



Universiteit  
Leiden

The Netherlands

**Analecta Praehistorica Leidensia 40 / Between foraging and farming : an extended broad spectrum of papers presented to Leendert Louwe Kooijmans**

Fokkens, Harry; Coles, Bryony; Gijn, Annelou van; Kleijne, Jos; Ponjee, Hedwig; Slappendel, Corijanne et al.; Fokkens, Harry; Coles, Bryony; Gijn, Annelou van; Kleijne, Jos; Ponjee, Hedwig; Slappendel, Corijanne

**Citation**

Fokkens, H. ; C. , B. ; G. , A. van; K. , J. ; P. , H. ; S. , C. et al. (2008). Analecta Praehistorica Leidensia 40 / Between foraging and farming : an extended broad spectrum of papers presented to Leendert Louwe Kooijmans. Retrieved from <https://hdl.handle.net/1887/32994>

Version: Not Applicable (or Unknown)

License:

Downloaded from: <https://hdl.handle.net/1887/32994>

**Note:** To cite this publication please use the final published version (if applicable).

# ANALECTA PRAEHISTORICA LEIDENSIA 40

*This article appeared in:*

PUBLICATION OF THE FACULTY OF ARCHAEOLOGY  
LEIDEN UNIVERSITY

## BETWEEN FORAGING AND FARMING

AN EXTENDED BROAD SPECTRUM OF PAPERS  
PRESENTED TO LEENDERT LOUWE KOOIJMANS

EDITED BY

HARRY FOKKENS, BRYONY J. COLES, ANNELOU L. VAN GIJN,  
JOS P. KLEIJNE, HEDWIG H. PONJEE AND CORIJANNE G. SLAPPENDEL



LEIDEN UNIVERSITY 2008

Series editors: Corrie Bakels / Hans Kamermans

Copy editors of this volume: Harry Fokkkes, Bryony Coles, Annelou van Gijn,  
Jos Kleijne, Hedwig Ponjee and Corijanne Slappendel

Editors of illustrations: Harry Fokkkes, Medy Oberendorff and Karsten Wentink

Copyright 2008 by the Faculty of Archaeology, Leiden

ISSN 0169-7447

ISBN 978-90-73368-23-1

Subscriptions to the series *Analecta Praehistorica Leidensia*  
and single volumes can be ordered exclusively at:

Faculty of Archaeology  
P.O. Box 9515  
NL-2300 RA Leiden  
The Netherlands

## The Danubian-Baltic Borderland: Northern Poland in the fifth millennium BC

Peter Bogucki

### 5.1 INTRODUCTION

The establishment of agricultural communities in the basins of the major northward-flowing rivers of continental Europe late in the sixth millennium BC brought farmers into contact with indigenous foraging populations along the southern margins of the North European Plain. For over a millennium, during the fifth millennium BC, the edge of the territory populated by farmers hardly advanced further. While some might call this a frontier (Bogucki 1996), in truth the North European Plain was more of a borderland between the farming communities of riverine interior central Europe and the foragers of the Baltic and North Sea coastal zones. The goal of this essay is to explore the nature of the contacts between foragers and farmers across the part of this borderland that falls between the Oder and the Vistula basin, in the territory of modern Poland.

The application of the term 'borderland' to areas lying along the lower Rhine and Maas rivers can be attributed to Leendert Louwe Kooijmans in the 1970s (Louwe Kooijmans 1976), and it has been a recurring theme in his writing since then (*e.g.* Louwe Kooijmans 1993; Louwe Kooijmans 2005a). It encompasses far more than 'forager-farmer interaction' for it is fundamentally a geographical concept that recognizes that the spatial patterning of forager activity and farming settlement defines the nature of their relationship. Leendert's thoughtful reflections on the Neolithic borderland along the lower Rhine and Maas have stimulated my thinking for nearly three decades, and it is with sincere gratitude that I acknowledge my intellectual debt to him.

