Les industries à pointes foliacées du Paléolithique supérieur européen, Krakòw 1989
E. R. A. U. L. No 42, Liège 1990

SOME REMARKS ON TRANSPORTATION WAYS REPRESENTED IN THE INVENTORY RANIS 2 OF THE CAVE ILSENHÖHLE, RANIS, THURINGIA, GDR

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The famous Ilsenhöhle containing five resp. six – unfortunably old-excavated – Palaeolithic inventories (Hulle 1977) is situated at 50 degr. 40' N; 11 degr. 35' E, in the Ranis Zechstein calcareous massive, some 20 km south from the so-called Feuersteinlinie marking the maximum extension of the Elsterian morraines and therefore the dispersion of the Baltic morraine flint as the most important raw material for Stone Age artefact production.

Thus the raw material procurement for the numbered Palaeolithic sites of the Middle Orla Valley (fig. 1) was ever a question of transportation or of using local resources, e. g. from river gravels (quartz, quartzite, slate, Hornstein, etc.).

In the Middle Palaeolithic inventories Ranis 1 (16 excavated flint resp. quartzite artefacts in the Landesmuseum Halle) and Oppurg-Gamsenberg (different raw materials, but including a respectable portion of small Baltic flint pieces: D. Schäfer, personal communication) the second strategy at least seems to dominate whereas in the later – especially Magdalénian – complexes the morraine flint may be stated as the most favoured raw material (e. g. Feustel et al. 1974; 1980).

Since several years the stone material collection from archaeological and geological sites has begun to play an important role to understand the conditions of raw material procurement during the Stone Age. In our region, as a result of the glacial transport, it is only possible to distinguish the flint into several weathering (nodules, well-rolled pebbles, wrecked pieces firstly including *debris thermiques*) and size classes (for our purposes of an useful flake and tool production beginning only with more than 30 mm, in 10 mm steps). From the Thuringian Basin, now data can be presented from 5 find-spots (fig. 2).

The curves do not very differ although the pieces found in travertine complexes probably come from different sources – from river gravels in the Ilm valley and perhaps from morraines near the site in Bilzingsleben and Weimar-Widderberg. In spite of their origin from – certainly different – archaeological sites they really reflect the situation of flint resources available in the Thuringian Basin even after the Saalian Glaciation (2).

To modelling the probabilities to find – under the described conditions – baltic flint pieces large enough to produce the Ranis 2 inventory we have to study firstly its size distribution (fig. 2). Under the artefact classes the leaf

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points require our particular interest as the largest pieces. Some of them have clearly been made from flakes/blades which must had been larger than the finished tools but smaller than the cores from which they originate (3). If we take into account that the original pieces must be larger than the nuclei elaborated at different stages we can expect that for such a leaf point production as represented in Ranis 2 it is necessary to have a certain number of well-qualified flint nodules or pebbles as large as 200 mm and more in their maximum length.

We may confront now this demand with the suppositions given in our raw material observations and, tendencially, perhaps representative for the situation in the Thuringian Basin. Table 1 shows the results of different studies. The find-spots come from Bilzingsleben Lower and Bilzingsleben 2 perhaps Middle Palaeolithic travertine sites, from the Middle Palaeolithic sites Weimar-Ehringsdorf, Weimar-Belvédèrer Allee, and Taubach (all in connexion with archaeological material), and from the Weimar-Widderberg morraine residuum (surface collection, together with Lower Palaeolithic artefacts: Schäfer in prep.). For all of them a general trend of size distribution can be observed (fig. 2): clear predominance of the smallest, » 30 ... 40 mm size class, mostly 70 p.ct or more, with a maximal size of the pieces between 110 and 120 mm, often not more than 60... 70. From all of these observations together, we could establish a general distribution (table 2), based on observations on 1188 pieces from 6 samples.

