

A Comparison of two Neolithic Flint Industries

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The purpose of this paper is to compare the flint industries of two Neolithic sites that were found as part of a study of prehistoric settlement in an erosion cliff in NW Denmark. The sites chosen are named "Penbjerg" and the "Barrel Site". They are 700 m apart and each contained a sealed and uncontaminated assemblage of flint, pottery, and worked amber. Penbjerg (1) belongs to the Funnel Beaker Culture and may be dated to the period Middle Neolithic I – a bit before 3000 B.C. according to the calibrated radiocarbon chronology. The Barrel Site (2) belongs to a local variant of the Bell Beaker Culture. The dating to 1770 bc (± 85) in radiocarbon years of charcoal from the site suggests a true date late in the third millennium B.C. (K-3537).

PENBJERG

The raw material used at Penbjerg had already been to a large extent broken and when struck it often shattered instead of flaking nicely into pieces with conchoidal fracture. It was apparent that the flint was derived mostly from the ice-age deposits (till, boulder clay) which cover the area and in which flint of this kind is found. Other possible sources would have been the pebble beaches and the chalk outcrops, both of which were used at the Barrel Site, but the raw flint from the beaches is better rounded than that used at Penbjerg, and the flint from the outcrops has a clean white crust. The poor raw material influenced the character of the work at Penbjerg, in that an unusually large proportion of the implements are made on irregular pieces instead of on true flakes.

The assemblage

Table I shows the flints classified into various types and classes. It is divided into four parts. Part A is a rough overall classification of the total material. Part B shows the clear implement types scrapers, knives, borers, and burins and gives percentages both in relation to the total clear implement types and in relation to the total

material. Part C shows the implement types whose classification presents difficulties. Here also percentages are given in relation to the total of clear implement types and of the total material. Part D shows waste products, or at least pieces without retouch, and the percentages are calculated as before. In our opinion this is the best way to set up a table of Neolithic flints from Denmark.

Attention should be called to the following points about the assemblage:

1. It faintly reflects the character of a blade industry, in that a number of regular blades are present and about one third of the cores can be described as poor blade cores. The blade element was, however, of a low standard, and blades were not much used for secondarily retouched implements (fig. 1, 19).

2. By far the commonest definite tool was the scraper (fig. 1, 1–6). During the initial sorting the scrapers gave the impression not of a homogenous group, but of being of two types. They were therefore subjected to a more detailed analysis using metrical procedures (see below), and it was confirmed that two (or possibly three) different kinds of scraper were being made.

3. The next commonest tool type was the flake or blade knife (fig. 1, 7–9) comprising one fifth of the finished tools. Only one was on a blade. Unfortunately flake knives often look very much like scrapers, and it is not by any means sure that different archaeologists could produce identical classifications of the same material. The class was first clearly defined by Davidsen (1979). It consists of flakes (or at Penbjerg also other fractured pieces) with a sharp edge along one side and a blunted back opposite to or more often at right angles to this edge. Davidsen pointed out that a blunted edge tends to be steeper than a scraper edge.

4. A third major tool type was the borer (or awl), comprising about one tenth of the finished clear implements. Metrical analysis (see below) suggested that there also were two distinct types of borer at Penbjerg – heavy ones on a core or thick flake (fig. 1, 10–11) and lighter ones (fig. 1, 12).

5. Burins are present, though rare. The two at Penbjerg were both angle burins on truncated flakes (fig. 1, 14–15).

6. In the less clear part of the tool-kit pieces with notch were the commonest category (fig. 1, 16). It is thought that the notch or notches have been deliberately made, but in some cases they may only have resulted from hard use. The pieces varied a good deal in shape and size. They shade over into other pieces which appear to have been irregularly retouched, but where again hard use could be the cause. Notched pieces were about as common as flake knives, other retouched pieces somewhat rarer. This part of the tool-kit included also some supposed core tools. There were a small number of long rectangular cores with a high, but narrow flaked edge at one end (fig. 1, 18). As waste cores they seemed decidedly odd, and they may have been definitely formed implements such as could be termed “narrow planes” or “core burins”. Another group consisted of cores with wide flaking all down a long, fairly straight edge (fig. 1, 17). It seemed that these too might be “planes”. We do not know whether they occur regularly in assemblages of the Middle Neolithic Funnel Beaker Culture or not.