The chronological focus of this paper is the fifth millennium BC. As such it follows the initial Linear Pottery (*Linearbandkeramik* or LBK) expansion of farming settlements of the sixth millennium BC and predates the great transformation of the foraging societies of southern Scandinavia and the British Isles that occurred around 4000 BC. Contacts during this millennium between the farming communities of central Europe and the foragers of northern Europe have been discussed before. Fischer (1982; Pedersen *et al.* 1997) pointed out the many shaft-hole axes of central European origin in forager contexts in northern Germany and Denmark, while Klassen (2000, 2004) has renewed this discussion with the identification of other exotic

products in southern Scandinavia, particularly jadeites axes from central Europe. Most recently, Zvelebil (2006) has discussed the external contacts of late foraging societies in the Baltic basin. Much of the focus of this discussion has been on the exotic Neolithic items that occur in Mesolithic southern Scandinavia. My goal here is to examine the borderland in the Polish lowlands between 5000 and 4000 BC as a two-way street, particularly from the vantage point of my own research on the southern edge of this area.

### 5.2 THE DANUBIAN WORLD AND THE BALTIC WORLD

Northern Poland, the area lying above 52° N on the North European Plain, was part of two 'worlds' during the fifth millennium BC (fig. 5.1). By 'worlds' I mean distinctive cultural spheres within which intensive interaction produced commonalities in material culture and by extension in cultural practices and values. This construct is not original, and the reader will quickly recognize echoes of V. Gordon Childe's division of European Neolithic cultures into 'Danubian' and 'Northern' (Childe 1949). Here, I propose to differentiate between the 'Danubian World' and the 'Baltic World', both retaining and updating Childe's terminology but also extending it to include the late foraging populations of the Baltic basin and to use it as a way to characterize the frontier between foragers and farmers on the North European Plain. The distinctiveness of these 'worlds' was ephemeral, however, and here they really appear only in the sixth and fifth millennia BC before blending together. Thus the usage here is more limited than that of Childe.

The Danubian World was inhabited by the earliest farmers of riverine interior central Europe, beginning in the middle of the sixth millennium BC. Childe's Danubian terminology was criticized and fell into disuse on the grounds that these Neolithic cultures, the most prominent being the Linear Pottery culture, were found in areas outside the Danube drainage. Yet Childe had it right, for it is impossible to discuss these societies without reference to their initial dispersal into interior central Europe along the Danube corridor and its tributaries. Thus, even though the subsequent Neolithic societies of the fifth millennium BC may have developed locally, there remained a common heritage that connected them to their Danubian roots.

