The domestic sphere of the Corded Ware Culture: a functional analysis of the domestic implements of three Dutch settlements

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Chapter 7. The domestic implements of the Corded Ware Culture: An overview

7.1 Flint, stone, bone and amber procurement networks

The three settlements studied were located in a former tidal basin, which started to silt up between 4500 and 4000 BC as a result of sea level rise. The tidal basin was formed during the Holocene, when Pleistocene soils started to be covered by peat. The settlements were located on an open and treeless landscape covered by grasses, heavily influenced by brackish waters, although fresh water sources were close to the settlements. Although the area was characterized by a rich combination of ecological niches, some resources were not available for the communities living in the area. Besides several types of wood, nuts, and fruits (Kubiak-Martens 2012, 2013, 2014), flint and stone had to be acquired and transported from elsewhere.

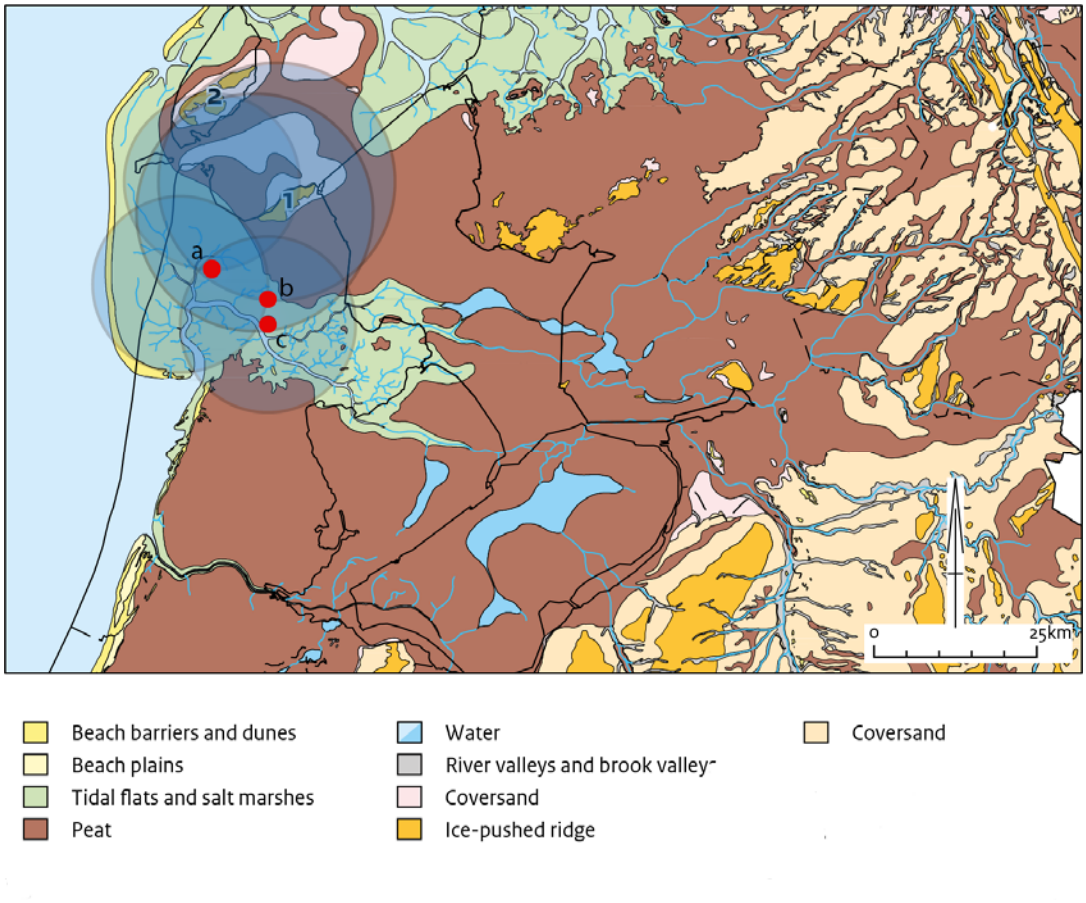

Figure 7.1. Relation between the three studied settlements and the procurement areas used by the Corded Ware Culture populations. 1:deposits of Wieringen; 2: Texel; a: Keinsmerbrug; b: Zeewijk ; c: Mienakker (after Kleijne and Weerts 2013).

Northern flint and stones

Northern flint and stones were probably obtained from the Pleistocene deposits of Wieringen and Texel, located 15 to 20km away from the settlements. Expeditions in search of lithic material and/or wood could easily have been combined with other activities, such as hunting, fishing, or gathering fruits. The treeless landscape in which the settlements were located probably forced the community to organize expeditions to obtain some scarce natural resources, such as apples, wild fruits, berries, hazelnuts and acorns (Kubiak-Martens 2012, 2013, 2014), but also good-quality wood necessary to build houses and fences. Accordingly, raw material acquisition of stone, flint and amber was probably intertwined with subsistence activities. Put another way, and as suggested by Binford for the Eskimo groups, raw material acquisition was '*embedded in basic subsistence schedules*' (Binford 1979: 259). The use of the glacial till deposit of Wieringen as a raw material procurement source area has been documented for other Corded Ware settlements in this area (Drenth and Kars 1990), as well as for other Neolithic sites (see Chapter 8). Therefore, the continuous use of the deposits of Wieringen by prehistoric groups suggests that the area was part of the '*mutual knowledge*' of the Neolithic inhabitants of the northern part of the Netherlands. This '*mutual knowledge'* was related to landscape perception, and it was transferred from one generation to the next and from one group to another (see Chapter 3). This idea is similar to Schlanger's term '*persistent place'* (Schlanger 1992: 97), a term used to define the areas of a landscape that were used repeatedly over time (Schlanger 1992: 97). The exploitation of the Pleistocene deposits of Wieringen and Texel continued among the Neolithic groups of the Netherlands through long-term memory processes. The landscape, therefore, was part of the material culture of prehistoric societies. The use and reutilization of specific places relate to the social norms and rules imposed by previous generations. The Pleistocene deposits of Wieringen were also part of the TRB and Vlaardingen narratives. At the beginning of the third millennium BC, new possibilities for occupation became available to the Neolithic groups: a mosaic of landscapes was available in the tidal basins of West-Friesland. These areas were exploited and used, and the '*mutual knowledge'* of TRB and Vlaardingen groups was expanded, adapted and maintained by the so-called CWC.

Figure 7.2. Actual deposits of Wieringen at the Noorth-Holland province and modern distribution of raw material (García-Díaz).

Amber

It is generally accepted that the amber found in the Noord-Holland province had a Baltic origin (Bulten 2001; Van Gijn 2014a; Waterbolk and Waterbolk 1991). Amber is carried along the tidal streams of the North Sea and it can still be found today on the shores of the Frisian Islands (Waterbolk and Waterbolk 1991), so it is plausible that the nodules were collected by the Corded Ware communities on nearby beaches, 15 to 18km away from the settlements (Van Gijn 2014a). Amber could also have also been obtained from the boulder clay deposits located approximately 8-10km north of Zeewijk and 15-20km of Mienakker. In addition, two other sources are mentioned in the literature: the first is the Pliocene lignite deposits of the northern Netherlands, in which small amounts of amber are present (Huisman 1977), and the second concerns amber from tertiary sources transported by the rivers in the central Netherlands (Van der Valk 2007 in Van Gijn 2014a). Amber nodules were transported to such permanent or semi-permanent settlements as Mienakker (Bulten 2001), Zeewijk (Van Gijn 2014a) and Aartswoud (Piena and Drenth 2001), where beads and pendants were locally produced. At other sites, such

as Keinsmerbrug, where ornaments were probably not locally made (García-Díaz 2012), the ornaments may have been worn and then discarded, or accidentally lost. The collection of amber nodules was probably a simple task which could have been combined with other activities, such as shell gathering and fishing.

Southern flint and imported material

At Keinsmerbrug, Mienakker and Zeewijk the presence of southern flint was mostly due to the geological formation of the landscape. The Meuse and Rhine rivers ended in the present day Waddenzee, so river gravels are commonly found in the moraine (Houkes 2011). Therefore, although a southern origin for the stones cannot be discarded, some authors suggest Drenthe, or the Pleistocene deposits at Wieringen, as the acquisition source (Peeters 2001b).

Southern flint is commonly used in Vlaardingen settlement context, notably at settlements located on river dunes and the Pleistocene dunes (Devriendt 2013; Van Gijn 2010a, 2010b; Van Regteren Altena 1963; Van Regteren Altena *et al*. 1963; Verhart 1983), and at other CWC settlements (see Chapters 2 and 8). In addition, long-distance movement of stones is shown by the presence of Scandinavian flint blades and axes in CWC burials. French flint, such as Grand-Pressigny or Romigny-Léhry, is also present in the form of daggers from the All Over Ornamented period (Van Gijn 2010a: 145-148). Peeters (2001b) interpreted the fragments of Grand-Pressigny obtained at Mienakker as a reutilization of one of these daggers. Indirectly, the fragments of Grand-Pressigny would have been part of a broader social network, which influenced the acquisition of high quality raw materials, or implements (Peeters 2001b). It has been proposed that daggers which had been accidentally broken would be reused to produce other tools (Van Gijn 2010a: 140). Although some Grand-Pressigny fragments have been found at Corded Ware settlements (Delcourt-Vlaeminck in Van Heeringen and Theunissen 2001: 161; Woltering 1989), during the CWC complete Grand-Pressigny daggers are only found in graves (Van Gijn 2010a: 145). The daggers were probably imported as finished objects, as no production waste from the production of Grand-Pressigny blades has so far been found. Several authors have discussed the role of technology as a transmitter of the social and cultural worldviews of prehistoric communities (Dobres 2009; Edmonds 1995, 1999; Sørensen 2006). The selection of the raw material and the technological processes used to manufacture the tools imply a conscious choice for the reproduction of the norms and social rules of the society. The use of finished implements as a raw material source could point to this interpretation: these finished implements were intended to be part of the ritual life of the community, but the broken tools were reshaped and used for domestic proposes.