7. As at all normal settlement sites the bulk of the material (86.8%) consisted of waste flakes and blades, here mostly flakes. Because of abrasion it was not possible to estimate what proportion showed signs of use. Utilisation of some of the primary flakes and blades was normal in prehistoric times – and indeed unretouched blades are not uncommon as an item of grave goods, showing that they were looked on as a definite implement. The presence of the blades (e.g. fig. 1, 19) shows that a certain residue of blade technique survived from earlier periods, when blade technique was better and blades more abundant. A particular kind of waste was the keeled flakes struck when rectangular axes were being chipped to shape before being polished (fig. 1, 13). As such flakes were rare at Penbjerg axe manufacture can only have taken place to a very limited extent.

8. The cores also show a residue of blade technique. A group can be picked out characterised by having one or more plane striking platforms from which flakes or blades were struck in parallel batches. About one third of the cores were of this kind. They shade over into other kinds of core without clearly intended striking platforms and with flakes struck in a greater variety of directions. Many such cores tended to be somewhat flat

with flakes struck from the perimeter in towards the middle. Others however were so irregular or rudimentary that it is hard to say anything more about them.

9. One last point is to call attention to a puzzle. The last flakes struck from most of the cores before they were thrown away were too small to have been any use as blanks for the tool types found. No doubt at an earlier stage the cores had given blanks suitable for scrapers, knives, notched pieces, etc.; but the inhabitants continued to strike flakes after the cores no longer had any potential for producing suitable blanks. There seem to be two possible explanations, either the cores themselves were tools and this last flaking was a form of retouch (which seems unlikely), or else the inhabitants as a silly habit just kept on striking.

Metrical analysis of scrapers and borers from Penbjerg

The subjective impression that the scrapers from Penbjerg were not a homogeneous group inspired a closer examination to explain that impression: 59 suitable scrapers were measured, and weighed. Weight is the simplest way to measure total size. The lengths and breadths are shown in the scatter diagram (fig. 3), which also shows which scrapers were made on flakes and which on irregularly broken pieces. It will be seen that as well as the main group there is a compact little group very homogeneous in its dimensions, consisting of scrapers with lengths 3–4.6 cm and width 1.9–3.0 cm. This group consists almost exclusively of scrapers made on regular flakes. The main group consists of scrapers ranging from 4.2 to 7.6 cm in length and 2.1 to 6.9 cm in width. The majority are on rough pieces of flint, but examples on flakes also occur. Four exceptionally large scrapers could be regarded as a third group, but in our opinion their size is due to the peculiarities of the raw material and they were not really a separate tool type. Some scrapers were more than twice as long as they were wide. This does not reflect a blade component, as the implements in question were only made on irregularly fractured pieces, but it does show the great variation in the shape of these scrapers.

The same scrapers are shown in fig. 5, above, arranged according to weight. Here also a separate group of small scrapers shows up. These weigh under 20 g and are the same individuals as are indicated as a separate group in the scatter diagram. It seems therefore clear that the inhabitants were aiming at making two dif-

A	total number of pieces of these tools or utilised cores	2083 133 118		100% 6% 6%
B	scrapers broken scrapers (scraper roughouts) flake or blade knives borers burins total of clear implement types	59 6 (3) 18 10 <u>2</u> 95	65	% of clear implements 68% 20% 10% <u>2%</u> 100%
C	notched pieces pieces with miscellaneous retouch "planes", broad "planes", narrow	20 7 20 5		1.0% 0.3% 1.0% 0.2%
D	scraper roughouts keeled flakes from preparation of axes flakes struck from polished axes unretouched regular blades waste flakes cores: with residual blade technique flattish not further classified total	3 3 3 67 1742 36 28 <u>54</u> 2083	118	3% 3% 3% 69% 1815% 122% <u>5.7%</u> 100.0%

Table I.

ferent implement types within the category we call scrapers. One is represented by fig. 1, 1-3, the other by fig. 1, 4-5. It may be supposed that they had separate functions, that there were different words for them, etc.

One had a similar subjective impression that the borers fell into two groups. Owing to the small number, the result is not so clear as with the scrapers, but the weight distribution does suggest two different classes of implement. One group consisted of rather slight implements, mostly on flakes (fig. 1, 12) and the other of much heavier borers on shattered pieces or core fragments (fig. 1, 10-11). The diagram of weights, fig. 6, shows two different groups, one weighing around 10 g, the other around 50 g.

