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SCHIPLUIDEN

A NEOLITHIC SETTLEMENT ON THE DUTCH NORTH SEA COAST *c.* 3500 CAL BC

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AND PETER F.B. JONGSTE

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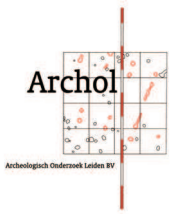

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10 Implements of bone and antler: a Mesolithic tradition continued

Annelou van Gijn

A small number of bone and antler tools were found, testifying to the continued use of late Mesolithic production techniques such as the metapodial technique for making awls and chisels and the cutting and breaking of red deer antler for the production of axes and sleeves. Remarkable is evidence of the use of the groove-and-splinter technique. Functional analysis showed that the bone and antler tools formed an integral part of various tool kits that also comprise flint and stone implements.

10.1 Introduction

In the Mesolithic, bone and antler tools played an important role in the technological system in a tradition that was to continue far into the Neolithic. Bone and antler tools have been found at all Neolithic wetland sites in the western part of the Netherlands. Schipluiden forms no exception. A technological and function analysis of the bone and antler implements complements the analyses of the stone and flint tools. All these artefacts form part of a technological system (Lemonnier 1986). One of the main objectives of the integral study of tools made of different materials was to obtain insight into the technological and functional interdependencies of the various tools. Such an approach leads to a better understanding of the technological choices people made in the past. That those choices may vary in unexpected ways was demonstrated by the study of the Late Mesolithic flint, bone and antler tools of the site of Hardinxveld-Polderweg (Van Gijn 2005; Van Gijn *et al*. 2001a; Louwe Kooijmans *et al*. 2001a). There, hides were scraped with bone and antler scrapers (sometimes recycled axes) and not with flint scrapers, the implements usually chosen for this task. By doing only a functional analysis of one category of material culture we run the risk of overlooking several other activities that may have been carried out at the site.

Although not as abundant and well-preserved as the bone and antler assemblages of Polderweg and De Bruin, the Schipluiden finds still constitute an important assemblage that illuminates the continuity of the Mesolithic bone and antler technology into the Neolithic. In comparison with the enormous quantities of bone remains, the number of bone and antler tools and production waste found at Schipluiden is relatively small (N=90). Of the total of 25 antler artefacts only five are finished tools, six are pieces of waste and 14 are possible tools. Among the latter are six unmodified antler tines that were classified as awls because they showed some damage. The number of modified bone artefacts is higher (N=65), including a total of 10 waste products, 21 possible tools and 34 finished implements, mainly awls. These artefacts however include some remarkable objects, such as a large axe-like object and waste products deriving from the groove-and-splinter technique typical of the early Mesolithic.

10.2 Selection and methods

The bones and pieces of antler displaying traces of manufacture or use comprise a mere 1% of the total of bone and antler fragments that could be identified to species level. These artefacts were all selected during the analysis of the archaeozoological material (chapters 22 and 23) and they all belong to the category of manually collected remains. Finds from the 4-mm sieve were not included in the worked bone and antler assemblage, but these finds did include some very small fragments such as broken awl tips, testifying to the meticulous care taken in the find recovery. In total, 90 pieces of bone and antler were considered 'worked' artefacts. They are discussed in this chapter.

The preservation of the bone and antler was very good in the lowermost parts of the excavated area, such as Unit 18. No bone and antler had survived on top of the dune. This means that the assemblage consists entirely of remains that were dumped as waste. A total of 14 artefacts display signs of burning. Thirteen of those artefacts are of bone, one is of antler.

Not all the materials of which these artefacts are made could be identified to species level due to the absence of characteristic features. Species determinations were done during the archaeozoological analysis (chapters 22 and 23). In addition, all the artefacts were examined to determine their metrical attributes, signs of burning, breakage pattern, typology and manufacturing traces.

The use-wear analysis was done with a Nikon Optiphot, magnifications of 50-560×, equipped with a free arm allowing large implements to be examined, too. All the implements were also studied by stereomicroscope to examine manufacturing traces and locate any residues.

A total of 50 artefacts were examined for traces of use. The implements were not chemically cleaned. Incidental use was made of an ultrasonic cleaning tank because some artefacts were covered with sediments that were not readily released in running water. Although some pioneer use-wear studies of bone and antler tools were done in the eighties (Campana 1980; D'Errico 1993; LeMoine 1994), systematic high-power study is a relatively recent development (Christidiou 1999; Louwe Kooijmans *et al*. 2001a, b; Maigrot 2003; Van Gijn 2005). The experimental reference collection on which the functional inferences are based includes results of experiments relating to the Late Mesolithic and Neolithic exploitation of wetland environments. The tools used in the experiments were replicas of Late Mesolithic and Neolithic implements.

Two awls (nos. 3147 and 8017), believed to have been used on silicious plants, were subjected to phytolith analysis. The implements were soaked in distilled water, using the ultrasonic cleaning tank to vibrate the residues from the awls. The solution was centrifuged for 5 minutes at 3000 rpm. This procedure was repeated twice in order to enable comparison of the results after the first and second rinses to account for possible contamination of the adhering sediments. No chemicals were used to extract the phytoliths. The samples were examined with a Nikon transmitted-light microscope (magnifications up to 1000×). The phytolith analysis was carried out in collaboration with Dr Channah Nieuwenhuis.

10.3 Tool technology and typology

10.3.1 Bone tools

Metapodial technique

Some pieces of waste point to the use of the metapodial technique for the production of a range of bone tools including awls and chisels. Red deer metapodia were used mostly for this purpose (table 10.1). The natural grooves in the metapodia were deepened by means of incision with flint implements, after which the distal or proximal part was cut off (Maarleveld 1985; Van Gijn 1990, fig. 59). This standardised technique that produces highly characteristic waste was practised in the Mesolithic already. One piece of waste, a proximal part of a red deer metapodium, displays very distinct cutting marks (no. 5860, fig. 10.1). Quite a few flat pieces of bone also showed cutting marks constituting incisions along which the bone was intended to split or break. A series of awls were made with this technique (fig. 10.2). Awls were in fact the most common type of tools (table 10.1), ranging in length from approx. 3-4 cm to 17 cm in the case of one implement. This variation in size may be attributable to rejuvenation of the awls by grinding them to a fine point each time they had become blunt due to use. Another explanation could be that awls of different sizes were produced for different purposes, but this does not seem to be supported by the results of the use-wear analysis. Many of the awls were broken and six of them show signs of burning. At least some of the awls must have been highly valued implements because considerable effort was put into finishing them. Two awls (nos. 1351 and 10,552) display a very intensive gloss all over their surface, which has completely obliterated the cut marks formed in the metapodial technique (fig. 10.2). The polishing seems to have been done by means of hide or leather (Y. Maigrot, pers. comm.).

The chisels were also made on metapodia (fig. 10.3). Most of them are very small (approx. 4 cm long with a width at the edge of approx. 1-1.5 cm); many are broken. This is probably due to frequent resharpening. Chiselling wood,

	red deer			wild boar / pig			cattle	mammal		duck	swan	
skeletal part / artefact type	antler	metacarpus	metatarsus	fibula	cranium	tooth	metacarpus	bone	antler	humerus	tibiotarsus	totals
awl	–	–	–	1	–	–	–	23	6	–	–	30
axe	3	–	–	–	–	–	–	–	–	–	–	3
bead	–	–	–	–	1	–	–	2	–	–	–	3
chisel	–	–	–	–	–	–	–	6	–	–	–	6
groove-and-splinter	3	–	–	–	–	–	–	–	–	–	–	3
hammer	1	–	–	–	–	–	–	–	–	–	–	1
sleeve	1	–	–	–	–	–	–	–	–	–	–	1
pointed spatula	–	–	–	–	–	–	–	1	–	–	–	1
indet.	6	2	3	–	–	1	1	13	2	1	–	29
waste	2	1	–	–	–	–	–	8	1	–	1	13
Totals	*16*	*3*	*3*	*1*	*1*	*1*	*1*	*53*	*9*	*1*	*1*	*90*

Table 10.1 Bone and antler implements, tool types versus skeletal parts.