Bones

Bone acquisition is different from the lithic procurement. First, if bones are procured from wild animals the animals' own pattern of mobility has to be taken into account. The migration patterns of prey animals will have '*an impact on the timing and reliability of access to osseous raw materials* and *other animal products*' (Gravina *et al*. 2012: 3). In addition, the obtained raw materials like metapodia generally have an identical form and shape, with similar or identical characteristics, which helped to produce regular and standardized items. Bone acquisition was closely connected to the subsistence activities of the groups. In the case of the studied settlements, both wild and domesticated animals were used to produce bone implements. Hunting, and especially fowling, strategies suggest that the Corded Ware communities had a wide knowledge of the natural cycles of the wetlands. The mass catching of ducks during the moulting period suggests that the Corded Ware communities possessed a thorough knowledge of the behaviour of the birds. This knowledge was probably rooted in the Mesolithic and maintained during the Neolithic, when hunting and fowling continued to be important subsistence activities.

The domestication of animals, however, implied a change in social practices. Domesticated animals were treated in a different way from wild animals, which led to a change in values and practices (Cummings and Harris 2011). In the first place, domestic animals could not care for themselves the way wild animals do, but instead required more attention from people (Chadwick 2007). Animals had to be fed and the settlement, as the centre of pastoral activities, had to be located in areas with adequate pasture and water supplies. This requires '*choosing the right combination (bundle) of animals to herd at the right time and the right place*' (Carlstein 1982: 114). The combination of diverse herds (pigs, cattle and sheep/goats in the case of the CWC) is one of the main tactics that agro-pastoralist societies used to maximise the long-term viability of the household (Russell 1998: 43). The former tidal basin where the settlements were established was rich in pastures and grasses. Short-distance journeys were common for the Corded Ware people. The deposits area of Wieringen did not only offer a well-supplied source for stone and northern flint acquisition, but would also have provided rich pasture land for animal herds. In addition, living and working with domesticated animals encouraged a change in the symbolic life of these communities. Many hunter-gatherer societies considered wild animals to be part of their daily landscape, as part of nature, and interacted with them, trying to maintain an equilibrium between the community's needs and their natural environment (Ingold 2000a, 2000b). However, domestication changed the way animals were perceived by the communities, as domesticated animals started to be treated like

objects, and considered property (Ingold 2000b; Orton 2010). Furthermore, the use of secondary products introduced new forms of interaction between humans and animals and a new range of products to consume and exchange (Orton 2010).

Social strategies related to bone procurement were probably affected by animal domestication. In the first place, the primary source of bones, i.e. the domesticated animals, were embedded in the social rhythms of the groups, meaning that animals formed part of the daily resources of the Corded Ware groups. The production of bone implements was probably embedded in other economic systems deriving from the exploitation of animal products. As inferred from the archaeological remains found at CWC settlements, domestic animals were used both as a meat source and for the production of clothes (hide) and ornaments (teeth). In addition, ethnographic research and experimental archaeology suggest that tendons could have been used to produce ropes, and blood could have been consumed. Animal slaughtering provided the Neolithic population with a wide variety of resources that could be used for domestic activities, and by controlling the slaughtering rhythms they could also control the storage of bones and tendons to produce other implements at a later time. However, live domestic animals were also part of other economic systems, and their exploitation included the acquisition of other products, such as milk and wool in the case of sheep and goats, and the use of cattle for animal traction (Bogucki 1993). In addition, several authors consider that cattle functioned as wealth and capital during the Neolithic (Fokkens 1998; Russell 1998). The value of cattle was related to the effort and work invested in raising and keeping the animals. Large animals, like cattle, reproduced slowly; the effort required to breed these animals was significant, and the value of the investment was not realised in the short term (Russell 1998: 42). Therefore, the decision to slaughter cattle was probably planned taking into account the benefit to the community. In the case of the settlements under study, mostly adult and subadult animals were slaughtered (Zeiler and Brinkhuizen 2012, 2013, 2014).

7.2 Knowledge as praxis: Techno-typological analysis of the flint, stone and bone implements and amber ornaments

7.2.1 Flint

Technology

The technology of the Corded Ware settlements has traditionally been classified as '*opportunistic*' (Beuker 2010; Drenth 2005; Peeters 2001a). The term is based on Binford's categorization of Eskimo technology (Binford 1979). If a curated technology infers a planned organization of the production and use of tools, the term '*opportunistic*' refers to a technology that suggests the opposite. During the analysis of the three Corded Ware settlements, the perception of the technology employed by the groups changed. Although initially it was assumed that tool production could be defined using the concept of '*opportunistic*' technology (García-Díaz 2012: 79), by the end of the present study this concept had been revealed to be inaccurate, and it was considered inappropriate to define the organization of the technology during the Corded Ware period as '*opportunistic*' (García-Díaz 2013, 2014a). Following the analysis of the assemblages of the three sites, and their interpretation along with the rest of the archaeological data obtained from the excavations, the technology was considered to be more complex than initially thought. The continuity of some Neolithic technological traditions, such as the bipolar technique, the selection of raw material, and the repetition and specialized processes to produce several types of tools, suggests that the technology was planned, and conditioned by the specific needs existing at every site. Therefore, the technological processes involved in the production of domestic implements should be considered intentional, and not opportunistic.

Technological choices are, to some extent, dictated by the raw material used. Technological approaches were oriented to different types of flint and stone, taking into account the physical properties of the material. Flint pebbles were usually exploited using a bipolar technology, while bigger flint nodules were flaked using a unidirectional or bidirectional approach. At the three settlements, the analysis of the flint assemblage suggests that the flaking process was carried out on-site, after the raw material was brought to the settlement. This is supported by the high number of implements displaying cortex in the three assemblages and the presence of primary flakes and unworked nodules (García-Díaz 2012, 2013, 2014a; see Chapters 4, 5 and 6). In addition, the refitting of a number of flint implements recorded by Peeters at Mienakker (Peeters 2001a) confirms the idea that flint nodules were carried to the settlements and knapped in several episodes (García-Díaz 2013; Nobles 2012b).

A combination of different methods of core reduction characterizes the Corded Ware domestic flint technology. The use of bipolar techniques coexisted with others requiring more advance planning and preparation. Two technical approaches could be distinguished: the first approach is based on the exploitation of small flint nodules with hard direct percussion, while the second is based on the exploitation of larger nodules, using a bidirectional reduction sequence (García-Díaz 2013, 2014a; Peeters 2001a). The selection of raw material for the production of tools, as in the case of the borers and the scrapers, is also an example of this combination of techniques. While at Mienakker and Zeewijk borers were produced using low-quality flint (rolled pebbles), scrapers were principally produced from flint nodules of higher quality (García-Díaz 2013, 2014a; Peeters 2001b). Similar borers have been documented at other contemporaneous sites, such as Aartswoud I (Van Heeringen and Theunissen 2001; Van Iterson Scholten and De Vries-Metz 1981), Warmond Park Klinkenberg (Dijkstra and Bink in Bink 2006), and De Veken (Peeters in Van Heeringen and Theunissen 2001). In addition, preliminary analysis confirmed the presence of small borers in the flint assemblage from Kolhorn (García-Díaz *personal observation*). Therefore, it could be suggested that the use of rolled pebbles was directly linked to obtaining similar borers by bipolar percussion, and that it was a common practice in Corded Ware settlements. The existence of different technological strategies within the same settlement is characteristic of the Neolithic technological system and has been observed elsewhere (Binder *et al*. 1990; Guyodo and Marchand 2005). As previously stated, bipolar techniques were commonly used during the Neolithic period and were linked to low-quality raw materials and the acquisition of specific tool types (Binder *et al*. 1990; Guyodo and Marchand 2005).

The use of bipolar technology is considered to reflect an unplanned technology regarded as easy and simple, not requiring a high level of knowledge and practical skills. This technological approach could be related to knapping activities performed by children (apprenticeship) (Sternke and Sörensen 2007), or to the production of flint tools by low-skilled individuals (Stapert 2007). The development of bipolar techniques has also been linked to the disintegration of Neolithic production systems: due to '*inégalité dans l'accès aux savoirs techniques, elle apparaît comme un effet collatéral du développement des hiérarchies sociales […]*' (Guyodo and Marchand 2005: 548). However, the use of bipolar technology in the CWC could be related to the uniformity and standardization of the products obtained. Some of these similar implements are what has been classified as '*splintered pieces*' or '*pièces esquillées*'. These tools have been identified in numerous archaeological contexts with different chronologies, from Late Palaeolithic to Late Neolithic. The splintered pieces have been defined as rectangular implements which display bifacial splinters on two ends due to hard percussion (Sonneville-Bordes and

Perrot 1956: 552). In addition, and as experimentally observed, bipolar flaking of pebbles produces a high number of regular flakes with long, and sharp edges, characterized by several features: a large quantity of cortex; rounded or semi-rounded fragments with cortex with steep angles; thin flakes displaying cortex on the entire dorsal surface; triangular-shaped section flakes with cortex present on the entire dorsal face; squared and pointed fragments; and a large quantity of small flakes and splinters. Blades are rare, but do occur. Blades can be obtained from a bipolar core if the knapper prepares the core. Therefore, some mental planning is needed to flake small pebbles and acquire the desired shapes (D. Pomstra *pers. comm*.). Bipolar flaking, therefore, results in tools with similar shapes, with a wide range of angles available to work with.