THE BARREL SITE

The usual raw material at the Barrel Site was drift pebbles with well-rounded surface. A few pieces showed very fresh chalky cortex, indicating that they were brought direct from the original deposits of chalk.

These outcrop on the coast at Hanstholm, 40 km further north, and inland were exploited by mining in some periods, though there is so far no evidence of mining in Bell Beaker times.

The assemblage

The material is classified in Table II using the same methods that were used in Table I. The following points should be made:

1. Although there was a single regular blade and a small number of cores that seemed in principle to be blade cores, the quality was generally so poor that we may say that virtually nothing remained of blade technique.

2. On the other hand a technique of surface-covering pressure flaking had made its appearance. This technique was used to finish off fine barbed-and-tanged or hollow-based arrowheads and larger flat-flaked implements such as daggers and sickles. There were alto-

A	total number of pieces	1367	100%
	of these tools or utilised	57	4%
	cores	57	4%
		number	% of clear implements
B	barbed and tanged arrowheads	2	5%
	hollow-based arrowhead, broken (uncompleted arrowheads, one made into borer)	1 (4)	2%
	fragment of sickle (other flat-flaked roughouts)	1 (5)	2%
	scrapers	23	79%
	broken scrapers (uncompleted scrapers)	10 (5)	
	borers, one on arrowhead roughout	3	7%
	flake knives	2	5%
	total of clear implement types	42	100%
C	notched pieces	11	26%
	pieces with miscellaneous retouch	11	26%
D	uncompleted arrowheads	3	7%
	other flat-flaked roughouts	5	12%
	uncompleted scrapers	5	12%
	a blade	1	2%
	waste flakes	1232	2933%
	cores: with residual blade technique	8	
	flattish	32	136%
	not further classified	17	
	total	1367	100.0%

Table II.

gether 13 pieces with surface-covering retouch, comprising about 1% of the total material (fig. 2, 1–6).

3. Scrapers were by far the dominant tool, making up nearly four fifths of the clear and obvious tool types. They were mostly made on roundish flakes with cortex on the back (fig. 2, 7–10). In contrast with Penbjerg they appeared to be a single homogeneous group, and this was confirmed by metric analysis (see below).

4. There were only two flake knives (fig. 2, 13), but they were quite typical.

5. Borers appeared like scrapers to be a homogeneous group (fig. 2, 11–12). They were light, fairly delicate implements, one of them adapted from a roughout for an arrowhead. In fig. 6 they are compared metrically with those from Penbjerg (see below).

6. There are a number of pieces with retouch or heavy use of less clear kinds. Eleven can be classed as notched (fig. 2, 15–16) and 10 as miscellaneous retouched (fig. 2, 14 and 17).

7. As usual the bulk of the material consisted of waste flakes. A proportion of them (estimated at nearly 4%) appeared to have been used. There was only one unretouched blade. There was no indication that axes were made or re-sharpened at the Barrel Site.

8. Cores made up 4% of the total material. As already said, there were very few blade cores, and they were of such poor quality that one could dispute whether they ought to be so described at all. The commonest cores were flattish with a tendency for flaking to have been done in towards the middle from different parts of the perimenter. As at Penbjerg the cores had been flaked up long after they could give the sorts of flakes needed for scrapers and knives. Possibly some of the small flakes were wanted for light borers and arrowhead blanks, but if so the number struck was far in excess of requirements.