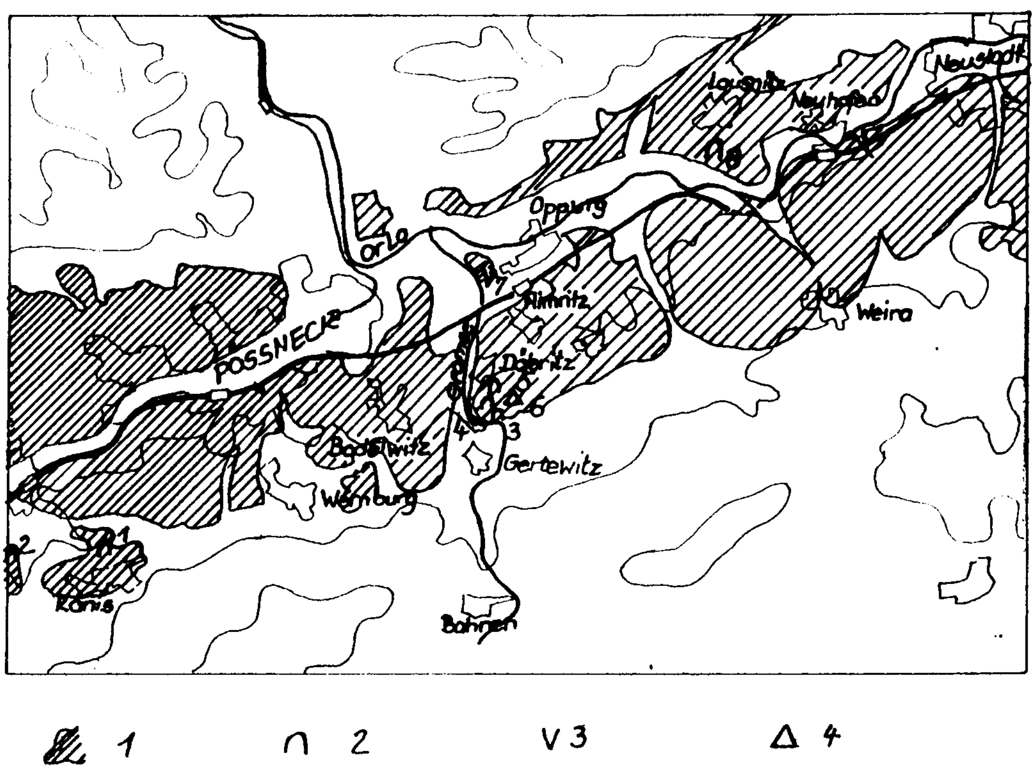

Fig. 1. Map of the Middle Orla valley with Zechstein reefs and Palaeolithic sites

Symbols: 1 – Zechstein reef dispersion; 2 – caves with Palaeolithic finds; 3 – clefts filled Pleistocene sediments containing Palaeolithic material; 4 – Upper Palaeolithic surface finds

Number of sites: 1 – Ranis Ilsenhöhle; 2 – R., Herthahöhle; 3 – Döbritz, Wüste Scheuer; 4 – D., Kniegrotte; 5 – D., Urdhöhle; 6 – D., surface finds (Upper Palaeolithic) on the Zechstein reef; 7 – Oppurg, Gamsenberg; 8 – Lausnitz, Abri Theure