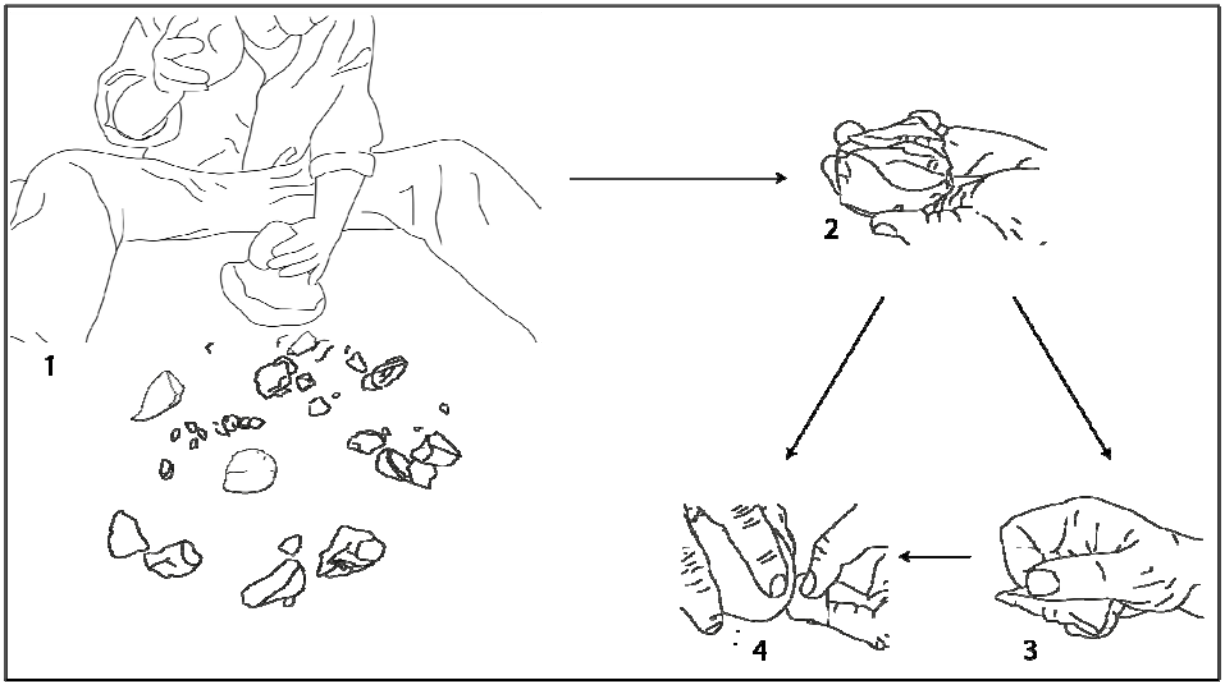

Figure 7.3 Flint technology in the Corded Ware Culture was characterised by an extended use of bipolar technology. The products of this technology, mostly flakes, were primarily used without further modification. However, retouched flakes and blades, scrapers and borers were also produced with bipolar technology (García-Díaz).

The low quality and small size of the flint nodules used at the three settlements studied determined the technological practices adopted by these communities. The variability of the tools seems to be related to the temporal and functional characteristics of the three settlements. In the first place, a smaller assemblage was found at Keinsmerbrug, interpreted as a special settlement (see Chapter 4). Although unmodified flakes are the most frequently represented tool type in all cases, the diversity of types at Mienakker and Zeewijk is greater than at Keinsmerbrug. Mienakker and Zeewijk have been interpreted as permanent or semi-permanent settlements (see Chapters 4, 5 and 6). Several studies relate group mobility to the degree of diversity of tool types used at

the site (Binford 1979, 1980; Douglass 2010; Holdaway and Stern 2004; Holdaway and Douglass 2012; Kuhn 1994; Torrence 1983). Shott states that '*mobility frequency may limit the number of tools, and the number of tool classes that can be carried between residences*' (Shott 1986: 20). Therefore, the lower degree of mobility of the groups allows for a higher degree of tool specialization, and reduces the multifunctional character of the tools transported by more mobile communities (Torrence 1983). However, the idea of a single cause for tool variability has been extensively criticized. A combination of several factors, such as site formation processes and the intensity and duration of occupation, has been suggested by several researchers (Douglass 2010; Holdaway and Stern 2004; Holdaway and Douglass 2012). In fact, a relationship between the functionality of the settlement and its tool types seems to be explicit at the settlements studied. At Mienakker and Zeewijk, where specialized activities were performed, a higher number of specialized tools were documented (see Chapters 5 and 6). The correlation between the small drills and borers used to produce amber beads and ornaments locally and the large quantity of scrapers and retouched tools oriented towards hide preparation should be noted in this regard. The presence of querns could also be related to the more permanent character of the settlements. At settlements where agricultural activities played an important role for the subsistence strategies of the groups, as in Mienakker and Zeewijk, grinding and cereal processing implements were found in greater quantities than at Keinsmerbrug, where hunting and fowling were the basic economic practices and overall agricultural implements, such as axes, adzes and sickles, are lacking.

Tools were produced within the domestic arena at Keinsmerbrug and at Mienakker (García-Díaz 2012, 2013, 2014a; Nobles 2012b, 2013b). At Keinsmerbrug, an area outside the houses (Area 4) was interpreted as a knapping zone due to the quantity of flint flakes and waste present (García-Díaz 2012; Nobles 2012b). At Mienakker, two flint concentrations, both associated with hearths located inside the dwellings, were interpreted as flint knapping areas. Houses were an integral part of the identity of the group. Ethno-archaeological studies show that houses reflect cosmological beliefs, gender and social inequality, and provide links to the ancestors and their '*narratives*' (see González Ruibal 2001; Horton 2005; Lanee 2005; Waterson 2013; see Chapter 3). In domestic spaces, cultural ideas and values that structure daily life were transmitted through habitual practices (Bourdieu 1973; Çevik 1995; Gerritsen 1999; Gerritsen 2001; Hodder 1990). Hearths, as part of domestic spaces, structured social activities. Fire was used in many domestic activities, from cooking and pottery production to heating and lighting. In addition, hearths are closely related to the structure of the household space.

It is assumed that hearths played an important part in the social life of prehistoric communities, as places where people gathered to conduct a wide range of activities.

Typology

The main observation from the typological analysis of the assemblages of the three settlements is that the proportional representation of the tool types on the assemblage is variable. The variability of the tools seems to be related to several conditions. In the first place, a scarcity of raw materials probably determined the size and shape of the final products, which is interesting considering the small size of the implements of the CWC. Cores were exhaustively exploited, probably due to the fact that the area of raw material acquisition was approximately 15 to 20km from the settlements. As observed in several ethnographic studies of stone tool makers in Australia and the western United States, flint scarcity determines the technological choices applied to the raw material and to the tools obtained from it (Andrefsky 1994).

Although the range of tool types at the settlements varied, common traits can be observed. Unmodified flint implements were the dominant feature of the studied assemblages, with flint fragments and splinters being the most frequently represented tools. Flint knapping was for the most part oriented towards obtaining flakes, and retouched tools mainly included flakes, scrapers and borers. In addition, fragments of flint were also retouched at the three settlements, and at Zeewijk exhausted cores were occasionally retouched. Some tool types, such as blades and arrowheads, are scarcely represented in the assemblages. Blade technology was probably constrained by raw material quality and nodule size. The blade cores and blades confirm the ability of the Corded Ware communities to produce these implements, and suggest that the absence of blades was a deliberate technological choice. Although a systematic analysis of flint technology is lacking for other Corded Ware assemblages from the Noord-Holland province, preliminary results from several assemblages suggest a similar behaviour (Van Heeringen and Theunissen 2001; see Chapter 2). The scarcity of blade technology in domestic contexts is a common phenomenon in the Late Dutch Neolithic (see Chapter 8). Blades found at the settlements lack a regular appearance with parallel edges and ridges, and most of them could be considered an accidental by-product of flake knapping.

In the CWC, few examples of arrowheads have been documented in domestic contexts. Besides the two '*pine-shaped*' points from Zeewijk, arrowheads have been unearthed at Ede-Frankeneng and Donk-Het Spookestraatje (Drenth *et al*. 2008), Aartswoud (Van Iterson Scholten and De Vries-Metz 1981) and Molenkolk 2 (Peeters 2001c). Archaeozoological remains suggest that hunting still held great importance in the

economy of Corded Ware communities (Zeiler 1997; Zeiler and Brinkhuizen 2012, 2013, 2014); as such, the low number of arrowheads could not be interpreted strictly in terms of changes in subsistence strategies. One reason to explain the relative scarcity of these implements in the archaeological record could be that projectiles were very valuable tools and had a prolonged use.

Bipolar technology produced regular shapes, which facilitated the production of specific tools. The analysis clearly shows that borers were produced from the squared and pointed fragments obtained from bipolar flaking. In addition, although the majority of scrapers were obtained from unidirectional flaking, bipolar fragments and triangular shape-section flakes were used to produce scrapers and retouched tools at Mienakker and Zeewijk. The use of bipolar percussion to obtain specific tools has also been recorded in other European Late Neolithic contexts, such as the western French Chalcolithic (Binder *et al*. 1990; Guyodo and Marchand 2005). In these contexts, bipolar techniques were intentionally used to obtain scrapers and borers (Guyodo and Marchand 2005: 546).

7.2.2 Stone

At Keinsmerbrug, stone tools were almost completely absent and only one hammer stone was recovered, while at Mienakker and Zeewijk the quantity and diversity of implements were greater. As in the case of the flint tools, the selection and variability of stone implements could be a reflection of the social organization of the settlement (Shott 1986). At settlements of a more permanent character, stone tools were used more frequently and exhibit higher variability, while at sites related to mobile populations stone tools was seldom used. However, as in the case of flint, the selection of stone tools was probably dependent on other factors (Holdaway and Stern 2004; Holdaway and Douglass 2012). The stone assemblages at Mienakker and Zeewijk were dominated by querns and hammer stones, although other tools such as pestles and grinding tools were also present (García-Díaz 2013, 2014a). Querns and hammer stones have been catalogued at other CWC settlements such as Steenendam, Aartswoud I, Zandwerven and Kolhorn (Drenth and Kars 1990; Fokkens 1980; Regteren Altena and Bakker 1961; Van Iterson and De Vries-Metz 1981).

Raw materials were probably selected on the basis of natural shape and lithological characteristics (García-Díaz 2013, 2014a, 2014b). Grinding and cereal processing tools were usually fashioned from granite and sandstone, while quartzite was selected for percussive implements (García-Díaz 2012, 2013, 2014a, 2014b). Due to the physical composition of sandstone and granite, characterized by the hardness of their

individual grains, both raw materials are suitable for grinding and cereal processing activities (Delgado Raack 2008, 2009; Schneider 2002). Quartzite, on the other hand, was the most appropriate raw material available for percussive activities due to the interlocking quartz crystals which form the internal structure of the stone. A similar selection of raw materials was observed at the contemporaneous settlement of Kolhorn, where querns were mainly produced from granite and gneiss, while quartzite was chosen for hammer stones (Drenth and Kars 1990). The selection of raw materials based on their petrographic characteristics is a common phenomenon observed in several archaeological contexts (Adams 1999; Andrefsky 1994; Delgado Raacks *et al.* 2008; Delgado Raack and Risch 2008; Delgado-Raack *et al.* 2009). Knowledge about the physical properties of the stones was probably passed on from one generation to another. The information generated and carried by the tools was part of the social norms and rules defined by the groups, but it was also generated through knowledge and learning.