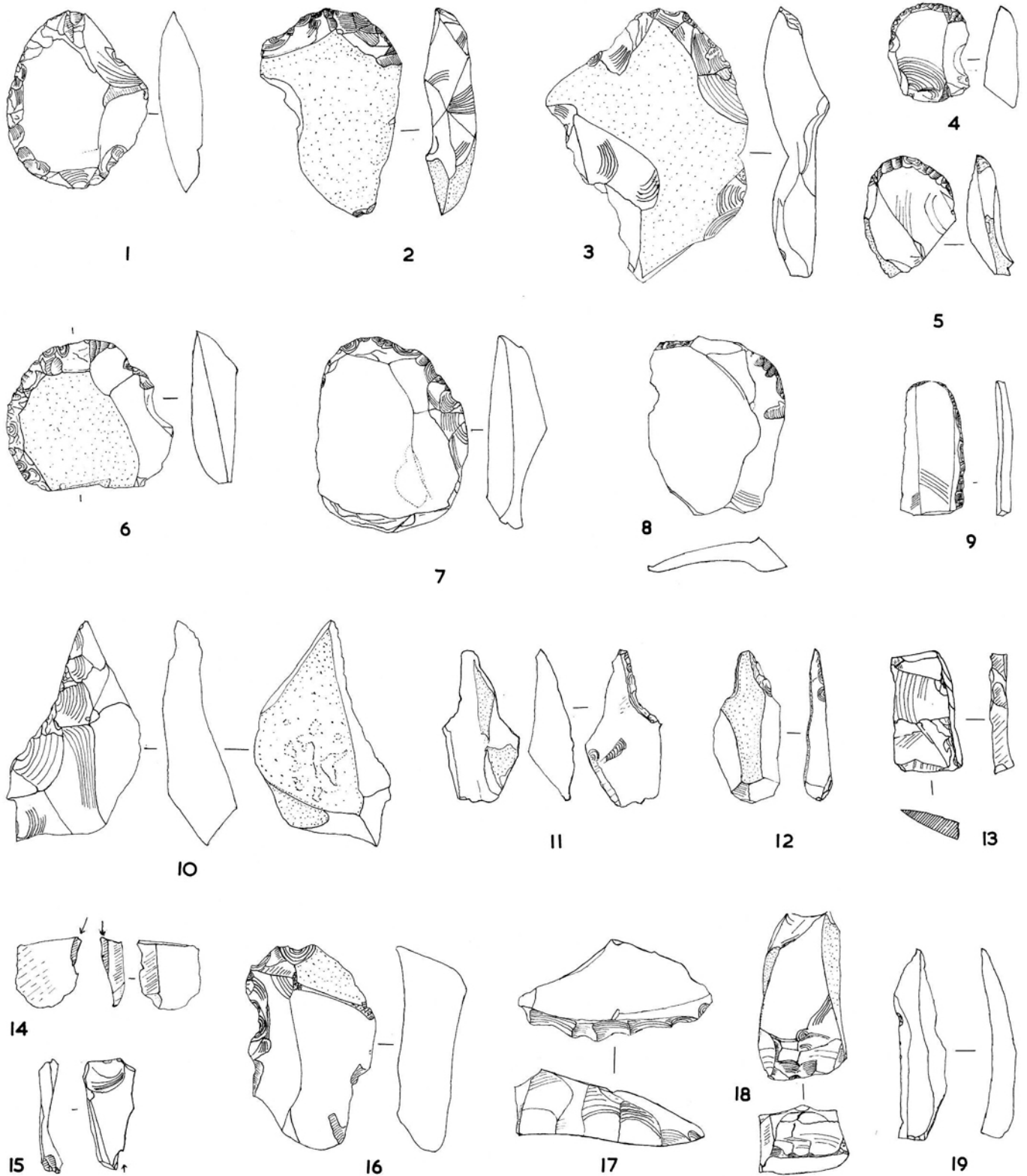


Fig. 1. Selection of flints from Penbjerg, scale 1:2. Drawn by P.K. Singh.