Figure 10.1 Cut-off distal end of red deer metatarsal constituting evidence of the local use of the metapodial technique (scale 1:1).

the activity for which these tools seem to have been used (see below), causing edges to blunt very quickly, necessitating frequent resharpening.

Other techniques

It may be assumed that there was a more opportunistic way of making implements besides the systematic metapodial technique, in view of the shapes of some pieces bearing traces of use. The bones may have been broken by pounding with a hammer stone (many of which were indeed found at the site; see chapter 8). Suitable edges will then have been selected for minor modification or even direct use (see below).

Bird bones were used for making beads (fig. 10.4). The beads show cut marks made by flint tools (fig. 10.5b). Waste products of this technique were found, too, in the form of one broken fragment of a hollow bird bone with possible cut marks. The finished beads, which appear to have been freshly made, accompanied a young child as grave goods (chapter 5). The bone was very light in weight and hollow, making it ideal for bead production. Yet another bead was made of an ear bone of a pig or wild boar (fig. 9.7, no. 8462), and was badly worn. The beads were discussed in greater detail in section 9.5.3.

Comparison with other assemblages

The range of bone tools found at Schipluiden is limited in comparison with what has been found elsewhere. At the late Mesolithic sites of Hardinxveld a lot of production waste from the metapodial technique was retrieved, as well as numerous finished tools (Louwe Kooijmans *et al.* 2001a and b); these finds form a marked contrast with the meagre evidence of Schipluiden. Moreover, several characteristic tools that were used in the Late Mesolithic and the Swifterbant culture are absent at Schipluiden. They include socketed bone axes made on the proximal part of the radius of domestic cattle of the kind that were found at Hoge Vaart (Laarman 2001) and Swifterbant (Clason 1978). Neither did Schipluiden yield any parallels of the perforated teeth of dog and horse found at Swifterbant (Clason 1978).

The Schipluiden bone assemblage bears a close similarity to the contemporary Hazendonk assemblage from the type site of this archaeological culture (Van den Broeke 1983). There, too, use was made of the metapodial technique and the number of broken awls was considerable. No bone tools were encountered at Wateringen 4, partially due to the poor preservation of organic materials (Raemaekers *et al.* 1997). Ypenburg likewise yielded only few bone tools due to poor preservation conditions (Koot./Van der Have 2001). At this site, three long bones had been modified into awls. Bones of the crane and white-tailed eagle were common, but no modified bird bones were reported (De Vries 2004).

Several sites of the Late Neolithic Vlaardingen group yielded numerous bone tools. The metapodial production technique is evident at most sites, such as Hekelingen III (Louwe Kooijmans 1985; Van Gijn 1990), the Vlaardingen levels at the Hazendonk site (Van den Broeke 1983) and the type site of Vlaardingen (Walvius 1961). The most common tool types are awls and chisels. The Late Neolithic site of Aartswoud yielded metapodia awls with the epiphysus still attached (Van Iterson Scholten/De Vries-Metz 1981). The metapodial technique must therefore have been practised over a very long stretch of time, from the Mesolithic until the Bronze Age.

The custom of using bird bones for artefact production likewise seems to have been practised for a long time. It was demonstrated at the Late Mesolithic sites of Hardinxveld-Polderweg (phase 1) and De Bruin (Louwe Kooijmans *et al.* 2001a and b), at the Early Neolithic site of Bergschenhoek (Louwe Kooijmans 1985) and at the beaker site of Aartswoud, which yielded four artefacts made on bird bones, one of which is an awl made on a tarsometarsus of a sea eagle (Van Wijngaarden-Bakker 1997).

10.3.2 Antler tools

The number of antler tools is limited (N=5 and six unmodified antler tines classified as awls). All the antler tools were made on red deer antler (table 10.1). Two basic tool-production techniques could be distinguished: the groove-and-splinter technique for obtaining splinters for the production of fine tools such as points and awls, and a technique that involved cutting and breaking red deer antler into smaller fragments that could be turned into tools such as axes or awls (fig. 10.7).

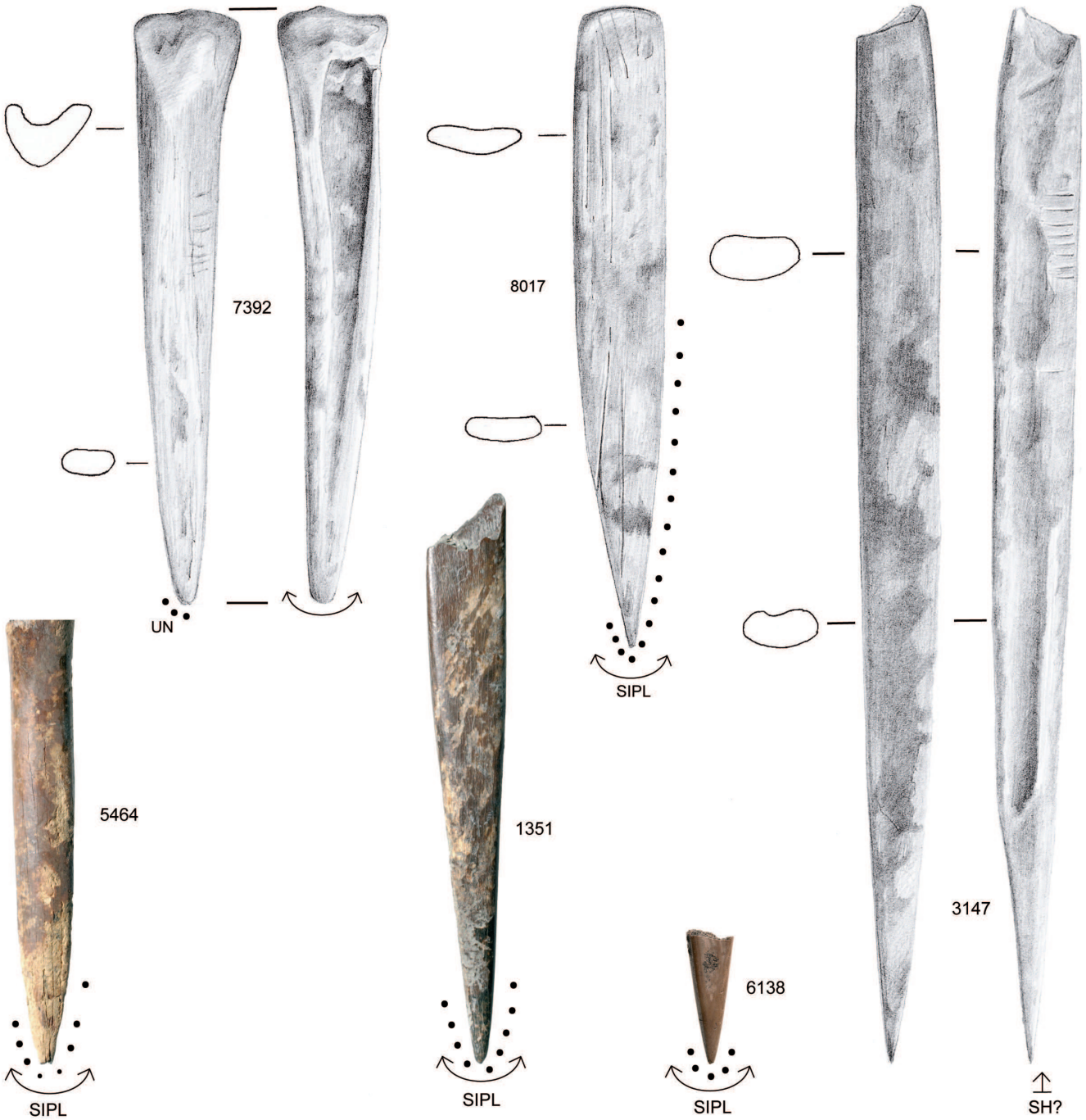


Figure 10.2 Bone awls made using the metapodial technique (scale 1:1). For legend of codes see chapter 7.