Figure 7.4 The chaîne opératoire of the querns and grinding stones at Mienakker and Zeewijk suggest that after the selection of the raw material, querns were used for cereal processing. When the surface was blunted, flaking was used to reshape and revive the grinding surface. On the image, quern with several flake negatives (García-Díaz).

The technology applied to these tools was simple: implements dedicated to percussion activities show no manufacturing traces, although grinding and cereal processing implements were intentionally modified prior to use. The latter display flake negatives on their surfaces, not only related to the initial shaping of the tool, but also to the rejuvenation of their use surfaces. Similar production traces were observed in contemporaneous assemblages (Fokkens 1980; Regteren Altena and Bakker 1961; Van

Iterson and De Vries-Metz 1981), and additionally, at Kolhorn, some handstones showed traces of percussion along their lateral perimeter. Although the shape of the implements changed, and the tools were probably adapted to the needs of the communities and the availability of raw material, the technology applied to these tools remained similar, if not precisely the same. The production of querns in agro-pastoral societies has generally been associated not only with the increased dependence of the human diet on cereals, but also with the social organization of the household, gender interactions and learning processes (Adams 1999, 2010; Hamon and Le Gall 2013). Ethnographic studies show that querns were usually related to other implements and *chaînes opératoires*, such as for example wooden mortars (Hamon and Le Gall 2013), and that they were used in different craft interactions; querns are usually associated with women, and the use and maintenance of the tools is passed from one generation to another during the daily practices of the group (Adams 1999, 2010; Dobres 1995; Hamon and Le Gall 2013). Therefore, while learning, women preserved and transmitted the '*mutual knowledge*' of the communities (Broadbent 1989; see Chapter 3).

7.2.3 Bones

The physical morphology of implements has been considered as a way of communication '*through which people negotiate their personal and social identity*' (Wiessner 2006: 60). Although not many bone tools were available for study, it seems that the Mienakker and Zeewijk bone assemblages have a distinct character, with awls, needles and ripples the most frequently occurring implements (García-Díaz 2013, 2014a; see Chapters 5 and 6). Some Corded Ware settlements displayed similar bone tool types: at De Vrijheid 1 and 2 and at Flevo (Van Heeringen and Theunissen 2001) the main tool types were awls and needles, and one bone was interpreted as a flute (Van Heeringen and Theunissen 2001). The worked bone assemblage at Aartswoud was also composed primarily of needles and awls, but also included spatulas, ornaments, weights, scrapers, axes and *retouchoirs* (Cavallaro 1994 in Drenth *et al.* 2008: 164). In addition, bird bones were selected to produce borers (Van Wijngaarden-Bakker 1997), and teeth were used for ornaments. Three perforated teeth (from a dog, a pig and a deer) were also recovered during the excavation of Aartswoud (Van Heeringen and Theunissen 2001).

Although the analysis of bone implements from the Corded Ware settlement assemblage is partial and unsystematic, a certain continuity is observed within the preserved Neolithic assemblage. Vlaardingen settlements have well-preserved bone assemblages that consist of awls and chisels as well as a large amount of the waste produced during their manufacture (Van Gijn and Bakker 2005). Bone implements were produced using the '*metapodium technique*' used at other contemporaneous sites such as

Hekelingen III (Maarleveld in Van Gijn 1989). Antler was used to produce hammers, handles and points at Vlaardingen (Maarleveld 1985; Van Gijn 1989), and in addition one antler point was found at Barendrecht-Carnisselande (Moree *et al.* 2011). Technological choices made in the production of tools probably relate to this observed uniformity. The '*metapodium technique*' was used to obtain long bones in order to produce tools. Other techniques used to produce bone tools were probably simpler, in view of the shapes of some bones displaying use-wear traces. The use of a combination of techniques has also been documented at other Neolithic settlements in the Netherlands, such as at Schipluiden (Van Gijn 2006), Hazendonk (Van den Broeke 1983) and Hekelingen III (Louwe Kooijmans 1985; Van Gijn 1989).

7.3 Domestic activities at the Corded Ware settlements

Use-wear analysis reflected the different functions of the three settlements. The use-wear traces observed at Keinsmerbrug indicate that the settlement was used sporadically, and that the traces were the result of maintenance activities. However, traces displayed on the implements from Mienakker and Zeewijk pointed to sites of a more permanent character, and to a greater diversity in the activities performed at the settlements. As already discussed in previous chapters, households were at the centre of the activities performed at the settlements. At Zeewijk, no spatial patterning of activities was identified. However, at Keinsmerbrug some of the implements displaying use-wear traces were found near to hearths within the Northern Structure (Nobles 2012b), while at Mienakker both occupation episodes were clearly related to the construction of two dwelling structures, which hold a high density of archaeological implements (Nobles 2013b). At the Corded Ware settlements, therefore, the house was the focal point of production and consumption activities. As already discussed (see Chapter 3), these cycles were embedded in the '*mutual knowledge*' of the groups. This knowledge was evidenced not only in the way of tools were produced, but also in the way they were used and discarded.

7.3.1 Tools to make tools

At the three settlements under study, the spatial distribution of flint and stone implements indicated that tools were produced inside the structures, around the hearths (García-Díaz 2012, 2013, 2014a; Nobles 2012b, 2013b, 2014b). The production, retouch and maintenance of flint implements were carried out using hammer stones. Although no clear correlation between use-wear traces and the production of flint implements could be established at any of the sites, the spatial analysis at Mienakker showed that tools were produced during different episodes, probably in response to the needs of the

inhabitants of the settlements (García-Díaz 2013; Nobles 2013b). In addition, as shown by ethnographic sources (Hayden 1989), hammer stones could also be used to produce and repair querns and other grinding tools. The *chaîne opératoire* of the querns and grinding stones at Mienakker and Zeewijk suggest that after the selection of the raw material, querns were used for cereal processing. When the surface was blunted, flaking was used to reshape and revive the grinding surface (Figure 7.2).

Although the preservation of the bone implements did not permit a proper recognition of the techniques employed to produce them, the '*metapodium technique*' would have been the most suitable technique. The analysis of faunal remains permitted a better understanding of the production system of bone implements. Flint and stone implements were employed during raw material acquisition, as inferred from the cut marks on bones. Both scraping and cutting actions were inferred from the use-wear traces on several flint implements, suggesting that the production and maintenance of bone implements was performed locally. However, no traces of bone processing were displayed on any stone tool. Although percussion activities were probably performed with hammer stones, traces developed after percussive activities are hardly ever developed enough for the worked material to be inferred. In addition, and as already discussed in Chapter 5, the polishing of the bone surfaces during the manufacturing process could have been performed with flint implements (Semenov 1981[1957]), or with several other implements that were not archaeologically recovered, such as fine sand and leather (Olsen 1979; Van Gijn and Verbaas 2008) or horsetails (Richie 1975 in LeMoine 1997).

Use-wear traces suggest that amber beads and ornaments were produced at semi-permanent and permanent settlements such as Mienakker and Zeewijk (Bulten 2001; García-Díaz 2013; Van Gijn 2014a). The *chaîne opératoire* of the amber implements suggest that the raw material was collected and transported to the settlements from nearby beaches (see Chapter 5). At the settlement, cortex was removed by scraping the surface with a flint implement, or by flaking the amber nodule with a hammer stone. Afterwards, amber was cut with a flint implement and the final shaping of the bead was performed by polishing the surface with a stone. The final step in the production of the amber beads was the perforation of the ornaments with bone, antler and flint borers. Although several implements were required for the production of amber ornaments and pendants, at Mienakker and Zeewijk only the implements of the final production stage were found, such as small borers related to the production of amber beads displaying a heavily rounded edge and a well-developed flat and bright polish (García-Díaz 2013). The analysis of the amber assemblages corroborated the interpretation of the functional traces on the small borers. At Mienakker (Bulten 2001)

and Zeewijk (Van Gijn 2014a) all the steps of the production process were observed. Although use-wear analysis has not been performed at other wetland settlements, similar borers have been found at other contemporary sites such as Warmond Park Klinkenberg (Dijkstra and Bink 2005), Aartswoud (Van Heeringen and Theunissen 2001; Van Iterson Scholten and De Vries-Metz 1981), De Venken (Peeters in Van Heeringen and Theunissen 2001) and Kolhorn (García-Díaz *personal observation*; Woltering 1976), suggesting that the production of beads and ornaments occurred at several settlements.

7.3.2 The use of vegetal resources

Vegetal resources were frequently exploited by the Corded Ware inhabitants of Keinsmerbrug, Mienakker and Zeewijk, as shown by the use-wear traces of the domestic implements, but also by the analysis of botanical and palynological remains and the organic residues preserved in the pottery vessels (Oudemans and Kubiak-Martens 2012, 2013, 2014). Plant resources were used for two main purposes. In the first instance, vegetal resources played an important role in the diet of Neolithic populations in general, and in the CWC in particular, as indicated by the analysis of the skeletal remains found at Mienakker (Plomp 2013). In addition, leaves and grasses were used as the main food source for the cattle. Secondly, vegetal resources were used as raw material for the construction of buildings and for furnishing (Kubiak-Martens 2013, 2014), but also to produce necessary equipment, tools, and other goods such as clothes or ropes. Traces of wear recorded on the domestic implements of the three settlements illuminated the range of activities performed at the settlements and the social structure of the groups.

7.3.2.1 The use of plants as a food source

Archaeobotanical analysis implied that both domestic and wild plants were used as food at Keinsmerbrug, Mienakker and Zeewijk (Kubiak-Martens 2012, 2013, 2014; Kubiak-Martens *et al.* 2015; Oudemans and Kubiak-Martens 2012, 2013, 2014). Remains of emmer and naked barley are present at the three settlements, and the cultivation of both crops was proposed for Mienakker and Zeewijk (Kubiak-Martens 2012, 2013). In addition, further evidence supports the idea of local cultivation, for instance the plough marks recorded during the excavation of Zeewijk at the same level as the Neolithic features (Nobles 2014a). Cereals were sown in spring, in order to avoid saltwater flooding during autumn and winter, and cereal harvesting was performed at the end of summer (Kubiak-Martens 2013, 2014).