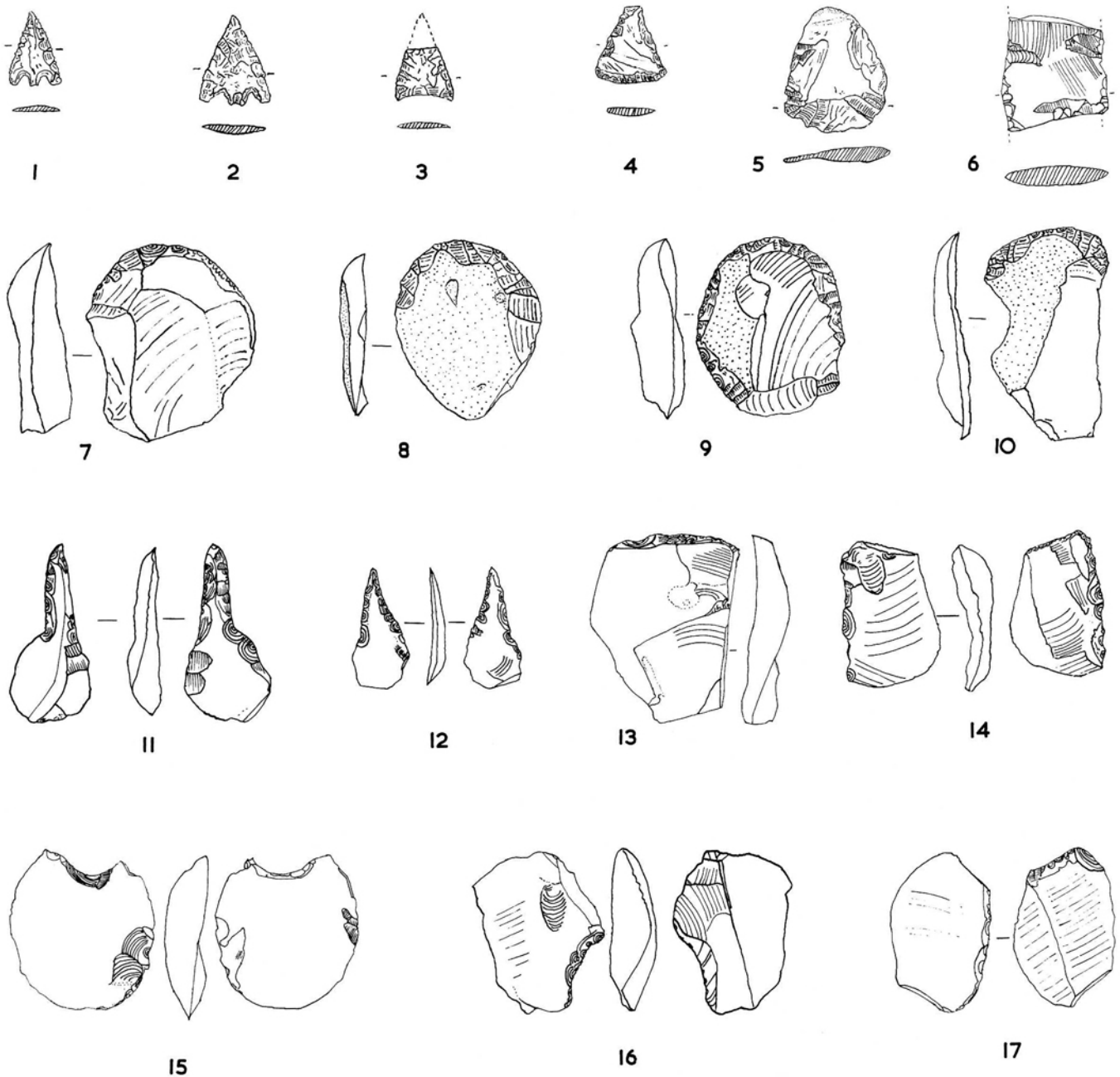


Fig. 2. Selection of flints from the Barrel Site, scale 1:2. Drawn by P.K. Singh.

Metrical analysis of the scrapers and borers from the Barrel Site

The lengths and breadths of the scrapers are plotted in fig. 4 in exactly the same way as was done for Penbjerg. It can be seen that the scrapers from the Barrel Site are a more homogeneous group. The size range is less,

there are none twice as long as they are broad, and nearly all are on regular flakes. From the clustering of the dots it can be seen that there is only one type present. The same is shown by the diagram of weights, fig. 5. As for the borers, fig. 6 shows that they all are very light, but as so few are present no real weight distribution has emerged.

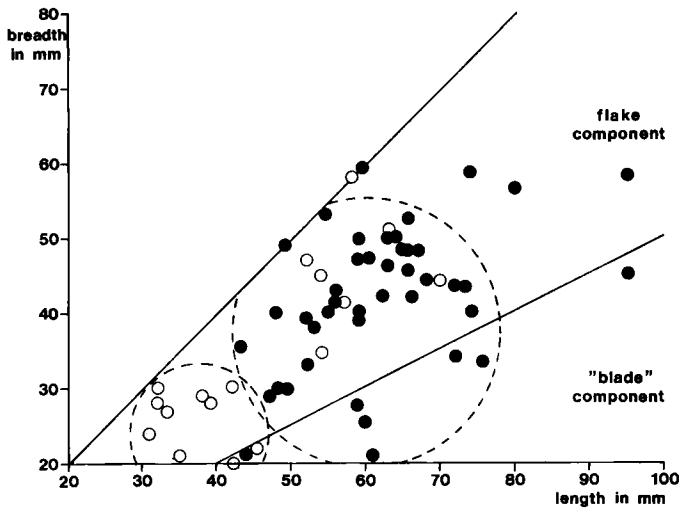


Fig. 3. Length and breadth of 59 scrapers from Penbjerg. Open circles on flakes, filled circles on shattered fragments.