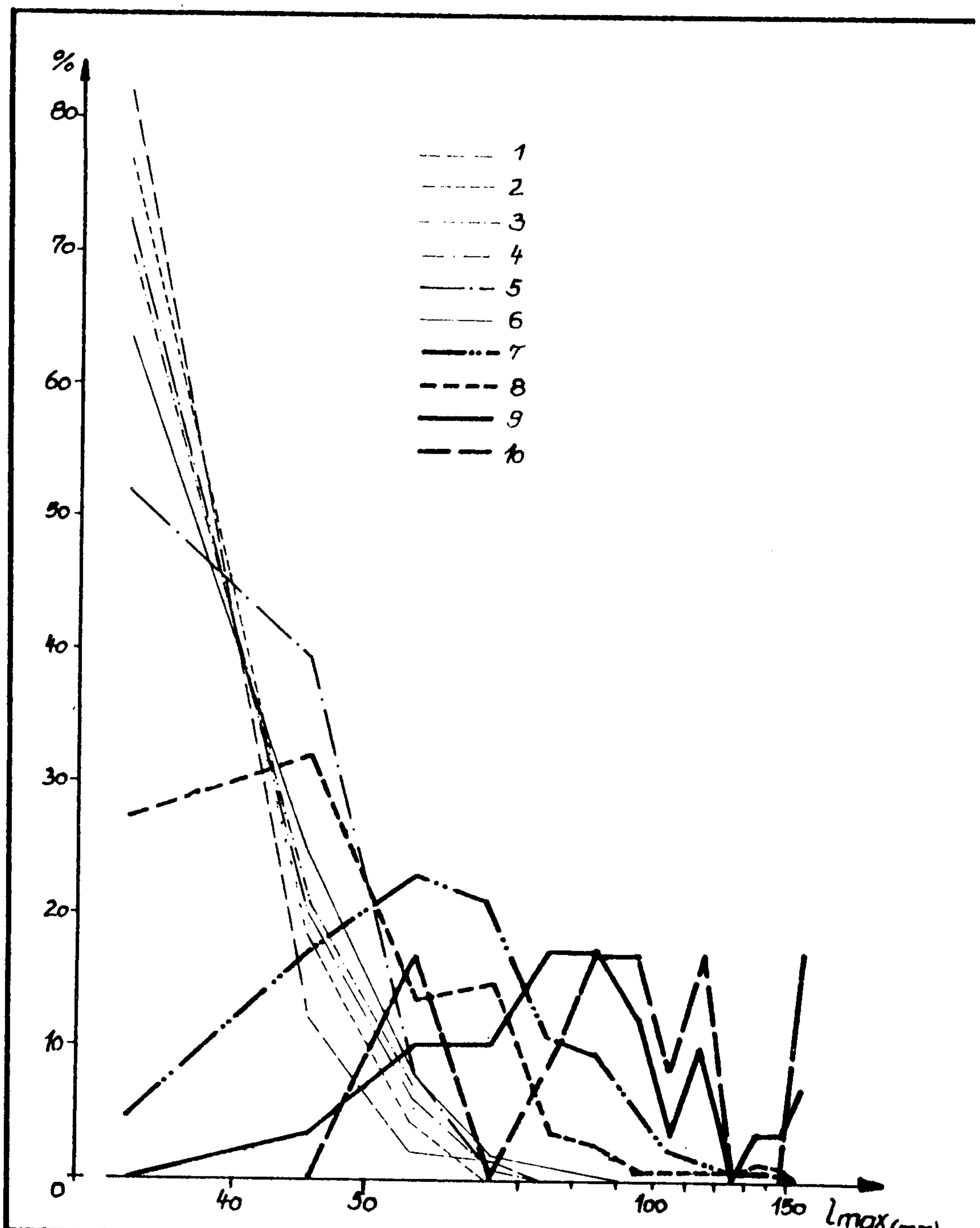

Fig. 2. Length (largest size) distribution of flint raw material pieces collected in the Thuringian Basin: find spots Bilzingsleben (1); B. 2 (2); Weimar, Belvédèrer Allee (3); Ehringsdorf (4); Taubach (5); Weimar-Widderberg (6); in the middle Pleistocene gravels from Wallendorf, Merseburg county (7); and Gleina-Stettweil, Altenburg county (8, – compared with the artefact length distributions for all the Ranis 2 tools (9) and especially for the leaf points (10)

Table 1
Flint raw material collections in the Thuringian Basin

Size class	mm	Bi	Bi 2	W	E	T	W–W
1	»30 ... 40	272	54	120	174	41	196
2	»40 ... 50	40	13	36	49	31	77
3	»50 ... 60	7	3	12	15	6	25
4	»60 ... 70	5		4	2	1	6
5	»70 ... 80						4
6	»80 ... 90						1
9	»110 ...120						1
All		324	70	172	240	79	310