No flint sickles were found at the settlements. The absence of sickle blades is a common phenomenon in the wetlands (Bakels 2014; Van Gijn 2010a), and very few sickles have been found in Middle and Late Neolithic and Early and Middle Bronze Age

settlements or graves, although evidence for cereal harvesting and processing exists in the Hazendonk group (Kubiak-Martens 2006; Van Gijn 2006). The absence of flint sickles might be explained by the use of other materials, such as wood or bone, to make sickles, although unfortunately no such tools have been identified. In addition, ethnographic studies have also documented the harvesting of cereals without the use of sickles (Ibáñez Estévez *et al.* 2000). Botanical remains of cereal processing were present at Mienakker and Zeewijk. At Keinsmerbrug, however, emmer was probably carried to the settlement as naked grain. From the organic residues found in pottery vessels, it was inferred that cereals were processed and consumed in the settlements (Oudemans and Kubiak-Martens 2012, 2013, 2014).

The presence of cereal processing tools at Mienakker and Zeewijk reflected the importance of cereal consumption at both settlements, and in the CWC as a whole. The percentage of tools with use-wear traces related to cereal processing is high at both settlements, and querns were heavily used. As already stated, some of the querns present at Mienakker and Zeewijk are flaked, probably as a way of rejuvenating and/or preparing the surface. In addition, the use-wear present on the used surfaces is intensely developed in some cases, and use-wear traces present on the bottom of the querns give a good indication of the length of use of the querns (Verbaas and Van Gijn 2008: 196), as this part of the tool does not need to be rejuvenated. At Mienakker, the bottom zones of the querns are highly worn and rounded, indicating a prolonged use of the tools (Chapter 5; García-Díaz 2013). The raw material selection would have played an important role in the functionality of the tools. For grinding and cereal processing stones, the physical characteristics of the raw material '*influence their fineness of grind; efficiency of processing, in terms of both volume and moisture content of the substance being processed; resistance to dulling; durability of the stone; ease with which the stone may be worked, and its use-wear characteristics*' (Horsfall 1989: 369). The presence of querns and grinding tools within the archaeological context has been interpreted by various authors as an economic marker (Adams 2002). One argument that supports this hypothesis focuses on the relationship of querns to food production and productivity. The higher efficiency and use-intensity of the cereal processing tools is directly related to their productivity and thus increases the capacity to feed a larger number of people. Therefore, a demographic increase of the population could be sustained by agricultural economies, materialized through grinding and cereal processing activities, and long-term occupations will appear in close proximity to the fields. Although population increase during the Late Neolithic is still a current debate, the interpretation of the settlements at Mienakker and Zeewijk pointed to permanent or long-occupation settlements (Kleijne *et al*. 2013; Theunissen *et al.* 2014). This hypothesis was supported by the documentation

of two concentrations of cereal remains interpreted as storage and/or cereal processing areas at Mienakker (Kubiak-Marteens 2013). Food storage would permit the consumption of cereals, which had to be collected after the summer to avoid the winter floods, at a later date (Kleijne *et al.* 2013; Theunissen *et al.* 2014). Cereal storage would have been one of the main strategies used by the Corded Ware communities to reduce the risk of starvation. Besides the economic diversification practised by the Corded Ware communities, food storage guaranteed that they could survive periods of scarcity (Groot and Lentjes 2013; Halstead and O'Shea 1989).

Food grinding has been considered a gender-specific task, based on several ethnographic models from the U.S. Puebloan and non-Puebloan groups (Adams 2002, 2010). Food grinding was a technology learned within the community by women, among women. Although the context of the native North Americans is different from the Late Neolithic Dutch context, a similar strategy could have been followed at settlements of the Dutch CWC. According to Sherratt (1996), women were relegated to the domestic sphere after the discovery and diffusion of secondary product innovations. The production of daily equipment, food processing and maintenance work were part of the tasks undertaken by women. If Sherratt's suggestion is valid, querns were part of the toolkit associated with female activities. Accordingly, the analysis of these tools provides important information about the technical skills of women and the way these skills were applied (Adams 2002). Stone tools, as much as basketry and textile production, were a means of transmitting technical knowledge within the domestic context (Hurcombe 2006). Although during the spatial analysis no direct link between the querns and the grain remains could be established, a possible concentration of stones associated with the MKII structure (Nobles 2013b) might suggest that the cereals were processed near to, or within, dwellings. Cereal processing at the door of houses has been documented in non-Pueblo groups, while women from Pueblo groups process food daily inside their homes (Adams 2010). The mobile nature of querns and grinding tools would provide flexibility to work, depending on other circumstances such as social events, the weather or a change of owner (Hamon and Le Gall 2013).

In addition, wild nuts, fruit and seeds were used as a food source at Mienakker and Zeewijk. At Keinsmerbrug, however, botanical remains of nuts and fruits were absent, although seeds were probably consumed (Kubiak-Martens 2012). Hazelnuts and acorns, stored for winter use, could be opened with the help of a pebble or a small hammer. In addition, at Mienakker there is also evidence of storing dried apples cut into small pieces (Kubiak-Martens 2013). Flax and orache seeds, recorded at the settlements and used as a food source, could have also been processed with hammer stones (Kubiak-

Martens 2012, 2014; Kubiak-Martens *et al.* 2013). However, although hammer stones are numerous at Mienakker and Zeewijk, use-wear traces related to vegetal processing were observed only on one hammer stone (García-Díaz 2013).

7.3.2.2 The use of plants as equipment and construction material

Several types of plants have been identified as raw material for the construction of dwellings at Mienakker and Zeewijk (Kubiak-Martens 2012, 2013, 2014). The remains of wooden posts from the central post line of the Zeewijk-East structure suggest that alder wood and willow twigs were used to build the frame of the dwellings (Kubiak-Martens 2014), with reed, cattail leaves and stems of club-rush also being used as construction material (Kubiak-Martens 2013, 2014). Evidence for the use of other types of wood, such as oak and hazel, was recovered from the charcoal samples studied at the excavation, suggesting their use as building material as well as fuel. However, evidence of coarse woodworking was not observed on tools from any of the three sites. The fragments of flint axes found at the three assemblages may suggest the use of these tools to chop wood, although no use-wear traces supporting this hypothesis were displayed. In addition, other organic implements could have been used: archaeologically, ethnographic and experimental research shows the use of bone and antler implements to chop wood (LeMoine 1994, 1997; Maigrot 2000; Pomstra and Van Gijn 2013). As already discussed, the three settlements were located on a relatively treeless landscape. Oak and hazel did not grow near the three settlements, and they were probably obtained from more distant areas such as Texel or the Pleistocene deposits of Wieringen (Kubiak-Martens 2012, 2013, 2014). Therefore, coarse woodworking was likely performed outside the domestic area, and the tools were probably carried and used outside the settlements, which could partially explain their absence from the archaeological record. In addition, the absence of flint axes could also be explained by the reutilization of broken axes into cores, as suggested by the small number of implements displaying a polished surface (García-Díaz 2012, 2013, 2014a; see Chapters 4, 5 and 6)(Fig. 7.3).

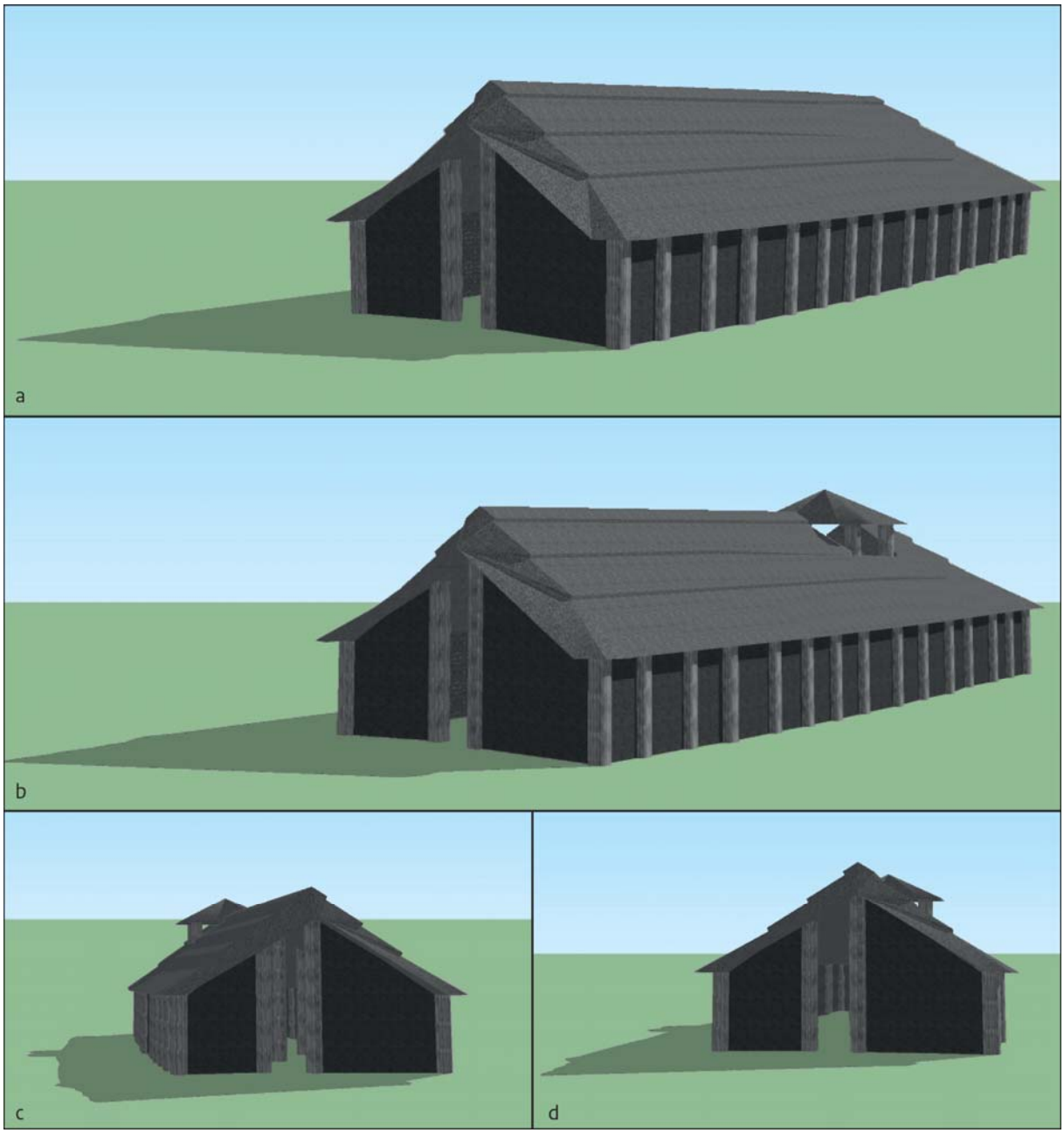

Figure 7.5. Image of the possible Zeewijk-East house reconstruction (Nobles 2014: 208).