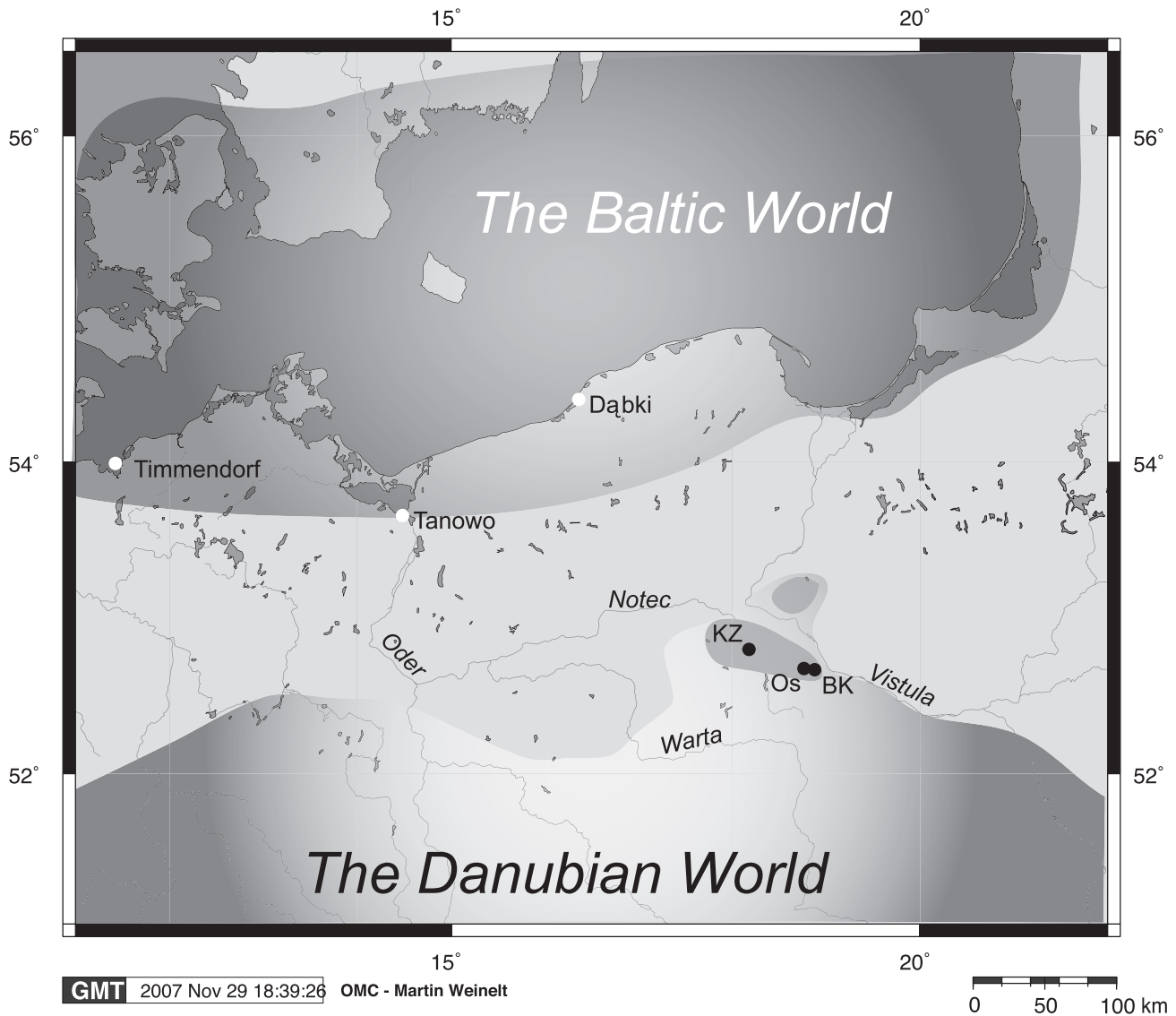


Figure 5.1 Map showing the proximity of the Danubian and the Baltic Worlds during the fifth millennium BC. Areas of Neolithic settlement in Kuyavia and the Chełmno Land are highlighted, along with major sites mentioned in text.

BK – Brześć Kujawski  
 KZ – Krusza Zamkowa  
 Os – Osłonki

This heritage is manifested in several ways in the archaeological record, the most visible of which involves longhouse architecture. Whether rectangular or trapezoidal, longhouses are a specifically Danubian signature during the sixth and fifth millennia in temperate Europe. A developmentally-coherent ceramic tradition is another characteristic, for it is possible to trace the evolving ceramic styles in interior central Europe between

c. 5500 BC to 4000 BC with no major discontinuities, despite the fact that the beginning and ending states in any particular region might look very different. Stone tool technology is also developmentally coherent in the Danubian World, as are all other technological systems. The mature farming economy of interior central Europe late in the fifth millennium BC is clearly built upon earlier farming and stockraising practices.

The Baltic World during the sixth and fifth millennia BC was inhabited by foragers, specifically the Ertebølle culture and its congeners in the southwest Baltic basin but also by other Mesolithic peoples outside the southern Baltic basin. Over the last several decades, the astonishing cultural variability of the Baltic World has come to light, with the discovery not only of cemeteries containing elaborate burials but also of submerged and waterlogged settlements that reveal a complex technology beyond that preserved on terrestrial sites and a rich repertoire of decorative motifs. Of particular relevance here is the evidence for increased sedentism on one hand as reflected in settlements and burials and the technology for increased mobility on the other as reflected in watercrafts.