COMPARISON OF PENBJERG AND THE BARREL SITE

When both assemblages had been fully analysed it was found that there were clearer and more consistent differences than had been expected when the work was begun. The differences can be summarised as follows.

The blade technique had degenerated. It was already poor at the older site, where blades were sometimes struck but hardly ever used for retouched implements. At the later site it was virtually extinct. On the other hand a new technique of flat, surface-covering pressure

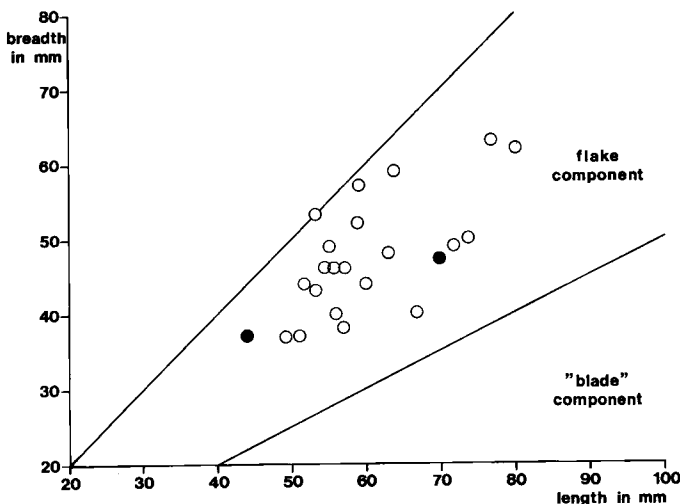


Fig. 4. Length and breadth of 23 scrapers from the Barrel Site. Open circles on flakes, filled circles on shattered fragments.

flaking had been evolved and was used to finish such tools as arrowheads, daggers, and sickles.

Tools other than scrapers became fewer, so that at the Barrel Site scrapers dominated the assemblage with 79%, as against 68% at Penbjerg. The percentage of knives had fallen correspondingly from 20% to 5% and of borers from 10% to 7%. The burins apparently had completely disappeared. At the same time requirements for scrapers and borers apparently became simpler. At the earlier site it was aimed at producing two distinct kinds of scraper, the normal kind and a small kind, and also at producing large as well as small borers. At the later site the scrapers and borers each formed a homogeneous group of one type only. It seems that the requirement for a detailed tool kit was lowered.

COMPARISON WITH OTHER SITES

Can any overall tendency be detected in the development of Neolithic flintwork in Denmark?

In fig. 7 is shown a diagram of the proportions of clear tool types at a number of sites. The data is all taken from recent publications (3). The sites represent the Funnel Beaker Culture in the pre-megalithic, the megalithic, and the final phase, or are from the Bell Beaker Culture. The implements are divided into four major groups. These are:

1. The Mesolithic-derived burins, flake axes, and transverse arrowheads.
2. Knives and borers – tools without such a definite Mesolithic association.
3. Scrapers.
4. Implements with flat surface-covering retouch.

The diagram illustrated how the proportions of these four groups changed through time. It shows that the Mesolithic-derived types were important in the pre-megalithic phase of the Funnel Beaker Culture, but later became insignificant. The knives and borers, on the other hand, maintained their position in both the pre-megalithic and megalithic phases, but declined apparently in the final Funnel Beaker Culture and definitely in Bell Beaker times. As these tools lost importance the scrapers became correspondingly more and more to dominate the statistics. The only thing that prevented them from becoming at the end almost the only tool was the appearance of a new series of implements characterised by flat retouch.

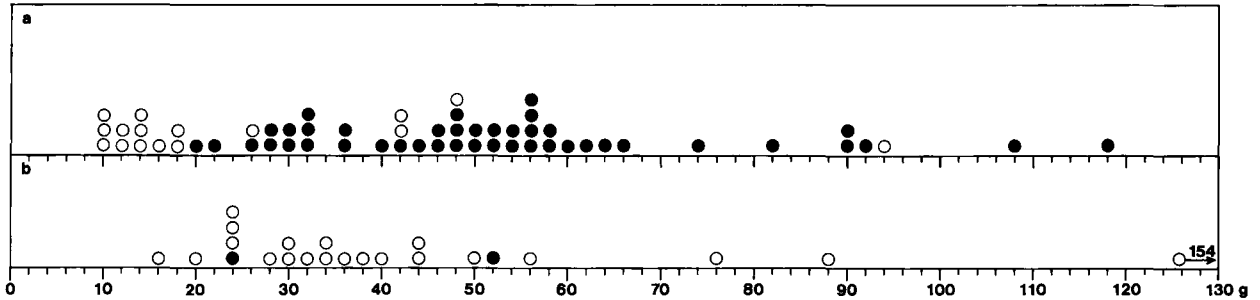


Fig. 5. Diagram comparing weights of scrapers from Penbjerg (above) and the Barrel Site (below). Open symbols show implements made on flakes, filled symbols show implements made on shattered fragments.