Cattail leaves and club-rush stems could be used to produce sitting and sleeping mats, while willow twigs could be used to produce ropes and traps for fishing and fowling (Kubiak-Martens 2013). In addition, flax was used for its oil-rich seeds and possibly also for its fibres (Herbig and Maier 2011). Flax could have been used for producing ropes and clothes and as insulation for the houses (Kubiak-Martens 2013, 2014). Wooden tools accounted for a large proportion of the implements used by prehistoric communities, although unfortunately such implements have been preserved only in a few exceptional contexts. Bowls, spoons, digging sticks, sickles, spears and tool hafts have been recorded in Neolithic archaeological contexts where wood has partially survived (Bosch i Lloret *et*

al. 2006, 2011). In addition, wood was used to build houses and other structures. Based on ethnographic research, plant craftwork has been considered a female task. Textile and basketry production have been considered an important craft of the domestic sphere of the Neolithic population both from a functional point of view and from a social perspective. Hurcombe (2006) stated that social cohesion and mutual knowledge were created, maintained and transmitted by the style and patterns present on clothes, pots and baskets. Women would have been important agents in the construction and preservation of cultural norms and traditions.

Wood, both soft and hard, was processed with flint implements and stone and bone tools. At Mienakker, use-wear traces related to plant processing were observed on 23.5% of the tools with traces of use (García-Díaz 2013). Although the percentage of flint tools with use-wear traces at Keinsmerbrug and Zeewijk was lower, flint implements were probably used in combination with other organic implements such as wood and bone tools. Although the sample analysed was small and the preservation of the implements was unequal, the result of the use-wear analysis indicated that bone tools played an important role in plant processing activities at the Corded Ware settlements. At Mienakker, three bone implements displayed traces of wood and hard plant processing. The use of organic implements to process vegetal materials is well-represented at other Dutch Neolithic settlements. At Schipluiden several awls were related to basketry, while woodworking traces were displayed on bone chisels and one possible wedge. Woodworking traces were, however, rarely observed on flint flakes and blades, and were mainly visible on flint axes, probably used for chopping wood. Bone tools complemented the flint axes, and were used for fine woodworking (Van Gijn 2006, 2008). At the Late Neolithic settlement of Chalain Station 4 in France flint tools used to process vegetal resources were present in small numbers, and plant resources were mainly worked with implements made from antlers, bones and teeth. Bone implements were used for fine plant working such as debarking and separating fibres for basketry (Maigrot 2000, 2005). At Keinsmerbrug, Mienakker and Zeewijk fine woodworking were probably performed with bone implements and flint tools, as unmodified blades, and retouched flakes and fragments.

7.3.3 Animal resources

7.3.3.1 Animals as a food source

The importance of animals, both wild and domestic, in the subsistence activities of the Corded Ware settlements is reflected in the high quantity of bones present in the three settlements under study. Fowling was a characteristic economic activity of the CWC in the Noord-Holland province and was performed at every settlement studied, making it one of the most important activities. It implied a good knowledge of the natural life cycle of the wild animals that surrounded the settlements, and social cooperation in mass catching and storage. The vast majority of the bird bones excavated came from ducks, predominantly mallard, teal/garganey and widgeon (Zeiler and Brinkhuizen 2012, 2013). During summer, ducks and geese were in their moulting period and were unable to fly. Therefore, mass catches were probably performed without using arrowheads (Zeiler and Brinkhuizen 2012, 2013). Birds were probably caught with nets and traps made from perishable materials, in the way it was still performed until recently in the area (Zeiler and Brinkhuizen 2013). Therefore, although from a functional perspective use-wear traces related to this activity are almost non-existent among the domestic implements of the settlements, traces related to plant processing could be interpreted as part of the production process of traps and nets to catch birds.

At Keinsmerbrug the remains of only six wild animals were found (Zeiler and Brinkhuizen 2012), but at Mienakker and Zeewijk wild boar and fur animals were exploited (Zeiler and Brinkhuizen 2013, 2014). As already discussed, arrowheads were only found at Zeewijk. Although both of the flint arrowheads recovered at Zeewijk display impact traces (García-Díaz 2014a), the small number of arrowheads could be explained in several ways. In the first place, arrowheads were probably carried from the settlements to the catchment areas, and they will only have been abandoned if they were fractured or accidentally lost. In addition, arrowheads and projectile implements could be repaired and transformed into other implements after use (Keeley 1982). Finally, the absence of flint arrowheads could also suggest that Corded Ware groups were using other materials or strategies: projectile points made of wood or bone might have been used instead of flint, as observed in both ethnographic and archaeological sources (Dale Guthrie 1983; Legrand and Radi 2008; LeMoine 1994, 1997), and traps could have been used to catch small fur animals.

Wild animals were used as a meat source. However, birds, goats and cattle were the main sources of meat at the three settlements. Most of the bird species excavated were probably consumed. Although butchering traces were absent from most of the

remains, the distribution of the skeletal remains suggest that Corded Ware groups selected the meaty parts of the bird to consume at the settlements, and that ducks were not exploited only for their feathers (Zeiler and Brinkhuizen 2012, 2013, 2014). In addition, traces of butchering activities are present on bone remains of cattle at Keinsmerbrug, Mienakker and Zeewijk (Zeiler and Brinkhuizen 2012, 2013, 2014). As indicated by the analysis of the faunal remains, adult and sub-adult cattle specimens were selected for slaughtering. At Mienakker, cut marks on a mandible fragment and in several fragments of long bones, vertebrae and ribs shown that the meat was cut loose from the bone (Zeiler and Brinkhuizen 2013: 158), and similar processes have been inferred at Zeewijk (Zeiler and Brinkhuizen 2014). Although butchering traces are scarce at the three settlements, it is necessary to consider the effects of taphonomy and the high degree of post-depositional alterations on the preservation of the use-wear traces at the three assemblages that were studied. And, secondly, the poor development of use-wear traces on tools processing soft materials like meat or fish should also be considered as an important factor (González Urquijo and Ibáñez Estévez 1994; Grace 1990; Van Gijn 1986). Therefore, although meat was probably cleaned with flint implements (Zeiler and Brinkhuizen 2012, 2013, 2014) traces of this activity are underrepresented.

Tools displaying traces related to fish processing are scarce. Although use-wear related to fish processing has been discussed in several publications (Anderson 1981; Briels 2004; Clemente Conte 1997; Clemente Conte and García-Díaz 2008; García-Díaz 2009; García-Díaz and Clemente Conte 2008; Gutiérrez Sáez 1990; Iovino 2002; Moss 1983; Plisson 1985; Semenov 1981[1957]; Van Gijn 1986, 1989), these traces are not well displayed in these assemblages. In the Netherlands, use-wear traces related to fish processing have been documented in Mesolithic (Niekus *et al*. *in press*) and Neolithic contexts (Houkes and Verbaas *in press*), but always in low percentages (Van Gijn *et al.* 2001a; Van Gijn *et al.* 2001b). Although fish remains were very common at Corded Ware settlements (Zeiler and Brinkhuizen 2012, 2013, 2014), traces related to fish scaling and cleaning were only inferred at Zeewijk. However, the lack of evidence could also be related to the use of several techniques to process fish that did not require regular use of flint tools, such as smoking or drying (Rostlund 1952; Stewart 1977; Trigger 1969). In addition, other tools could have been used to scale fish or to remove their heads; wooden or bone tools would be effective enough. Fishing would have been important not only for the diet of the Corded Ware communities but for other activities as well. Ethnographic documentation shows that fish skins can be used as waterproof material to produce clothes, shoes and containers (Hurcombe 2014; Newell *et al.* 1990).

Fishing has been traditionally studied as a reflection of subsistence and technological practices performed by prehistoric populations (Schulting and Richards 2002). However, lately some articles have focused their attention on the importance of the maritime landscape for coastal populations, not only as a food supply but also as a generator of knowledge and traditions. Considering the sea as landscape '*provides a new perspective on how people in coastal areas actively create their identities, sense of place and histories*' (Cooney 2003: 323). Fishing implied specialized technology and equipment. Besides possible remains of a canoe found at Mienakker, evidence for specialized gear was not found at the studied settlements. However, fishing nets, hooks and traps are common finds for the Vlaardingen period (Van Iterson Scholten 1977), and their use during the Corded Ware Culture is assumed. In addition, fishing also implied the generation of a specialized environmental knowledge concerning '*not only seasonal cycles and the ecology of plants and animals, but also long- and short-term weather and tidal cycles*' (McNiven 2003: 330). Ethnographic research also suggests that the sea played a significant role in the creation of myths, social norms and cultural traditions (Barber 2003; Cooney 2003; McNiven 2003). In Late Neolithic wetlands, fishing was mainly performed in freshwater streams and tidal flats (Zeiler and Brinkhuizen 2012, 2014). Tidal areas have been interpreted as a meeting place and a boundary between the land and the sea, and, therefore, as an area with strong symbolic meaning for some communities (McNiven 2003). The symbolic role of the tidal areas has also been proposed for the Neolithic megaliths at Brittany and Orkney (Phillips 2003), as the visibility of these constructions from the sea would have further strengthened the importance of marine resources in the lifeways of the Neolithic communities in specific areas. The role played by fishing in the coastal areas and the wetlands during the Neolithic period supports the conception of the sea as part of the landscape and as a generator of knowledge and contacts (Needham 2009).

7.3.3.2 The use of animal resources as equipment and for the production of other implements

Fur animals predominated in the faunal assemblages of the three settlements, pointing to the importance of skin processing in the economic system of the Corded Ware society (Zeiler and Brinkhuizen 2012, 2013, 2014). In addition, cutting marks on cattle and seal bones suggested that these animals were also exploited for their skin (Zeiler and Brinkhuizen 2012, 2013, 2014). Fur animals could probably be hunted and skinned during winter (Van Gijn 1989).