Groove-and-splinter technique (fig. 10.6)
The discovery of waste products deriving from the groove-and-splinter technique came as a surprise, because none of the other Dutch Late Mesolithic and Neolithic assemblages yielded evidence of this typically early Mesolithic technique. One cut-off antler base that was fished up from the

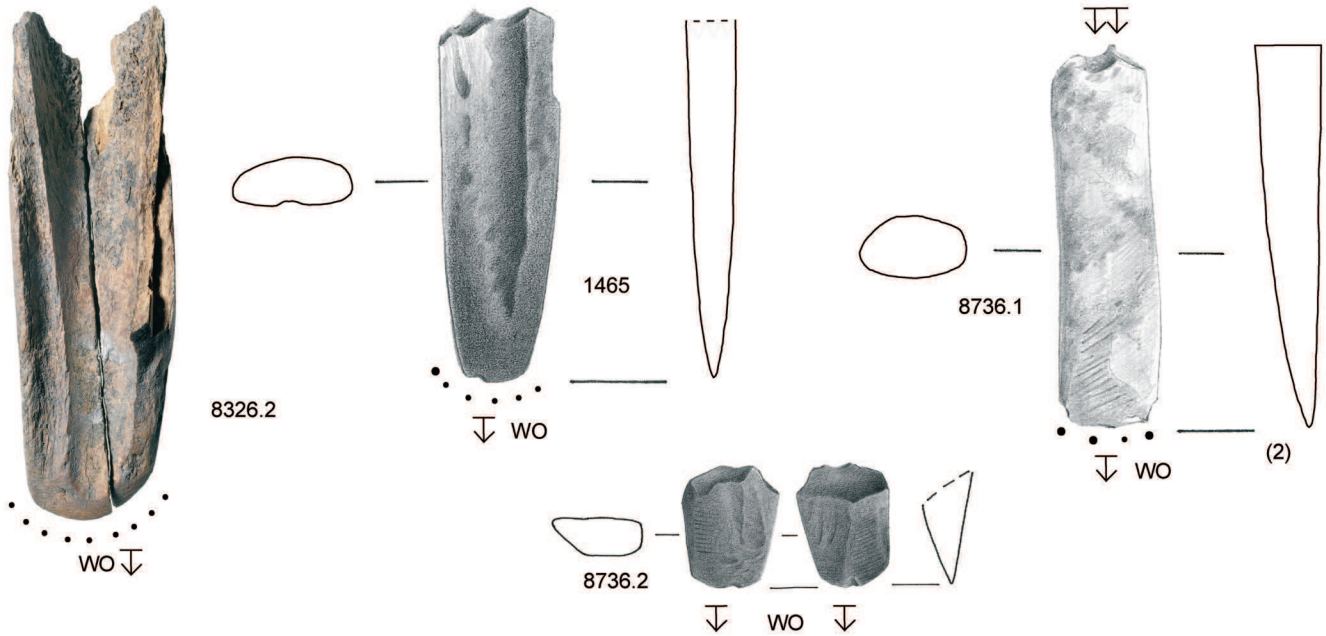


Figure 10.3 Bone chisels made using the metapodial technique (scale 1:1).

Oosterschelde and was tentatively dated to the Early Mesolithic on the basis of evidence of the use this technique is the only example known from the Netherlands (Louwe Kooijmans 1970/1971). It is therefore difficult to ascertain whether the use of this technique at Schipluiden should be interpreted as a continuation of a Mesolithic tradition or whether it should be seen as the re-invention of an old, forgotten technique. Interestingly Schipluiden yielded three classical examples of this technique.

One burr (no. 1905) of a small, shed red deer antler displays three narrow grooves, probably made with a flint implement (fig. 10.6). The rims of the cut are very straight, possibly suggesting the use of a string, but the irregular cut marks nevertheless point to the use of flint implements. Another object testifying to the use of the groove-and-splinter technique is a lower part of the beam of a red deer antler with two grooves and a perpendicular cut (no. 4590). The incision was made to the depth of the spongeous interior, after which the splinter was pried out of the shaft.

Very impressive is a long burr and beam with the bez and the ice tines removed by burning and breaking, from which a large strip was removed (no. 8038) The strip measures 22 × 4 cm. On closer inspection the strip was found to actually consist of three adjacent splinters that were removed one by one. Grooves were made along the full length of the beam until the soft spongeous interior was reached; deep cuts were made at the short ends to enable the splinters to be wedged off the antler beam. The beam is long and the antler is of very good quality, but no more objects were made on it. This would agree with the observation that antler was probably not a scarce raw material at the time of occupation.

No finished objects that could have been made on these splinters were found. It is possible that they were overlooked in the archaeozoological analysis, but it may also be that

Figure 10.4 Two beads made of bird bone showing cut marks. The beads come from the fill of grave 6 (scale 1:1, *cf.* fig. 10.2b).

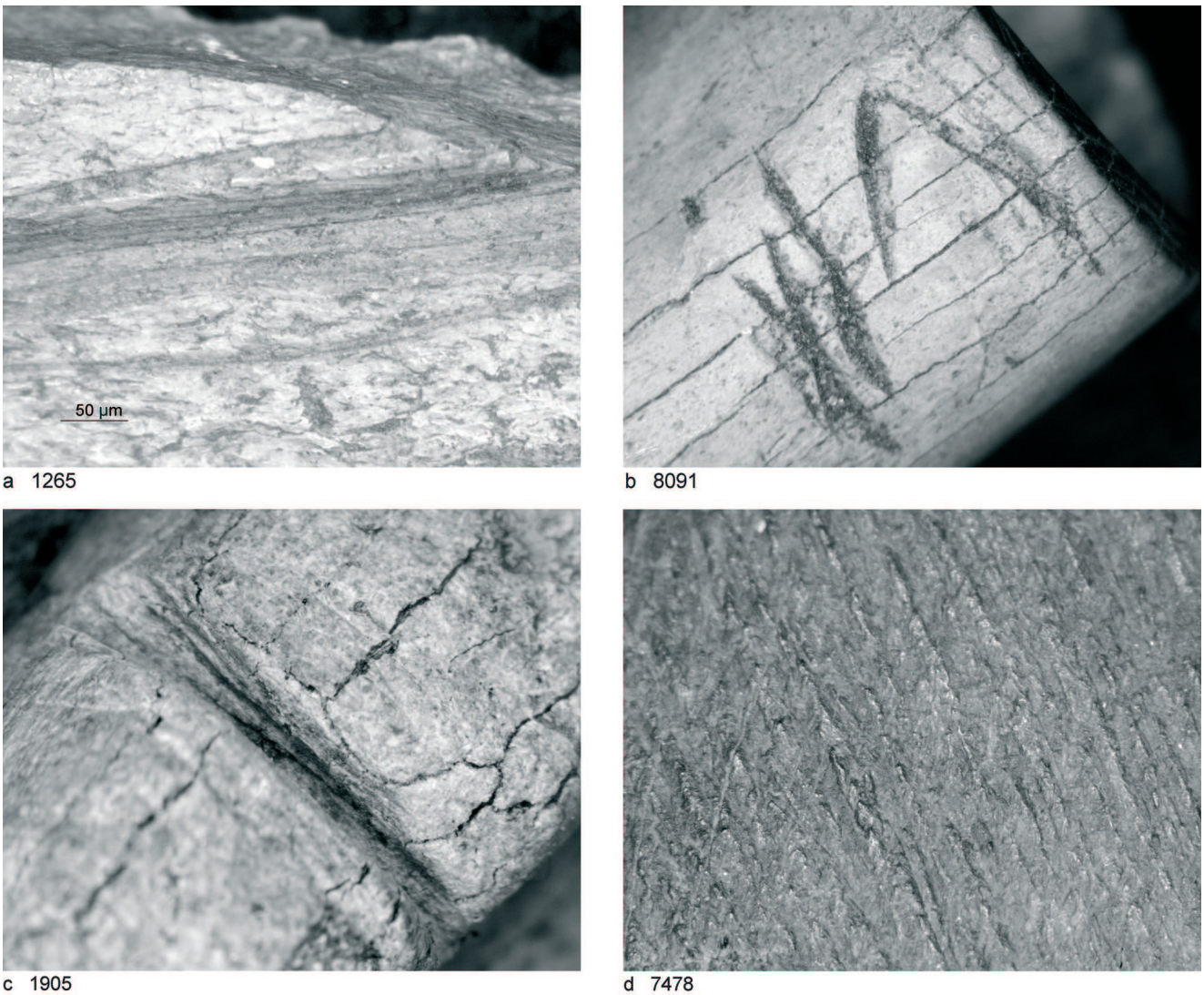


Figure 10.5 Production traces on bone and antler artefacts (stereomicroscope, magnification 7.5x)
a cut marks formed by flint on a piece of bone waste
b cut marks on a bone bead
c cut marks on a piece of waste resulting from the groove and splinter technique
d traces of grinding on a possible roughout of an axe

they were taken away from the site because they were still usable. Another disconcerting aspect of the demonstration of the groove-and-splinter technique is the absence of flint tools that could have incised or sawn antler. No use-wear traces indicative of such activities were observed in spite of the fact that such traces are very distinctive. It is possible that such tools were not selected for use-wear analysis because we do not understand which specific tool will have been used for this task (see chapter 7).