Thus quite a definite overall tendency can be seen in the development of the Neolithic flint industries in Denmark.

It would be interesting to discover also whether the internal development or simplification that is seen when the scrapers and borers from Penbjerg and the Barrel Site are compared was found at other sites too.

Unfortunately, owing to the limited time available for this joint study the material from the other sites in fig. 7 could not be studied directly, but a certain amount of further data could be gleaned from the publications. The statistics of scraper size given in the publications used (3) show that scrapers within the size range of the small group at Penbjerg were present at all Funnel Beaker sites. Only at Lindebjerg was analysis of the same kind applied as in the present paper, and the conclusion drawn was that the scrapers fell "naturally into three groups – large roundish, small roundish, and longish". Closer examination shows unfortunately that the "small roundish" group is not the same as the group of small scrapers at Penbjerg, but includes individuals up to 5.8 cm long and 4.4 cm wide (Liversage, 1981, Table II). Happily a second look at this diagram reveals a distinct separate concentration in the lower left-hand corner made up by 11 scrapers from 3.0 to 4.4 cm long and from 2.1 to 3.3 cm wide. These conform exactly to the small group at Penbjerg. They make up 13% of the scrapers at Lindebjerg and 17% at Penbjerg.

So far as concerns the presence of small scrapers the situation appears to have been similar at the other Funnel Beaker sites in the diagram. For the following references see note (3). Skaarup, p. 117, Table 17 gives minimum flake scraper dimensions of 2.3 and 2.2 cm, at Stengade II and 3.1 and 2.4 cm at Stengade I. Ebbesen

and Mahler, Table VI gives 3.1 and 3.0 cm at Virum. Ebbesen et al., fig. 12 gives 3.5 and 2.6 cm at Lyø. Statistics of size are not given for the final Funnel Beaker Culture, but Davidsen's illustrations show that small scrapers were present (e.g. Pl. 3,0; Pl. 41,9; Pl. 73,1; Pl. 101,g). We should therefore be able to conclude that small scrapers, smaller than any found at the Barrel site, were a normal part of any Danish Funnel Beaker assemblage. The contrast with Myrhøj is interesting, where Jens Aarup Jensen gives minimum lengths of 3.5 and breadths of 3.0 cm, i.e. distinctly larger.

That small scrapers were present, however, does not mean the same as that they formed a separate group. To show this more detailed statistics would be necessary, such are only available at Lindebjerg. As an experiment the scrapers from Virum were taken out of the museum's study collection and weighed. There was found to be a slightly separate grouping of scrapers weighing under 20 g. It would be premature to generalise from this, but it does look as though the dual nature of the scraper category as shown by the collection from Penbjerg was a normal feature of at any rate the earlier part of the Funnel Beaker Culture.

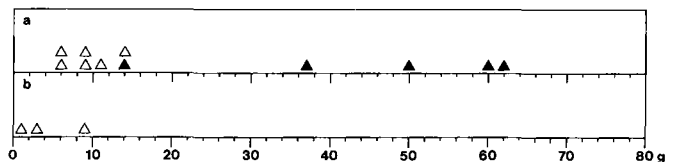


Fig. 6. Diagram comparing weights of borers from Penbjerg (above) and Barrel Site (below). Open symbols show implements made on flakes, filled symbols show implements made on cores or fragments.