Hide processing involves at least four steps (Beyries 2002; Beyries and Rots 2008; Hodges 1989; Rahme and Hartman 1995). The first step was the removal of the

layer of subcutaneous fat. Although the layer protects the live animal against the cold, after death the fat starts to decompose, causing the degeneration of the entire skin. Secondly, the epidermis layer has to be removed, including the hair if the skin is going to be dehaired. The removal of hair and epidermis can be performed following different methods, including the use of several additives. Skin dressing techniques of the Naskapi Indians included the employment of additives like calcareous earths, bone dust or flour, which were related to the '*absorbance of fat and grease*' (Mason quoted in Brink 1978: 364). In addition, among the Sami and other Native American Indians wood ashes were '*rubbed into the moistened surfaces, the alkalis so produced attacking the epidermis and hair*' (Hodges 1989: 149). The use of urine was also a common practice to remove hairs, due to the level of alkalinity of the ammoniac (Rahme and Hartman 1995). The use of additives to prepare hide generates specific use-wear traces on the implements used that can be characterized and distinguished from the traces formed without additives (Beyries 2002; Brink 1978; Mansur-Franchomme 1983). After removing the epidermis, the hide has to be dried and tanned to prevent bacterial decay. Ethnographic and experimental analyses have revealed that tools with sharp angles are not suitable for defleshing and hide working activities, because they tend to '*cut too deeply into the hide and puncture it*' (Hayden 1989: 92). Consequently, scrapers would be more appropriate tools for hide working.

Although hide is barely preserved in archaeological contexts, use-wear analysis provides some of the small amount of direct evidence of the hide working process, besides ethnographic information. At Keinsmerbrug, the tasks performed at the site were mostly directed to the repair and/or maintenance of the skins, but the actual preparation of the skin did not take place at the site (García-Díaz 2012). However, the type of use-wear traces displayed at Mienakker and Zeewijk suggests that flint scrapers and bone implements were used in different phases of hide working. At Mienakker and Zeewijk, flint scrapers and retouched fragments were probably used for defleshing and dehairing skins. Due to their small size and the absence of hafting traces, the implements were probably used without hafting (García-Díaz 2013, 2014a). Experimental analysis has shown that, in societies where hide was not worked in great quantities, scrapers and even unretouched tools could be used without hafting (Hayden 1989). However, the flint tools were probably selected based on their working edges, as the used implements display working edges ranging between 40 and 65 degrees (Table 7.1 and 7.2). As inferred from the abrasive characteristics of the polish shown on one scraper and on three bone implements, flint and bone implements formed part of the toolkit used in different stages of hide processing. Skin and hide were not only repaired and preserved at the settlements, but also produced and prepared there.

K+M+Z	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	borer	strike-a-light	total	%
Transversal(scrap)	-	-	1	6	6	9	7	8	7	12	5	5	3	1	3	-	-	73	46.5
Graving/Diagonal	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	1.2
Transversal/Longitudinal	-	-	-	1	1	-	3	-	1	-	-	-	-	-	-	-	-	6	3.82
Longitudinal	-	-	2	1	4	5	-	1	-	1	-	-	-	-	-	-	-	14	8.9
Unspecific	1	3	1	5	6	7	4	2	2	4	1	1	1	-	1	-	-	39	24.8
Borer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	8	5.1
Strike-a-light	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2	1.2
Hafting	1	-	1	1	1	-	3	-	-	4	-	2	-	-	-	-	-	13	8.2
Total	2	3	6	14	18	21	18	11	10	21	6	8	4	1	4	8	2	157	100
%	1.2	1.9	3.8	8.9	11.4	13.3	11.4	7.0	13.3	13.3	3.8	5.1	2.5	0.6	2.5	5.1	1.2	100	

Table 7.1 Relation between the type of motion and the edge angle used on the three studied settlements.

K+M+Z		20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	Borer	Strike-a-light	Total
Animal	Hide	-	-	1	4	4	7	5	8	6	7	3	2	1	1	2	-	-	51
	Meat	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	2
	Fish	-	-	-	-	-	-	1	-	-	2	-	1	1	-	-	-	-	5
	Bone	-	-	-	1	2	2	-	-	-	-	-	-	1	-	-	-	-	6
	Uns	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	3
	Uns Soft	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Uns Med	-	-	-	1	-	-	1	-	-	3	2	1	-	-	1	-	-	9
Plant	Hard Wood	-	-	-	1	-	3	3	-	-	-	-	1	-	-	-	-	-	8
	Sooftwood	-	1	1	-	2	2	-	-	-	-	-	-	-	-	-	-	-	6
	Wood Uns	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
	Unsp Soft Plant	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	Unsp Medium Plant	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	2
Hide/Wood	Hide/Wood	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	2
Hafting	Uns	1	-	1	1	1	-	3	-	-	4	-	1	-	-	-	-	-	12
Mineral	Uns	-	-	-	2	-	-	-	-	1	2	1	-	-	-	-	-	-	6
Unspec	Uns	-	2	2	3	6	5	3	2	2	3	-	2	-	-	1	-	-	31
Borer		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	9
Strike-a-light		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Total		2	4	6	14	18	21	17	11	10	21	6	8	4	1	4	8	2	157
%		1.2	2.5	3.8	8.9	11.4	13.3	10.8	7.0	6.3	13.3	3.8	5.1	2.5	0.6	2.5	5.1	1.2	100

Table 7.2. Relation between the type of worked material and the edge angle used on the three studied settlements (Unspec: Unspecific; Uns: unsure).

The use of bones for the preparation of skins has been reported in several prehistoric and ethnographic contexts (LeMoine 1997: 46; Semenov 1981[1957]: 319-322). For the Dutch Neolithic, the site of Ypenburg-4 yielded one awl probably used to process hide (Van Gijn and Verbaas 2008), and at Schipluiden an awl was used to pierce hides and one small fragment displayed use-wear traces suggesting a scraping motion (Van Gijn 2006). At other European Neolithic sites with similar chronologies to Mienakker and Zeewijk, such as Chalain Station 4, bone tools played an important role in hide working (Maigrot 2005: 118). Based on the narrow edge displayed by the tools, bone implements at Chalain were probably used for defleshing (Maigrot 2005).

Due to the several steps required for processing hide, it has been traditionally considered as an indicator of long-term or permanent occupation. Permanent or semi-permanent settlements have been linked to the execution of specialized tasks, which would involve a diverse toolkit and, frequently, specialized knowledge and skilled individuals. Ethnographic research indicates that hide working was a predominantly female activity (Arthur Weedman 2010; Frink and Arthur Weedman 2005; Hayden 1992) and that women participated in several steps of hide production. This would also have included the preparation of the stone tools needed to work hide (Arthur Weedman 2000, 2010, 2013).

Ethnographic examples suggest that hide could be used to produce clothes, rope and containers, but also as a building material employed to prepare roofs or the inner spaces of dwellings (Beyries 1990, 2002; Rahme and Hartman 1995). Finally, hide would also be used for canoe manufacture. During the excavation of Mienakker, several groups of branches were interpreted as possible frames of skin canoes (Nobles 2013c; Van Ginkel and Hogestijn 1997). This interpretation is in accordance with the analysis of the fish remains. The presence of deep-water fish, exemplified by the haddock, indicates the need of a proper fisher's tool-kit, including boats (Zeiler and Brinkhuizen 2013).

In addition, animal bones were used as raw material for the production of implements. Although the degree of preservation of bone implements at the settlements under study was low, the majority of the bones identified pertained to large/medium mammals, goats/sheep and cattle (García-Díaz 2013, 2014a). In addition, an incisor of a dog was used at Zeewijk to produce a pendant. Dogs were the fourth most frequent domestic animal encountered at Zeewijk. Most of the dog remains were teeth, suggesting that the production of pendants from this type of raw material was common at the settlements. In addition, cut marks below the proximal epiphysis on a femur implied that dog meat was part of the diet of CWC inhabitants (Zeiler and Brinkhuizen 2014). Although flint implements and stones were probably used in most stages of bone production, use-wear analysis only revealed part of the *chaîne opératoire*. Although both unmodified and retouched implements were used, it seems that a selection based on the edge angle of the implements was favoured.

7.4 The selection of flint tools for functional purposes

The formal variability of flint implements is still a current debate in archaeology (see Chapter 3). Traditionally, several inferences were made based on flint typology. A widely-held belief was that only the formal tools were used for the execution of tasks at the settlements. In addition, the traditional typology also suggested the use of specific

tools for specific tasks. However, use-wear analysis and experimental archaeology have invalidated some of the interpretations of traditional archaeology, and the case of the Corded Ware settlements is no exception.

The use of unmodified implements and '*non-formal*' tools was common at the three settlements. At Keinsmerbrug, unmodified flakes represent 35.7% of the implements displaying use-wear traces (Table 7.3), while at Mienakker that percentage is 20%. In addition, 17.5% of the flint implements displaying use-wear traces were small flint fragments, occasionally used after the retouch of one of their edges. If the percentage of the borers, produced from small flint fragments, is added the percentage grows to 32% of the sample (Table 7.4). And finally, at Zeewijk retouched implements are more frequently represented in the sample than at Keinsmerbrug and Mienakker. More than 65% of the implements displaying use-wear traces are retouched fragments, with scrapers being the most commonly occurring ones (40.4%) (Table 7.5). However, unmodified implements represent 30.35% of the implements displaying use-wear traces. If the percentage of the borers, produced from small flint fragments, is added, the percentage grows to 32.6% of the sample (Table 7.5). Most of these tools were unmodified flakes and blades, although 7.8% of the flint implements displaying use-wear traces were small, unmodified flint fragments (Table 7.5).

(edges)	Flake	Flake	Flake	Blade	Blade	Waste	Waste	Uns	Total	%
	Unm	Retgen	Scrap	Unm	Retgen	Unm	Strike-a-light	Borer		
Hide	2	1	-	1	-	-	-	-	4	14.2
Bone	-	-	1	1	2	-	-	-	4	14.2
Animal soft	-	1	-	-	-	-	-	-	1	3.5
Anim unsp	1	-	-	-	-	-	-	1	2	7.1
Hard wood	-	1	-	-	2	1	-	-	4	14.2
Soft wood	1	-	-	-	-	-	-	-	1	3.5
Mineral	-	-	-	-	-	-	2	-	2	7.1
Und	5	-	-	2	-	-	-	-	7	25
Hafting	1	1	-	1	-	-	-	-	3	10.7
Total	10	4	1	5	4	1	2	1	28	100
%	35.7	14.2	3.5	17.8	14.2	3.5	7.1	3.5	100	

Table 7.3. Relation between the type of worked material and the tool type used at Keinsmerbrug (Und: undetermined; Uns: unsure; Unsp: unspecified).

