shrubs). Palynological remains prove a wet soil, even the existence of small ponds or seasonal marshes, evidences of a more humid climate (Vértes 1964:211; Lőrincz 1985). The same vegetation and climate are suggested by the study of small mammals (Kordos 1985) and of malacological remains (Krolopp 1985). The only evidence is furnished by Stieber's investigations demonstrating the presence of many deciduous trees — numerous Quercus, less Acer, Fagus and Castaneae. However, if they are the remains of campfires — as suggested by the archaeological context — and not the remains of forest fires — they need not necessarily represent the vegetation of the direct environment of the site (Stieber 1964:214–5).

FLINT PROCESSING

There is no direct evidence of flint processing in the mine or in its vicinity. Yet field surveys in the Mogyorós hill and in the lowland area a few hundred meters’ distance to the W from the site yielded some results of indirect character. Numerous chips, flakes, half-products and a few finished flint tools were found on the surface in the Mogyorós hill indicating the presence of some flint processing, though they were found in a secondary position, due to the heavy erosion on the hill. Heavy erosion could also cover the remains of miners’ camps (Bácsay 1987:17, 1989:479).

Between 1987 and 1992 field surveys were made at a spot, about 800 m west of the mine where in a swamplike meadow near the source of the river Marcal in the peaty soil flint nodules, pieces, flakes, cores, half-products and finished tools made of mined Sümeg flint were found. These finds occurred together with Late Bronze Age (Urnfield Culture) and with Medieval pottery. This shows that the people of the Urnfield Culture did use flint, though we do not know whether the flint was mined or not. According to data from some European flint mines we must not exclude even small-scale exploitation of Sümeg flint at a later period as well. However, Sümeg flint found on the spot may belong to an earlier settlement there, because since Neolithic times a large volume of eroded soil had been accumulated on the slopes of the Mogyorós hill and in the Marcal River valley which may have covered this settlement. Furthermore earlier there was a spring of high yield in the now swamplike meadow mentioned above, therefore the place might have been ideal for both a camping and processing site for miners (Bácsay 1992).
CHRONOLOGY AND CULTURE IMPLICATIONS

The chronological position of the mine can be determined in three ways. We have three radiocarbon dates. The first one was from a charcoal from Vértess excavation: A-246 4520 ± 160 BP (Damon and Long 1964:212-3). The sample was taken from the N part of the mine (for the location of samples taken for analysis see Fig. 2), and suggests a Middle Copper Age date. In addition to this, two new dates were yielded by two antler samples from the N and S parts of the mine: Hv-11611 4840 ± 110 BP (N part) and Hv-11610 5960 ± 95 BP (S part). The three dates are given here in their uncalibrated form. Date Hv-11611 corroborates A 246. Hv-11610 is older and suggests a Middle Neolithic period (Bácskay 1986:13).

According to the archeozoological investigations made by Vörös the four horn-cores of typical aegagrus goats and a vertebra of a horse found in the mine together suggest a period between the Middle Neolithic and the end of the Middle Copper Age when the joint occurrence of these animals is known on Hungarian sites (Vörös 1985; Bácskay and Vörös 1980:45).

Since 1976 a systematic survey of Neolithic and Copper Age sites in Hungary has been in progress. The aim of this project is to trace mined flint of Sümeg origin at settlements and to determine the role of Sümeg flint in the life of settlement inhabitants. The results of this survey may answer questions related to the time and scope of activity in the mine, the cultural identifications of the miners and of the users of flint, etc. Till the end of 1994 mined Sümeg flint has been found at 12 sites in Transdanubia (Fig. 6). The map shows clearly that the raw material was transported first of all to the SW and S of the mine, while a distribution of minor importance is to the NW and the SE of the site. The sites belong to the Middle Neolithic Transdanubian Linear Pottery Culture (Zseliz — Želiezovce — Culture as well?), to the Late Neolithic Sopot and Lengyel cultures, to the Early Copper Age — Middle Copper Age Balaton-Lasinja Culture and to the Late Neolithic Copper Age Pécel Culture. This corresponds well to the other chronological data furnished by radiocarbon dating and archeozoology. Presumably it means that the mining activity had started during the Transdanubian Linear Pottery Culture period and mining activity remained more or less continuous during the Neolithic and Copper Ages till the end of the Pécel Culture. If the flint material found at the Marcal source at Sümeg were also mined pieces, certain extraction — or at least use — of the raw material seems plausible after the Copper Age as well. Furthermore we may presume that mining activity was most intensive during the Lengyel and Balaton-Lasinja cultures, judging from the quantity of tools made of Sümeg flint which was found at the settlement (Bácskay 1989:481-4, 1990:241-3).

Considering that the Sümeg flint mine was not the only source of relatively good quality lithic raw material available in the Neolithic and Copper Ages, in fact,
on the contrary, not far from Sümeg there are a lot of good quality lithic raw material sources in the Transdanubian Mid-Mts., where several extraction sites and also a huge mine at Szentgál-Tűzkőveshegy (Takács-Biró 1986; Takács-Biró and Regenyi 1991) are known, the only real “advantage” of Sümeg flint could be its accessibility. With relative small-scale mining, with the expenditure of little energy within a short time, large quantity of flint could have been extracted at Sümeg where favourable geological conditions also promoted access to the material. The Sümeg mine is one of the earliest known (surviving) European post-Palaeolithic flint mines and it is highly possible that under the climatic and vegetational conditions of the Atlantic period when the temperate zone of Europe was covered by dense deciduous forests,
especially in the mountainous areas (Lech 1981), relatively open, less vegetation-covered area, like the Mogyorósdomb, where heavy rainfalls might have exposed surface flint deposits was a place of great importance in this respect. Otherwise Sümeg flint seems to have a minor role in the life of Neolithic and Copper Age cultures, because the material itself has been found in relatively few sites and in a conspicuously small quantity (only a few pieces at every site) which is striking, considering the huge quantity of flint exploited from the mine. At present we are unable to give a proper explanation for this. At any rate it seems that Sümeg flint was transported first of all to those regions in modern Transdanubia (Zala county, part of Somogy and Vas counties) where there are no local sources of lithic raw materials and also the results of recent surveys made in this regions — especially in Zala county — indicate that more intensive researches there would furnish more valuable information. It is noteworthy in this respect that during the intensive microregion project surveys and excavations made in the area to the SW of Lake Balaton at the end of the eighties and at the beginning of the nineties, 7 sites belonging to five different Neolithic and Copper Age cultures were found within an area of 25 x 20 km, yielding tools made of Sümeg flint (Bácskay 1994).

REFERENCES


H4 KORLÁT-RAVASZLYUKTETŐ

see Katalin Simán, The Korlát-Ravaszlyuktető workshop site in North-Eastern Hungary (H4), pp. 41-58

H5 ERDŐBÉNYE-SÁS PATAK, BORSOD COUNTY

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The site Erdőbénye-Sás patak (exploitation site together with a chipping floor) is situated in the NE part of Hungary in the Zemplén Mountains, that is the NE part of the Northern Middle Mountains in Hungary, running along the north border of the country to the East of the Danube. It is at the SE end of a narrow valley that crosses the Zemplén Mountains in a NW-SE direction, near the SE fringe.