Table 2
Observed (O) and expected (E) numbers of flint raw material pieces collected in the Thuringian Basin (cf. table 1), in the Middle Pleistocene gravels from Wallendorf and from Gleina

Size class	mm	Thuringian Basin		Wallendorf		Gleina	
		O	E	O	E	O	E
1	»30 ... 40	857	857	22	35	30	28
2	»40 ... 50	246	242	80	75	35	24
3	»50 ... 60	61	65	105	92	15	18
4	»60 ... 70	18	17	97	85	16	13
5	»70 ... 80	4	5	51	65	4	9
6	»80 ... 90	1	2	44	44	3	6
7	»90 ...100			25	27	1	4
8	»100 ...110			11	16	1	3
9	»110 ...120	1	0	8	8	1	2
10	»120 ...130			4	4	1	1
11	»130 ... 140			3	2	2	1
12	»140 ...150			5	1	1	0
All		1188	1188	459	454	110	109

Expected frequencies following	NEGBINAB. BAS	NEGBINAB. BAS	NEGBINOM. BAS
Chi-square	0.37	13.42	14.23
Degrees of freedom	4	9	7
Critical value (5 p. ct)	9.49	16.9	14.1

(The programs used follow the different estimation procedures for the Negative binomial exponent in accordance with E. Weber 1972 and will be explained other where.)