	Flake Unmod	Flake Retouched	Flake Scraper	Blade Unmod	Blade Retouched	Waste Unmod	Waste Retouched	Waste Borer	Uns Borer	Total	%
Hide	2	-	9	-	-	-	2	-	-	13	32.5
Meat	-	-	-	-	-	1	-	-	-	1	2.5
Bone	-	1		-	-	-	-	-	-	1	2.5
Anim uns	1	-	-	-	-	-	-	-	-	1	2.5
Hard wood	2	-	-	1	-	-	1	-	-	4	10
Soft wood	-	-	-	1	-	1		-	-	2	5
Plant unsp	2	-	-		-			-	-	2	5
Hafting	1	1	-	-	-	1	-	-	-	3	7.5
Amber	-	-	-	-	-	-	-	6	1	7	17.5
Uns	-	-	3	-	2	-	1	-	-	6	15
Total	8	2	12	2	2	3	4	6	1	40	100
%	20	2	30	5	5	7.5	10	15	2.5	100	

Table 7.4. Relation between the type of worked material and the tool type used at Mienakker (Unmod: unmodified; Unsp: unspecified; Uns: unsure).

	Blade Unmod	Blade Retouched	Flake Unmod	Flake Point	Flake Retouched	Flake Scraper	Core Scraper	Waste Scraper	Waste Unmod	Waste Retouched	Unsp Retouched/ Axe fragment	Unsp Scraper	Unsp Borer	Total	%
Bone	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1.1
Fish	1	1	2	-	-	3	-	-	-	-	-	-	-	7	8.0
Dry hide		-		-	-	-	-	-	1	-	-	-	-	1	1.1
Hide unsp	2	-	3	-	6	17	1	1	2	2	-	2	-	36	41.3
Meat/bone	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1.1
Medium animal	-	1	-	-	2	6		-	-	1	-	-	-	10	11.4
Amber	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1.1
Hard inorg	-	-	-	-	-	1	-	-		-	-	-	-	1	1.1
Medium inorg	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1.1
Inorg unsp	1	-	-	-	-	1	-	-	1	-	-	-	-	3	3.4
Medium plant	-	-	-	-	2	-	-	-	-	1	-	-	-	3	3.4
Hard wood	2	-	1	-	-	-	-	-	-	-	-	-	-	3	3.4
Wood unsp	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1.1
Uns	1	1	1	1	1	1	-	-	-	-	-	-	1	6	6.8
Unsp fricglos	-	-	-	1	-	-	-	-	-	-	-	-	-	1	1.1
Hard unsp	1	1	-		1	-	-	-	1	-	-	-	-	4	4.5
Medium unsp	1	-	1	-	-	-		1	2	-	-	-	-	5	5.6
Soft unsp	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1.1
Hide/wood	-	-	-	-	-	2	-	-	-	-	-	-	-	2	2.2
Total	10	4	10	2	13	31	1	2	7	4	1	2	2	88	100
%	11.3	4.5	11.3	2.2	14.7	35.2	1.1	2.2	7.95	4.5	1.1	2.2	2.2	100	

Table 7.5. Relation between the type of worked material and the tool type used at Zeewijk (Uns:unsure; Unsp: unspecified; Unmod: unmodified; Hard inorg: hard inorganic; Medium inorg: medium inorganic; inorg unsp: inorganic unspecified; Unsp fricglos: unspecified friction gloss).

The analysis of the Corded Ware flint assemblages indicated that several tasks were performed using different types of flint implements. Although scrapers are traditionally related to hide scraping, at Keinsmerbrug and Mienakker this task was also performed with unmodified flakes and blades (Table 7.3; Table 7.4). However, at Zeewijk, a correlation between the use of specific tool types for the performance of specific activities could be observed (Table 7.5). Hide scraping is one of the most frequently represented activities at the settlement. Although some unmodified implements were used for this activity, most of the tools that display traces of hide processing are retouched (32.5%), with flake scrapers constituting the primary tool type

used, followed by retouched flakes. Unmodified blades were also used to process different types of material. Some animal materials, such as meat, fish and bone, were processed only with unmodified implements. Unmodified implements were also used exclusively for hard wood working, while other types of plant materials were worked with retouched implements (Table 7.5).

Through use-wear analysis and experimental archaeology, it has been observed that several types of activities are better accomplished with a specific type of angle. Therefore, while small angles are more suitable to cut soft materials, larger angles are preferred to scrape harder materials (Gassin 1996; Gibaja 2006; Ibáñez Estévez and González Urquijo 1996; Van Gijn 1990; Vaughan 1985). As mentioned at the beginning of this chapter, the use of bipolar technologies provided the Corded Ware communities with a uniform range of flint implements. Therefore, uniformity in the edges of the used implements could also be provided by this production system. Through the study of the edge angles of the flint implements with use-wear traces, a selection based on the morphology of the edge could be identified. During the analysis at Keinsmerbrug, it was observed that longitudinal activities were mainly performed with implements with angles of between 35 and 45 degrees, while implements with 40- and 45-degree angles were used to perform most of the transversal activities (Table 7.6). In fact, 60.7% of the implements with use-wear traces had an edge angle of between 35 and 45 degrees. In the case of the Mienakker assemblage, transversal actions were most common within the sample studied. Although a wide range of angles was documented (Table 7.7), the angles between 40 and 70 degrees were predominant. Longitudinal and diagonal activities were mainly performed with smaller angles, between 30 to 45 degrees. In fact, 60% of the implements with use-wear traces had an edge angle of between 40 and 65 degrees. The type of material would probably have influenced the angle selected. Hard materials, such as hard wood, were worked with larger edge angles than softer materials, such as soft wood (Table 7.7). Finally, at Zeewijk transversal actions were the most represented among the sample. Although a wide range of angles were documented (Table 7.8), the most predominant angles were between 35 and 65 degrees. Specifically, 75.2% of the implements with use-wear traces have an edge angle of between 35 and 65 degrees. Longitudinal activities were hardly present, although several edges show a combination of transversal and longitudinal activities, mainly performed with implements with edge angles larger than 45 degrees. Again, the type of activity performed would probably have influenced the angle, with implements with the larger edge angles being used for transversal activities such as hide and fish scraping (Table 7.8).

	20	25	30	35	40	45	50	55	60	65	Borer	Strike-a-light	Total
Longitudinal	-	-	1	1	2	2	-	1	-	-	-	-	7
Transversal	-	-	-	2	2	1	-	-	-	1	-	-	6
Unspecified	1	1		2	1	3	1	-	-	-	-	-	9
Borer	-	-	-	-	-	-	-	-	-	-	1	-	1
Strike-a-light	-	-	-	-	-	-	-	-	-	-	-	2	2
Hafting	-	-	1	1	-	-	1	-	-	-	-	-	3
Total	1	1	2	6	5	6	2	1	-	1	1	2	28
%	3.6	3.6	7.1	21.4	17.9	21.4	7.1	3.6	-	3.6	3.6	7.1	100

Table 7.6. Relation between the type of work and the edge angle employed at Keinsmerbrug.

	25	30	35	40	45	50	55	60	65	70	75	80	85	90	Borer	Total
Transversal	-	-	1	3	-	1	4	1	2	2	1	1	-	1	-	17
Graving/Diagonal	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	2
Longitudinal	-	1	-	1	3	-	-	-	-	-	-	-	-	-	-	5
Unspecified	1	-	1	-	1	-	-	-	2	-	1	-	-	-	-	6
Borer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	7
Hafting	-	-	-	1	-	1	-	-	1	-	-	-	-	-	-	3
Total	1	2	2	5	4	3	4	1	5	2	2	1	-	1	7	40
%	2.5	5	5	12.5	10	7.5	10	2.5	12,5	5	5	2.5	-	2,5	1.5	100

Table 7.7 Relation between the type of work and the edge angle employed at Mienakker.

	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	Borer	Total
Transversal	-	-	1	3	1	8	6	4	6	9	3	4	2	1	2	-	50
Transversal/Longitudinal	-	-	-	1	1	-	3	-	1	-	-	-	-	-	-	-	6
Longitudinal	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	2
Unspecified	-	1	1	2	4	3	3	2	2	2	1	-	1	-	1	-	23
Borer	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Hafting	1	-	-	-	-	-	1	-	-	3	-	2	-	-	-	-	7
Total	1	1	2	6	7	11	13	6	9	15	4	6	3	1	3	1	89
%	1.1	1.1	2.2	6.7	7.8	12.3	14.6	6.7	10.1	16.8	4.4	6.7	3.3	1.1	3.3	1.1	100

Table 7.8. Relation between the type of work and the edge angle employed at Zeewijk.

Use-wear analysis has shown its value to challenge functional ascriptions to flint tools assumed by traditional typology. The methodology has provided a better understanding of the flint domestic assemblage of the CWC. *'Formal tools'* had a similar functional value to the unmodified objects. The shape of the tool seems to have been less important than the edge angle and the functional capacities of the chosen implement. Although these conclusions are more noticeable within the analysis of flint implements, similar conclusions have been drawn from the use-wear analysis of stone tools. At both Mienakker and Zeewijk, use-wear analysis has shown that unmodified stones were selected to perform various activities. These conclusions should, therefore, modify the way implements are conceived and studied. A change to the parameters used to select and analyse implements is needed, and unmodified implements should also be taken into account in order to reach a deeper understanding of the technological organization of the assemblages.

7.5 Conclusions

In this chapter, the main results of the analysis of the assemblages of Keinsmerbrug, Mienakker and Zeewijk have been collated and contextualized. Several differences can be found between the three settlements: Keinsmerbrug was used seasonally, and specialized in the mass catching of birds, especially ducks, in combination with other economic activities such as fishing and herding; Mienakker and Zeewijk were used all year round, and although fishing and hunting were important, the economy was mainly based on crop cultivation and animal herding. However, all share several similarities: the use of local raw material; a combination of technological approaches to produce implements, such as bipolar technology and the '*metapodium technique*', which show technological continuity with other Neolithic groups; a limited variety of tool types and the importance of '*non formal*' tools; and the use of domestic implements for both craft and subsistence activities. Since the main characteristics of the three settlements have been established, and with the objective of understanding the origins of and the relationship between the CWC and other Dutch Neolithic groups, in Chapter 8 the material culture of the TRB Culture and the Vlaardingen groups will be examined and compared with that of the CWC.