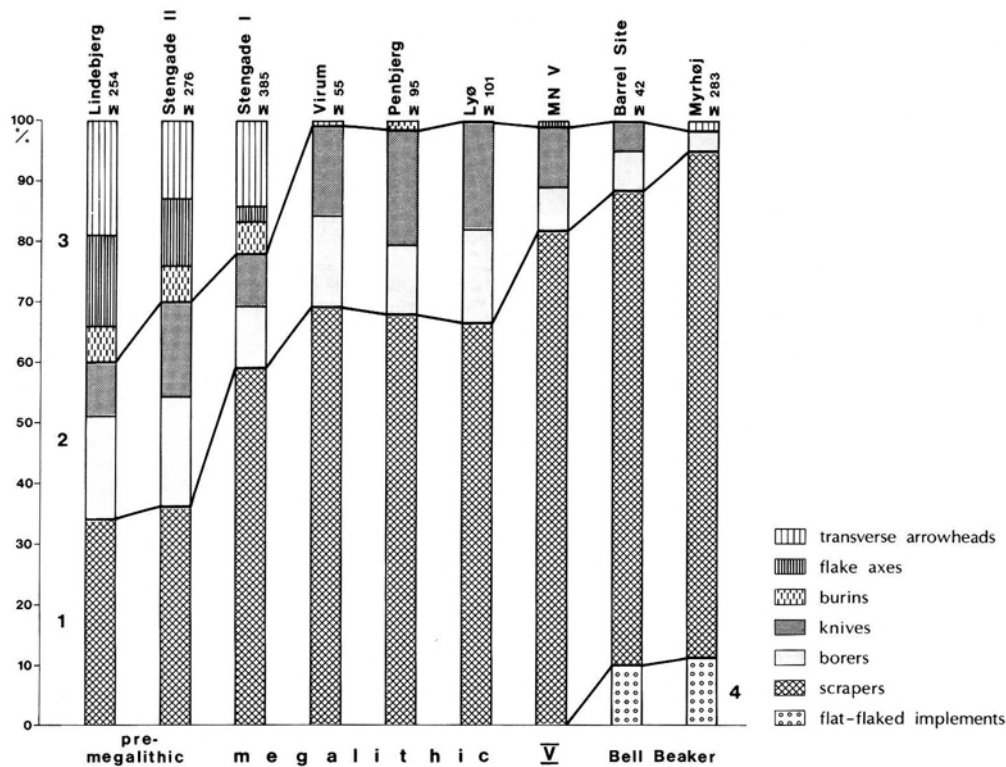


Fig. 7. Diagram showing progressive changes in the flint industry as exemplified by a number of Danish sites.

It is much the same with the borers. Those at Penbjerg fell into a large and a small group, while at the Barrel Site only small borers were present. At Lindebjerg it was written of them that "These appear to fall into a thick type with fairly strong point, which can be made either from a nuclear piece or from a thick flake... and a thin type made from a slighter flake or blade". The presence of both large and small borers is furthermore shown by illustrations and/or size statistics given for the above Funnel Beaker assemblages; but at Myrhøj, from the Bell Beaker Culture, the four illustrated borers have the same rather slight and delicate character as at the Barrel Site. However, there is so far so little Bell Beaker material to compare with that future finds may upset these results.

The general conclusion that can be drawn from the above is that the development of the flint industry in the Danish Neolithic is what may be called retrogressive. Forms became fewer and simpler, and the scraper group became more and more dominant among the implements. The only positive development was the introduction in the Late Neolithic of a technique of shallow surface, covering flaking.

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NOTES

1. Sb. 27 of Lodbjerg parish, Hassing herred. NMK. A 51028.
2. Sb. 37 of Lodbjerg parish, Hassing herred, NMK. jr. nr. 1250.
3. Lindebjerg after D. Liversage, "Neolithic monuments at Lindebjerg, northwest Zealand", *Acta Archaeologica* 51, 1980, 85-152. Copenhagen 1981. Stengade I and II after J. Skaarup, *Stengade, ein langeländischer Wohnplatz mit Hausresten aus der frühneolithischer Zeit*. Rudkøbing 1975. Virum after K. Ebbesen and D. Mahler, "Virum, et tidligneolitisk bopladsfund". *Aarbøger for nordisk Oldkyndighed og Historie* 1979, 11-61. Copenhagen 1981 (with German summary). Lyø after K. Ebbesen et al. "En neolitisk boplads på Lyø". *Aarbøger for nordisk Oldkyndighed og Historie* 1978, 45-72. Copenhagen 1980 (with German summary). The period Middle-Neolithic V after the combined statistics of K. Davidsen, *The Final TRB Culture in Denmark*. Copenhagen 1978. Myrhøj after J. Årup, "Bopladsen Myrhøj". *Kuml* 1972, 61-122. Århus 1973 (with English summary).