Implements made by cutting and breaking (fig. 10.7-8)
The second production technique that made use of large red deer antlers involved the division of the antler into segments for use as blanks for the manufacture of various tools. This practice was very common in Late Mesolithic times. At Hardinxveld-Polderweg and De Bruin tools from virtually every part of red deer antlers were found, testifying to a very intensive and economic use of this resource (Louwe Kooijmans *et al*. 2001a, fig. 11.6). A typical waste product is

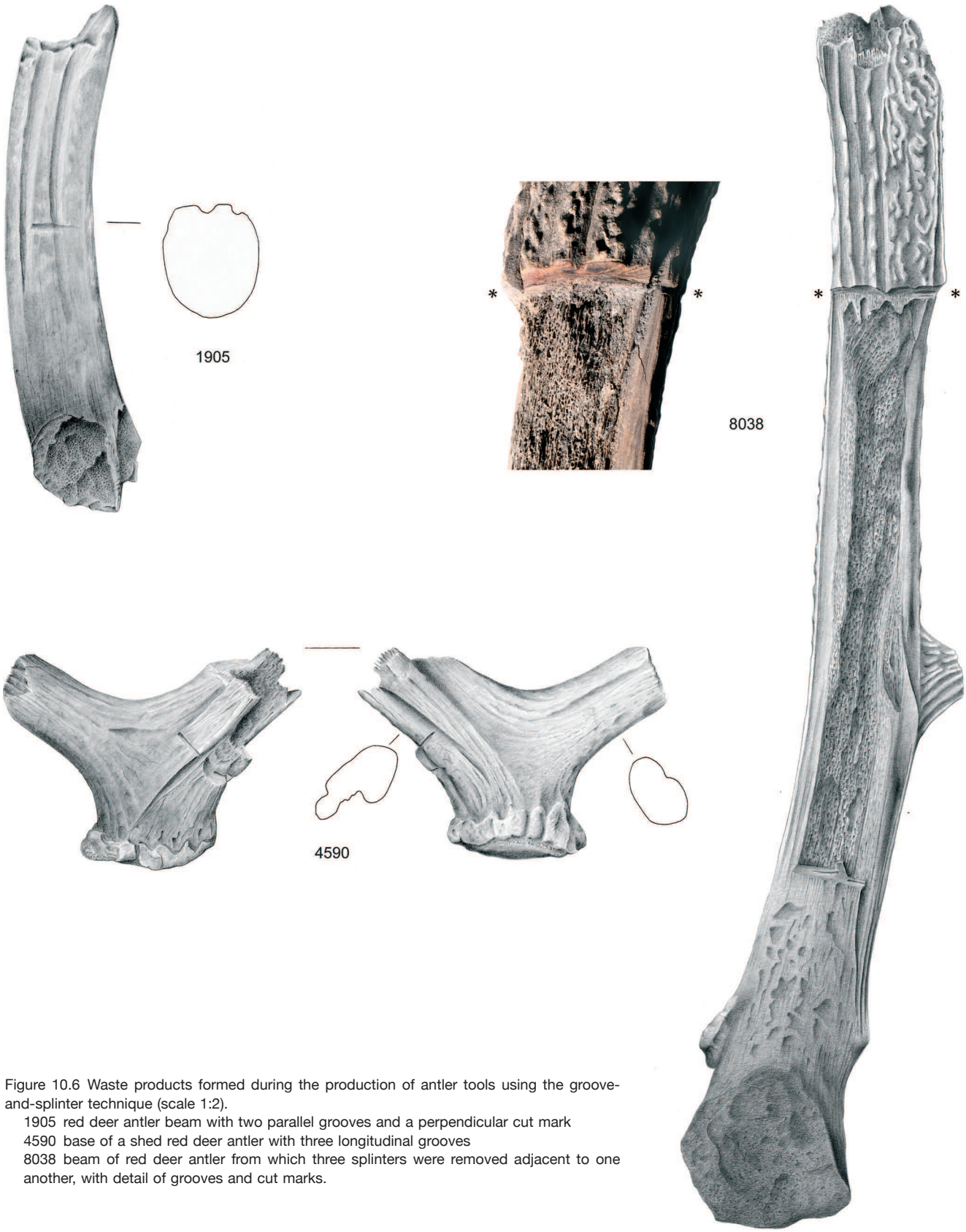


Figure 10.6 Waste products formed during the production of antler tools using the groove-and-splinter technique (scale 1:2).

1905 red deer antler beam with two parallel grooves and a perpendicular cut mark

4590 base of a shed red deer antler with three longitudinal grooves

8038 beam of red deer antler from which three splinters were removed adjacent to one another, with detail of grooves and cut marks.