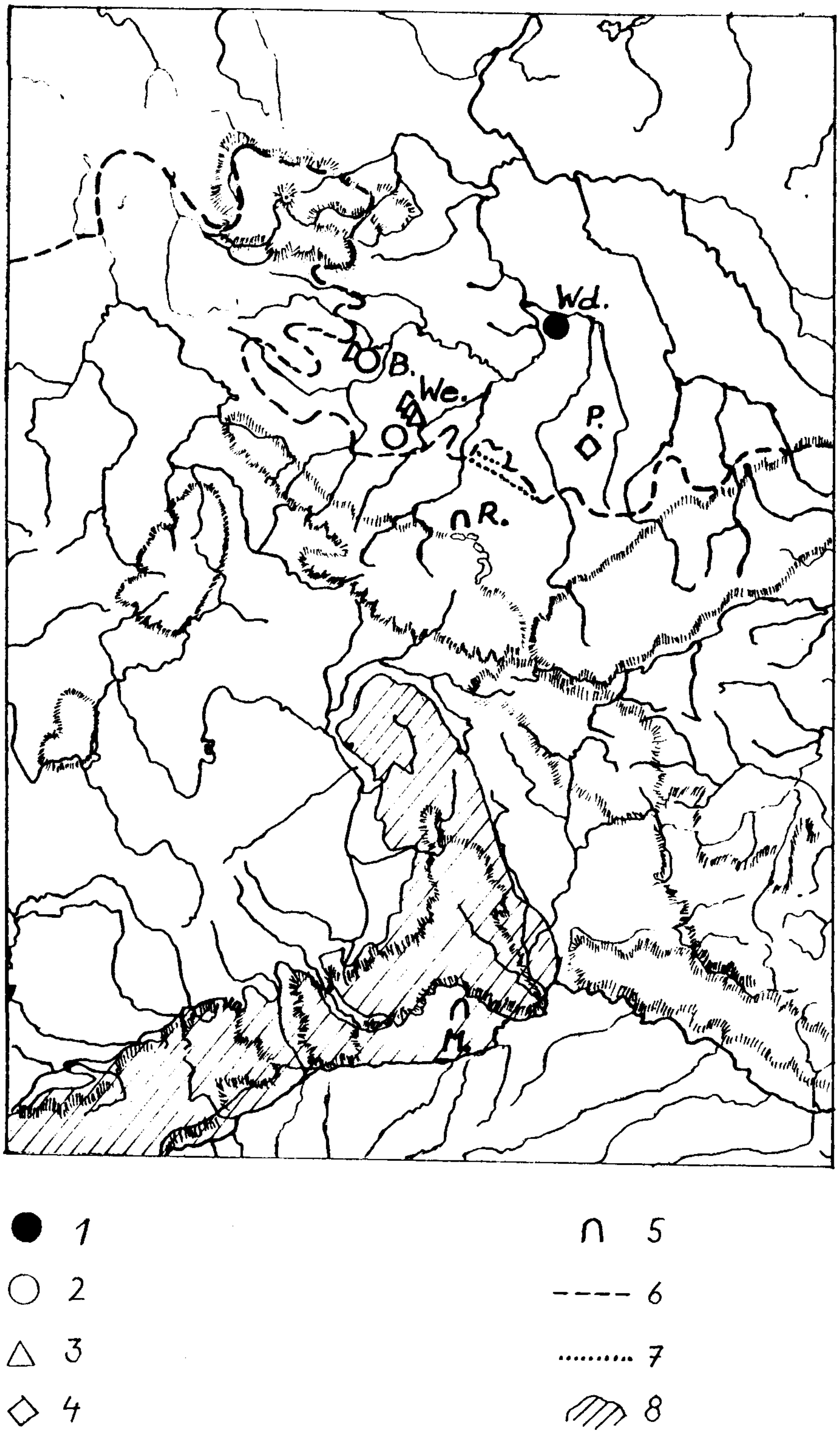

Fig. 3. Map Showing the mutual sources of stone raw materials used in the inventory Ranis 2
Symbols: 1 – Ranis, Ilsenhöhle cave; 2–5 cited raw material find-spots; 6 – maximum dispersion of the Elsterian morraines; 7 – maximum dispersion of the Baltic flint (fluvial transport included); 8 – dispersion of Malm sediments

Based on these bservations, the expected number of flint pieces larger than 30 mm can be estimated using a mathematical model. We find a nice approximation with the theoretical Negative binomial distribution (table 2). This has been tested by Chi-square and the difference between observation and model could be explained as an only insignificant one.

Using this model, we found an expected frequency for our size class 18 (» 200 ... 210 mm) of 1.05E–07. Based on our present knowledge it is highly improbable to find only one of these large pieces (not with standing its quality) or, in other words, 11.2 billions of flint pieces larger than 30 mm must be examined to find one of the desired size (4).

Let us compare with this the raw material conditions in the lowland zone north and in the region of river (Weisse Elster, Pleisse, Mulde) valleys east from the Thuringian Basin. Pleistocene deposits and also river gravels, sometimes covered by Saalian morraines (cf. Wagenberth & Steiner 1982, map on p. 26 for a quick overview) have not been eroded in such a degree as in the Thuringian Basin and are opened later by the large streams – especially under the less temperate conditions of an interstadial. Thus arose, probably, as few difficulties to collect useful raw material for the Middle Palaeolithic people as there were for us, e. g. in the Middle Plaistocene Saale-Elster gravels opened by the Wallendorf or Gleina quarry. Their size (length) distributions are given at table 2 and fig. 2.

If we try to adapt any theoretical distribution to our observations we find for these two complexes the Negative binominal models, too. Tested by Chi-square, there are also only small insignificant differences between observed and expected values. The expected frequencies for class 18 are 0.00705 resp. 0.0358 for the given samples (that means one piece at 65,000 / 3,080 specimens).

Therefore it seems to be most reliable that the larger pieces of Baltic flint found in the Ranis 2 inventory have been brought from the north-eastern raw material province over a distance of at least 40 or 60 km and treated otherwise (not in the cave, as we see from the composition of the inventory: Struwe 1989).

There is also a second example of the Ranis 2 inventory for which we do know the place of production but can establish some interesting suppositions about the provenance of the raw material. One medial fragment of a leaf point (fig. 3) shows remains of a greyish-white, porose calcareous cortex on both faces of the 13 mm thick specimen. As the former length of the artefact can be reconstructed as 100 or 120 mm it is obvious that it cannot be made from a globular or ovoid Baltic flint nodule.