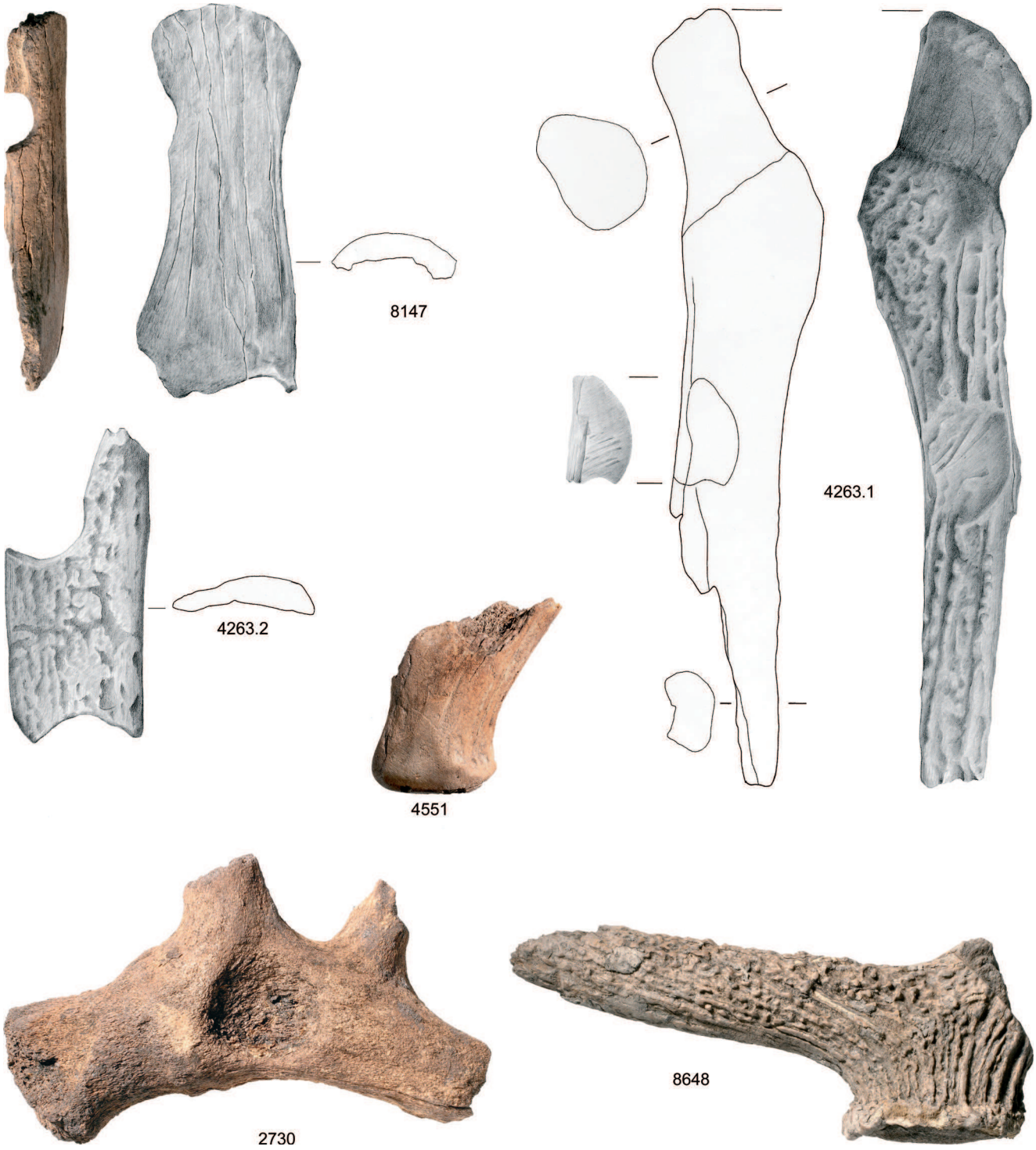


Figure 10.7 Antler tools and waste products of antler working (scale 1:2).
8147 fragment of base axe with shaft hole
4263.2 fragment of sleeve with shaft hole
4263.1 worked lower part of an antler beam with adhearing pedicel
4551 heavily worn antler base
2730 lower part of red deer antler with adhearing pedicel in which a depression was picked out
8648 base of a shed red deer antler with cut marks and signs of breaking, waste product

Figure 10.8 Bifacially worked base of an antler beam and adhering pedicle (scale 1:2) with detail (not to scale).

an antler burr bearing cut marks (no. 8648). The latter artefact may however also have served as a hammer because part of the burr was cut away. At Schipluiden only a few tool types were encountered: base axes, a sleeve, a hammer and unmodified antler tines.

One base axe (no. 4263.1) has an attached pedicle showing intensive smoothing and polishing. The edge of this piece is missing and the beam is flattened on both sides. These flattened areas were cut into shape and then further worn. They may have held a forked haft, but the leverage would have been wrong unless the tool was very long originally. The burr of this implement was completely worn away. It is not altogether clear whether this was done intentionally or whether it was due to friction with a haft.

Two other axe finds are broken fragments (4263.2 and 8147). The axes broke longitudinally, across the shaft hole. One still displays parts of the burr and is therefore probably a base axe. The other fragment is part of a beam and may bear some similarity to a T-axe fragment. Perforated T-axes are however characteristic of roughly the fifth millennium. They have been encountered in various cultural contexts of that period, *e.g.* the Ertebølle, later Lengyel and Rössen cultures, between *c.* 4700 and 4000 cal BC. In the Netherlands they have been found in Swifterbant contexts at Hardinxveld-De Bruin (Louwe Kooijmans *et al.* 2001b), at Hoge Vaart (Laarman 2001) and in the (undated) dredged-up assemblage of Spoolde (Clason 1985). They are not known from later contexts. This makes it unlikely that this particular axe fragment was actually part of a T-axe.

One last implement is a sleeve made on the beam of a red deer antler (no. 7917). It is hollow and measures 11.5 × 4.0 cm. It was poorly preserved and broken in four parts. One end displays manufacturing traces and minimal use damage, the other end is broken. Sleeves are common at Late Mesolithic sites and were found at various levels at the Hardinxveld sites, dating from 5500-4500 cal BC.

One of the most enigmatic finds of Schipluiden is also made of antler (no. 7478, fig. 10.8). It is a large beam with the burr and pedicle attached. They were both intentionally ground away to obtain two flat surfaces on the two sides of the antler, resulting in an edge suggesting that the artefact was intended to be used as an axe. However, the edge is almost square in cross-section and would have required extensive further sharpening to make it efficient. Cut marks are clearly visible along all the edges of this part of the implement. The abrasion marks formed in the grinding are also remarkably fresh and not worn away by subsequent use (fig. 10.5d). The unmodified part of the beam likewise looks remarkably fresh. In fact, the entire tool looks as though it has only just been made. It was interpreted as a semi-finished axe because the pedicle is harder than the antler itself, and will have constituted an effective edge. Artefacts with cutting edges made on the pedicle, but of a different type, are known to have been made of elk antler. In these cases the beam or shovel is perforated and the tool was probably hafted as a chisel, with the pedicle cut into a point or transverse cutting edge. Such artefacts are known from Early Mesolithic contexts onwards (Louwe Kooijmans 1971) and also from Spoolde (Clason 1985). The Schipluiden specimen is however entirely different. The freshness of the manufacturing traces, the intentional cutting of the top into a rectangular blunt edge and the fact that no tools of this type have ever before been found suggest a different function.

It is often assumed that antler tines were also used. It should however be borne in mind that tines naturally show fracturing and polish resulting from fights between the animals and rubbing against trees. It is therefore not always easy to distinguish use-wear traces with a human origin. The Schipluiden tines all seem to have been broken from the beam, as no cut marks are visible.

Other artefacts made of segments of red deer antler are difficult to classify. One base displays an incomplete large perforation (no. 2730). It is not clear whether this is an unfinished shaft hole or whether the intention was to make a small depression).The hole seems to have been at least partially made by cutting, as incision marks are visible, but it also displays signs of burning. Burning was sometimes practised as a production technique, for instance to remove the tines. Another intriguing tool is a base that was ground entirely flat to remove the burr (no. 4551). The scratches of the grinding are still visible. The rest of the artefact is broken off, so how this piece should be classified is not clear.

10.4 Tool functions

10.4.1 Bone tools

The range of activities demonstrated by use-wear analysis is rather limited, but supports the results of the functional analyses of other categories of implements and provides more insight into the technological system (table 10.2). Most of the bone tools examined are awls and chisels (table 10.3).

Plant processing

Several awls display traces formed in processing (silicious) plants, during which the tool was used in a rotating fashion (fig. 10.2). The polish is very bright and smooth, with numerous very fine, shallow scratches (figs. 10.9a, b). Remains of basketry and fabrics have been found at Schipluiden (chapter 12). They were made using a technique described as ‘looping around a core’, in which bundles of plant material were sewn together with thread. An awl is needed for this activity, to make a hole to pass the thread through. The awls found at Schipluiden may well have been used for this purpose. Phytolith analysis of two such tools

motion / contact material	boring	chiselling	wedging	piercing	scraping	shooting	unknown	no traces	total
hide	1	–	–	–	1	–	–	–	2
wood	–	5	1	–	–	–	–	–	6
pottery	–	–	–	–	1	–	–	–	1
reed	1	–	–	–	–	–	–	–	1
silicious plants	2	–	–	1	–	–	–	–	3
soft material	–	–	–	–	–	–	2	–	2
unknown	3	–	1	–	–	1	7	–	12
indet.	–	–	–	–	–	–	3	–	3
no traces	–	–	–	–	–	–	–	20	20
Totals	*7*	*5*	*2*	*1*	*2*	*1*	*9*	*23*	*50*

Table 10.2 Use-wear results, contact material versus motion by artefact.

revealed traces of phytoliths that could not be further identified to species level, but do support the inference that these tools were used on plants, probably silicious plants. Bone awls with similar use-wear traces have been found at the Late Mesolithic sites of Hardinxveld-Polderweg and De Bruin (Louwe Kooijmans *et al*. 2001a, b) and at the Early Neolithic site of Brandwijk (Van Gijn pers. observation; Van Gijn/Verbruggen 1992).

Woodworking

Bone chisels seem to have been used for fine woodworking (fig. 10.3, table 10.2-3). Some (such as nos. 8736.1 and 8736.2) are quite small and seem to have complemented the other woodworking tools found at Schipluiden, such as the flint axes used for chopping, the stone wedge and the large quartzite flakes that were used for cutting or sawing wood (section 8.6.8). Woodworking traces are surprisingly rare on the flint tools, and seem to be largely confined to the axes and flakes of such axes (section 7.7.2). The polish on the chisels is bright and smooth and has a domed topography (figs. 10.9c, d). One broken chisel displays slightly different traces of woodworking, interpreted as resulting from the removal of bark (no. 8326). One implement, a split metacarpus of cattle (no. 3403), that could not be classified typologically, was probably used as a wedge on wood. This implement may be directly associated with the split-off tangential pieces of alder wood described in section 11.4.3. The distal part of the tool was cut into an edge, which displayed polish and striations orientated perpendicular to the edge. The edge is slightly 'bent' – something frequently observed on experimental woodworking tools. The proximal part is very rounded and polished. This end may have been covered with a piece of hide to prevent the risk of the bone fracturing upon impact. A similar tool, with a similar rounded proximal end (no. 6956), was too poorly preserved to allow any conclusion as to whether it, too, may have been used as a wedge. A large fragment of a split long bone (no. 7199, fig. 10.10) was used as a chisel on wood. The presence of a range of tools used for woodworking does support the supposition based on the large number of different types of wooden artefacts that wood was worked locally (chapter 11).

contact material / artefact type	hide	wood	pottery	reed	silicious plants	soft material	unknown	indet.	no traces	totals
awl	1	–	–	1	3	1	6	–	6	18
axe	–	–	–	–	–	–	–	–	1	1
bead	–	–	–	–	–	–	1	–	2	3
chisel	–	4	–	–	–	–	–	–	–	4
groove-and-splinter	–	–	–	–	–	–	–	–	2	2
hammer	–	–	–	–	–	–	–	–	1	1
sleeve	–	–	–	–	–	–	–	–	1	1
indet.	–	1	–	–	–	1	4	2	4	13
waste	1	1	1	–	–	–	1	1	3	7
Totals	*2*	*6*	*1*	*1*	*3*	*2*	*12*	*3*	*20*	*50*

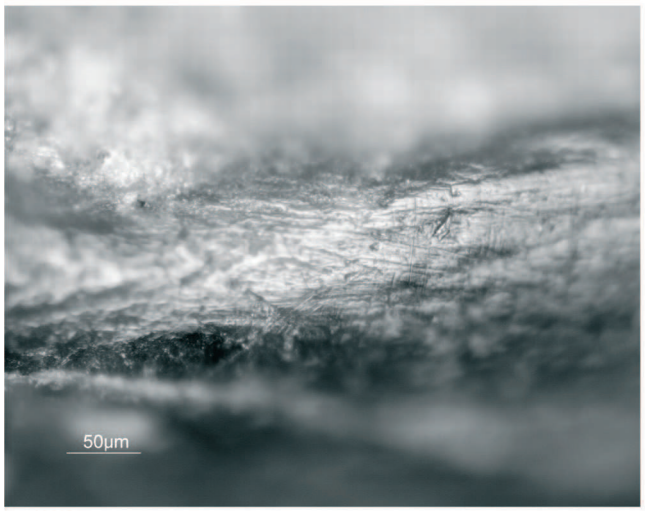
Table 10.3 Use-wear results, artefact type versus contact material by artefact.

Hide working

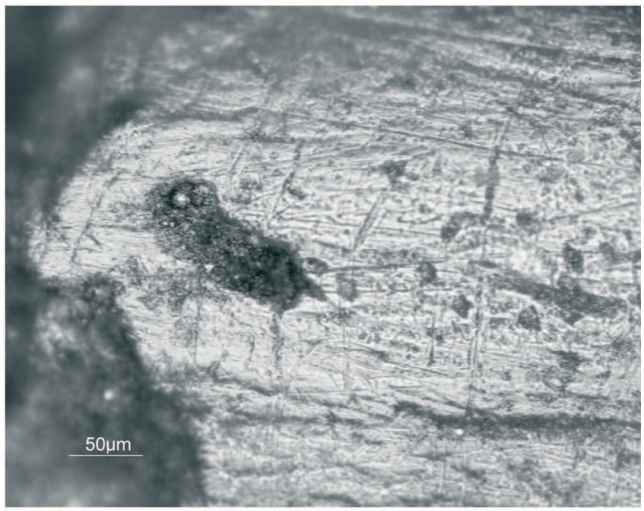
One awl fragment displayed a rough, heavily striated polish that was interpreted as resulting from contact with hide. The scratches indicate a rotating movement, suggesting that the tool was used to pierce hides. A small piece of bone waste with a suitable edge (no. 1265, fig. 10.10c) showed the same rough, striated polish, in this case perpendiculary oriented, suggesting a scraping motion.

Miscellaneous

Waste was incidentally also put to use. A case in point concerns a pointed piece of split bone displaying 'use retouch', rounding and polish at the tip. The striations indicate that the tool was used as a drill, but the contact material could not be specified (no. 5488, fig. 10.10). Another regularly shaped piece of waste was probably used to scrape pottery (no. 5033, fig. 10.10). It has a very bright, rough and striated polish that does not resemble hide-working traces. A large awl (no. 3147, fig. 10.3c) displays edge removals at its tip that are assumed to be impact fractures. This implement does not show any use-wear polish or striations and may actually have been a spearhead rather than an awl. A last piece of waste was used on a soft material that could not be further identified (no. 8611).



a 1351



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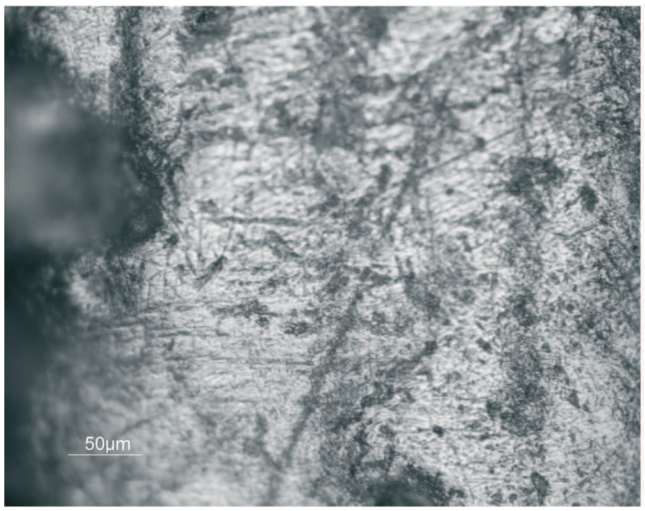
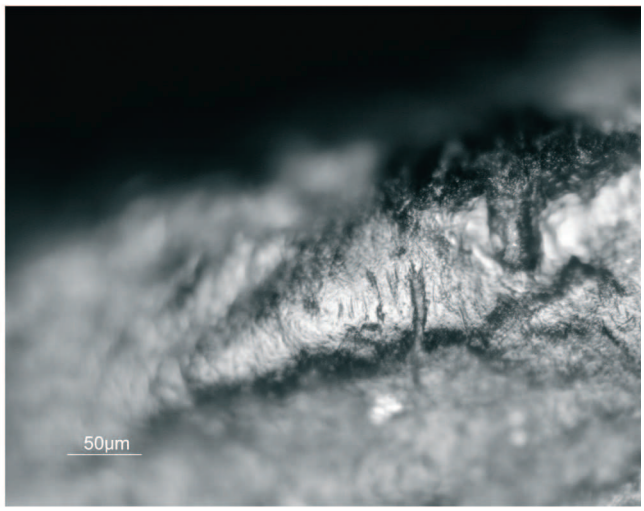