Fig. 4. Medial leaf point fragment from Ranis 2 probably made from Bavarian Jurassic (Malm) Horstein
Scale 1:1. From Hülle 1977 : 161 (Taf 37 : 2,77)

Thus we stimulated a comparison to other raw materials. Macroscopically the siliceous Ranis piece could be determined as Hornstein. Thuringian Muschelkalk-Hornstein can be excluded with regard to the colour and cortex. Dr. H. Blumenstengel, Jena, was so kindly to prove an alternative hypothesis concerning a possible Malm (Jurassic) – that means: Bavarian – origin of this piece. The result of his micropalaeontological studies using besides the Ranis leaf point samples of so-called Baiersdorf-Hornstein from the Lower Altmühl valley (5) (cf. map fig. 4) show serious differences between the fossil contents of the Ranis and Baiersdorf pieces:

While the Baiersdorf specimen is very rich on different micro– and macrofossils including radiolaria, large multichambered foraminifera spongy needles, and a remain of a crinoid handle member the Ranis piece contains different radiolaria, too, sometimes multi–chambered complicately winded foraminifera. Between the few macrofossils there is a fine–ripped shell (perhaps from a lamellibranchiat). Handled with fluorine acid, the material shows a large number of fossil remains with a dominance of pointed–conical against spheroid forms – firstly radiolaria fragments and spongy needles, further sea weed.

These differences, however, can possibly understood as only facial (facies-depending) in their character. Another explanation – origin from the Bohemian Barrandium for the Ranis piece – must be excluded as well from a palaeontological (evolutionary status of the foraminifera) as from an archaeological point of view (no Middle Palaeolithic leaf point finds in Bohemia). Using this argument of an archaeological probability it seems rather senseful to ask even for a Bavarian, Altmühlian origin. The amazing similarity between some of the famous Mauern and Ranis leaf point specimen (cf. Zotz 1955, Taf. 43 : 1; 45 : 3; 49 : 5; 50 : 16 with Hulle 1977, Taf. 22 : 2,53; 32 : 2,63; 23 : 2,55; 32 : 2,63; or Bohmers 1951; Taf. 24 : 2; 25 : 1; 26 : 1 with Hulle 1977 Taf. 22 : 2,54; 23 : 2,55; 32 : 2,63) confirms this consideration (6). In this case we may have the first evidence for any direct contact between these two regions of the Late Middle Palaeolithic with leaf points linking a distance of about 200 km and for the Ranis 2 population a possible spatial range of its stone raw material exploitation area with 250 km from their northern to their southern border.

Notes

(1) I thank Dr. sc. phil. R. Struwe for the permission to use her data from Ranis 2 inventory studies (size distribution) and for help and criticism to write this paper.

(2) During the Lower Palaeolithic (and even before any Late Pleistocene erosion) perhaps in the Thuringian Basin, too, larger and better flint pieces had been available (cf. the artefact data from the Weimar-Widderberg inventory: Schafer in prep.).

(3) From studies of Lower and Middle Palaeolithic assemblages (Weber 1986; Schafer 1988) it seems to exist a modestly varying relation between mean core and (for tool production selected) flake sizes between 1.2 and 2.

(4) The Negative binomial (generalized Poisson) distribution has been understood here as realization of discrete occurences along a length scale (Sachs 1984). The first (Zero) class goes from » 30 to 40 mm, the second from » 40 to 50, etc.

This is, of course, a very crude and only theoretical attempt to reconstruct Palaeolithic raw material patterns. There is a real practical maximum of flint nodule/pebble size – known from the northern morraine and primary Cretaceous sources but not reached by our calculations.

(5) I thank my colleagues Dr. W. Weissmüller, Erlangen, and Dr. A. Zimmermann, Frankfurt/Main, for the Hornstein samples collected in the Baiersdorf region.

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