c 1465



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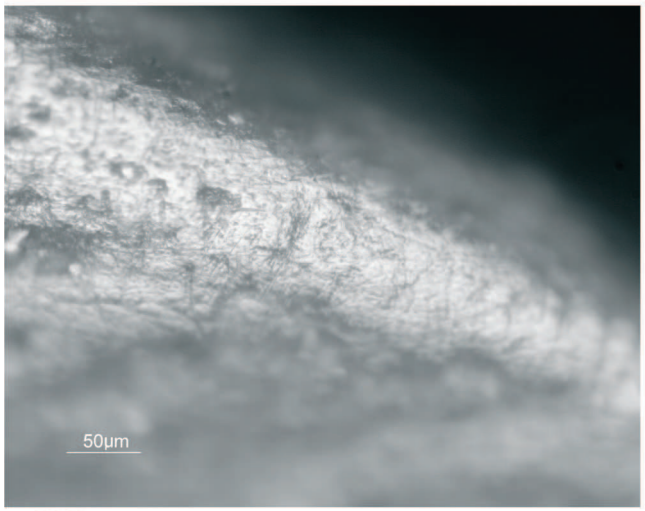
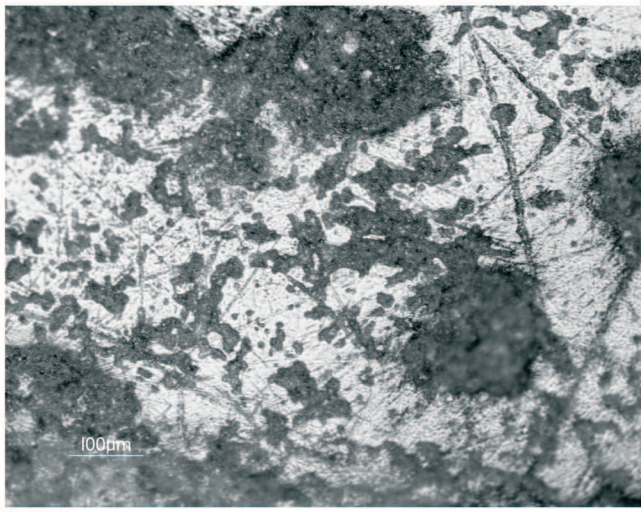


e 5033



f 7199

Handling or hafting traces were incidentally observed on some of the bone tools. Two awls displaying plant-processing traces for example also show extensive handling wear (nos. 1351, 5464). A possible chisel made on wood also shows handling traces (no. 7199, fig. 10.9f). A fourth tool classified as an awl (no. 3147, fig. 10.3) displays some striations on its proximal part that may be associated with hafting.

10.4.2 Antler tools

The antler tools less frequently display traces of use. One antler tine (no. 4570) that is rounded and has some worn fractures may have been used as a punch for indirect percussion during flint knapping. Some of the other antler tines however show no traces of use. Why they were removed from the main antler is not clear. The enigmatic antler axe (no. 7478) seems completely fresh. The manufacturing traces have not been worn away at all and traces of use are completely absent. This observation supports the interpretation that this object is a semi-finished axe that was possibly abandoned because its edge was not right. On the other hand, the absence of use-wear traces may also support a less functional explanation, for example for display during ceremonies. However, if the object had a symbolic value, it should display some wear – at least from handling – and this is not the case.

10.5 Diachronic differentiation

Almost 80% of the artefacts were found in the aquatic deposits along the dune's margin and could be dated to one of the occupation phases. The distribution over the phases roughly coincides with the distributions of all the other find categories, with phase 1 having a low score (table 10.4). Antler dominates the distribution in phase 2a (48%), while bone seems equally divided over the phases. It is not clear whether we should attribute meaning to this observation or whether it is a matter of chance. No obvious chronological trends are observable in the presence of different types of tools. Two of the three waste pieces deriving from the groove-and-splinter technique were dated to phase 2a, but then again the antler finds from that phase are the most frequent.

Figure 10.9 Use-wear traces (a-e magnification 200×, f magnification 100×)
a, b traces interpreted as resulting from piercing and pounding silicious plants
c, d polish and striations probably formed in contact with wood
e rounding and rough polish possibly formed in scraping clay
f handling traces

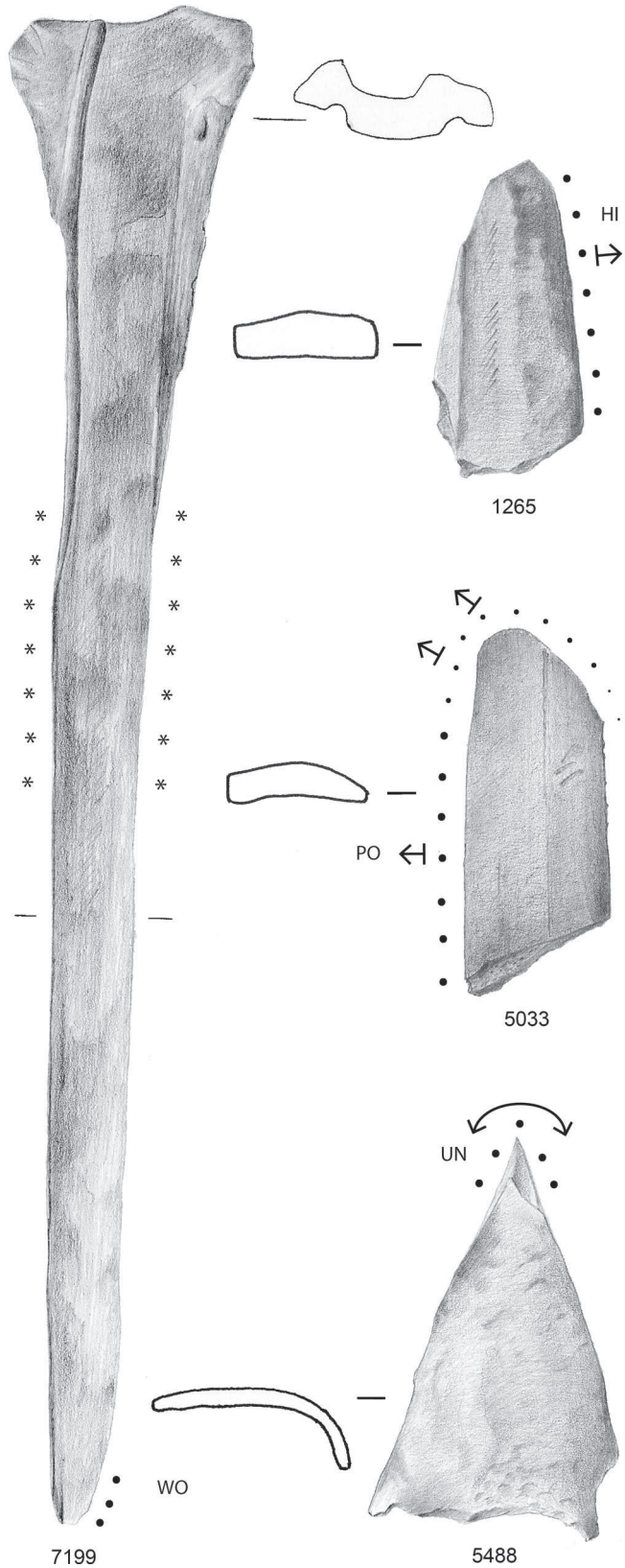


Figure 10.10 Production waste used as tools (scale 1:1).

phase	1	2a	2b	3	1-3	total
awl	–	13	11	4	2	30
axe	–	–	–	–	3	3
bead	–	–	1	–	2	3
chisel	–	–	1	2	3	6
groove-and-splinter	–	2	–	–	1	3
hammer	–	1	–	–	–	1
sleeve	–	–	–	1	–	1
pointed spatula	–	–	–	–	1	1
indet.	2	7	11	5	3	28
waste	–	6	3	2	3	14
Totals	*2*	*29*	*27*	*14*	*18*	*90*

Table 10.4 Bone and antler implements, tool types per occupation phase.

10.6 Spatial distribution

The general distribution of the bone and antler artefacts corresponds to that of all the organic material: predominantly in the southeastern dump zones and to a lesser extent in the low-lying northwestern part of the dune. The awls appeared to be confined to the southern margin, whereas the antler axes were found in the north. It is not clear what this observation means. The spatial distribution of the activities demonstrated by use-wear analysis shows no patterning. There is also no spatial relationship between the pieces of bark fibre fabric and the awls (fig. 10.11).

10.7 Conclusion

10.7.1 Mesolithic roots

The bone and antler tools of Schipluiden show how strongly the Neolithic inhabitants were rooted in the old Mesolithic traditions as far as their technology is concerned. Antler and bone were still important raw materials for tool manufacture, and some of the main techniques used have their roots far back in the Mesolithic. The manufacture of awls and chisels from metapodials – mostly of red deer – clearly has its roots in the Mesolithic, but continued to be practised until the Bronze Age. At the Late Neolithic site of Hekelingen III, for example, the entire sequence of the production process based on red deer metapodials was represented, along with the employed flint tools (Van Gijn 1990). This 'metapodial industry' was also noted at the Early Neolithic sites of Hoge Vaart, Brandwijk and Swifterbant, and the Middle Neolithic site of Hazendonk (Van den Broeke 1983). The range of bone and antler tools is however quite limited in comparison with the Mesolithic range. Awls constitute the largest category, followed by chisels and antler axes. Pieces of production waste were sometimes opportunistically employed as tools. A pointed piece of broken bone displays traces formed in piercing hide. The use of such *pièces de fortune* was also observed at Hardinxveld-Polderweg and De Bruin (Louwe Kooijmans *et al.* 2001a, b), and need not at all be related to a shortage of raw materials for tool production. Rather, it points to a flexible attitude towards tool use, involving also the recycling of broken implements such as axes for other purposes.

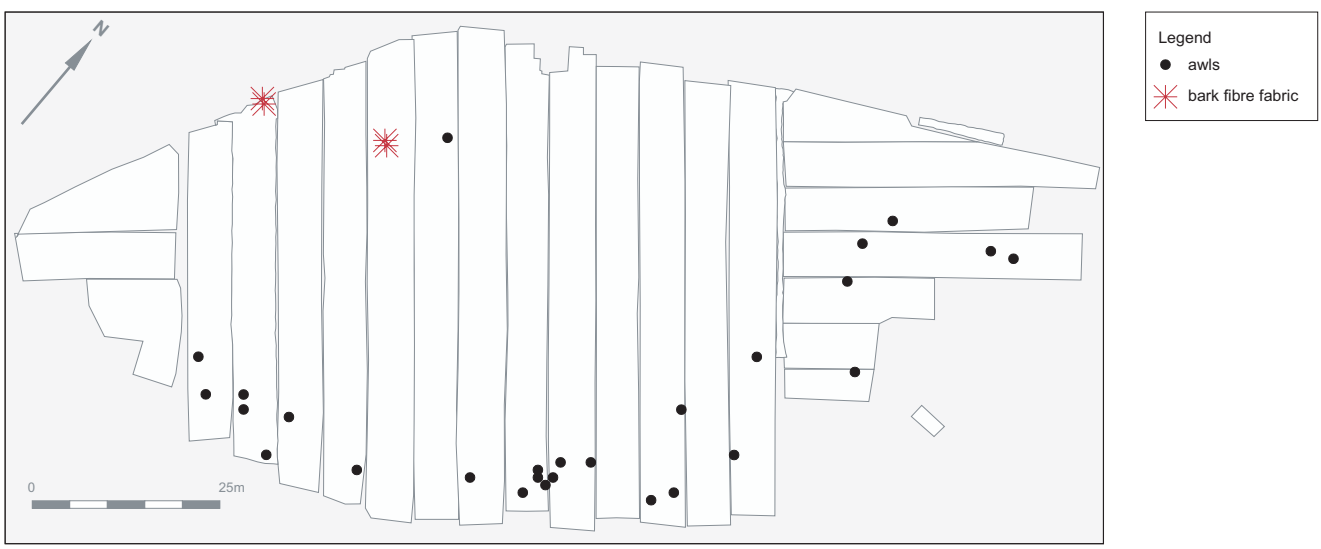


Figure 10.11 Distribution of the bone awls in relation to the pieces of bark fibre fabric.

Fragmenting red deer antlers by cutting and breaking is also a tool-making technique with roots in the Mesolithic. Numerous examples are known from the Late Mesolithic sites of Hardinxveld-Polderweg and De Bruin (Louwe Kooijmans *et al*. 2001a, b), but the evidence at Schipluiden is limited to one waste product and a small number of finished implements.

It is less clear whether the evidence for the groove-and-splinter technique should be interpreted as representing the continuation of an old Mesolithic tradition or re-invention of a formerly employed technique. The discovery of three pieces of antler showing evidence of the groove-and-splinter technique, used to obtain blanks of the compact outer tissue for the production of tools such as awls, chisels and points came as a great surprise. This technique has not been demonstrated for a Neolithic context before, and was considered to be purely Mesolithic, even Early Mesolithic. Only one example – a tool dredged from the Oosterschelde (Louwe Kooijmans 1970/1971) – is known from the Netherlands, suggesting that this was not a very common tool making technique in our region. The great chronological gap between the Early Mesolithic and the use of this technique at Schipluiden could imply that the technique was re-invented. However, we do not have a representative database and it may well be that future excavations in the wetlands will produce examples of the groove-and-splinter technique. Considering the continuity in the metapodial technique and the fragmenting of red deer antlers by cutting and breaking from the Mesolithic to the Neolithic, it is more likely that Neolithic tool makers were familiar with the groove-and-splinter technique, too. The use of hearth pits at Schipluiden is yet another example of the continued use of Mesolithic know-how. No remains of finished implements made on a splinter of antler were found at Schipluiden. Considering the small numbers involved, this does not necessarily mean that the implements were lost off-site, but the possibility of the production of hunting and fishing equipment is attractive in view of the presumed continuities.

10.7.2 Toolkits

The range of activities demonstrated by the use-wear analysis of the bone and antler tools is relatively restricted, with evidence of plant-processing and woodworking predominating. This outcome should however be viewed in relation to the small sample examined. Considering the fact that only a limited number of pieces of waste were studied, it cannot be excluded that a wider range of activities is represented in such *ad hoc* used tools.

Bone chisels, even very small ones, were used for fine woodworking, complementing the flint axes that were used to chop wood and the large quartzite flakes used as saws. We can consider this set of implements a woodworking toolkit (fig. 10.12).

The bone awls were for the most part used in a rotating movement on plants. They may have played a role in the 'looping around a core' technique for making baskets and other objects, remains of which were also found at Schipluiden (chapter 12). Together with the flint tools that were used to cut silicious plants, the awls may constitute a toolkit geared to the production of textiles, matting and

Figure 10.12 Toolkit used for fine wood working, consisting of small bone chisels and flint implements, such as the illustrated retouched blade of imported material.

basketry (fig. 10.13). There was however not a one-to-one relationship between awls and plant-processing. One awl may actually have served as a spearhead while another was used to work hide.

The use-wear analysis of the antler artefacts did not produce much information about activities that were carried out with the artefacts because the majority of the artefacts concerned were production waste and broken implements. One of the antler tines may have been used as a punch in flint knapping. Indirect percussion is a technique that is very useful for making flint axes – an activity that was most probably also carried out at the site, because some of the axes were small and made from – probably locally available – rolled pebbles (chapter 7).

The results of the analysis of the bone and antler implements and the production waste complement those of the technological and functional analyses of the other artefact categories, especially flint and stone, but also wood and vegetal fibres. Studying these various categories of material culture in an integral fashion makes it possible to reconstruct toolkits composed of different types of artefacts that were used for different specific tasks. In the case of the bone and antler tools these tasks included basket making, woodworking, hide processing, flint working and possibly hunting. This type of analysis therefore provides data that can be of help in reconstructing the daily activities carried out at a site. Those activities relate to the composition of the social group residing at the site, and also reflect the duration of the site's use. Some of the activities in which the bone and antler tools were used at Schipluiden imply a long-term stay at the site. It is moreover very likely that a complete social group was present. One enigma remains, and that is the interpretation of the freshly ground, modified large antler that has no parallel in any known assemblage. In the absence of supporting contextual or iconological arguments, we should resist the temptation to assign symbolic meanings to such an object. The series of equally enigmatic wooden artefacts of this same site reminds us that the sample of organic implements is very restricted, and that its variation and former importance can hardly be overestimated.

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Figure 10.13 Toolkit used for making fabrics and basketry – a task that involved a relatively large number of flint tools and bone awls.

Nieuwenburg-Bron made several of the experimental tools and shared her knowledge of bone and antler with me. Eric Mulder assisted in the preparation of the samples and the computer work. The photographs were made by Ben Grishaaver, AVC, Leiden University, and the drawings are by Erick van Driel.

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