Agriculture did not come to the Baltic World until about 4000 BC. Thus, for about 1500 years, a borderland existed between the Danubian World, whose northernmost outposts were along the lower Vistula and lower Oder rivers, and the Baltic World, where settlement was primarily coastal. In many respects, this borderland bears a superficial similarity to the situation in the Netherlands during roughly the same period (Louwe Kooijmans 1993; 2005b), in which the Danubian settlements of the Limburg loess were separated from the forager settlements at the mouth of the Rhine and Maas by about 90-100 kilometres. The intervening zone was not particularly attractive to the early farmers nor did it attract the foragers to settle for long periods. But people did move through it, and eventually the worlds of the farmers and the foragers connected. This happened in northern Poland as well.

### 5.3 THE BRZEŚĆ KUJAWSKI GROUP

The principal representative of the Danubian World on the lowlands of northern Poland during the fifth millennium BC was the Brześć Kujawski Group of the Lengyel Culture, a descendant of the Linear Pottery Culture of the previous millennium. Settlements of the Brześć Kujawski Group are found primarily in the region known as Kuyavia, a low plateau between the two major glacial meltwater valleys that run east-west across the North European Plain anchored by the modern cities of Włocławek, Inowrocław, and Toruń and by the Gopło and Pakość finger lakes. It is a landscape of meandering streams in the remnants of subglacial channels, and lakes formed in glacial relic features. To the west of Lake Pakość, a settlement of the Brześć Kujawski Group is known at Biskupin. Recently, settlements of the Brześć Kujawski Group have been found north of Toruń (Czerniak *et al.* 2003), confirming their presence in an area that had been the scene of intensive Linear Pottery occupation during the previous millennium.

The Brześć Kujawski Group is dated between 4700/4600 and 4200/4100 cal BC, clearly persisting for several

centuries. Its principal settlements include Brześć Kujawski (Jażdżewski 1938; Bogucki/Grygiel 1983), Krusza Zamkowa (Czerniak 1980; 1994), and Osłonki (Grygiel/Bogucki 1997; Grygiel 2004; 2008), but since 1990 many more settlements have been discovered, especially through aerial reconnaissance (Rączkowski *et al.* 2005). The discovery of so many new settlements indicates that Kuyavia and adjacent areas were fairly thickly settled during the fifth millennium BC rather than being the setting for a handful of several very large farming settlements separated by zones inhabited by deer, wild pigs, and hunter/gatherers.

Settlements of the Brześć Kujawski Group share a number of common features. The most visible is the presence of longhouses 20-30 metres long, narrow at the northern end and wide at the southern end (fig. 5.2). Many of these longhouses contain a single interior pit, oblong in plan and offset east of the central axis in the center of the house, whose function is unknown. Outside the longhouses are large irregularly shaped pits whose original function was to provide the clay for plastering the houses and which subsequently were filled with rubbish. Other pits were used for storage and eventually rubbish disposal. Among the longhouses are also graves, often in groups of 2-5 individual grave pits, occasionally double burials, in which the skeletons are typically (but not always) placed in a contracted position with their heads pointing toward the south and with men lying on their right side and women on their left. Grave goods include antler T-axes in some male graves and copper and shell ornaments in some female graves.

The economy of the Brześć Kujawski Group was decidedly agricultural. Crops included wheat and barley, along with weed taxa characteristic of arable fields (Bieniek 2002). The animal economy was almost entirely based on domesticated animals, with the hunting of wild mammals playing a subsidiary role (Bogucki 2008), although fishing, fowling, and turtle-catching were routine activities. On most sites, cattle were the most common species, followed by sheep and goats, with goats generally outnumbering sheep among the specimens that could be assigned to species. Pigs account for about 10-30% of each sample of mammal bones. In addition to deer and wild pigs, beavers were hunted for their pelts and almost certainly their meat (see Coles 2006: 55 for a discussion of the meat and fat yield of beavers.).

The settlements and economy of the Brześć Kujawski Group reflect its Danubian heritage. Although the longhouses are trapezoidal rather than rectangular in plan, they clearly use similar construction techniques, and the settlements are organized very similarly to the classic Linear Pottery settlements of the previous millennium. Ceramics and stone tools can be clearly traced to Danubian roots. The suite of crops is clearly in the Danubian tradition, as is the suite of livestock, although the Brześć Kujawski Group represents



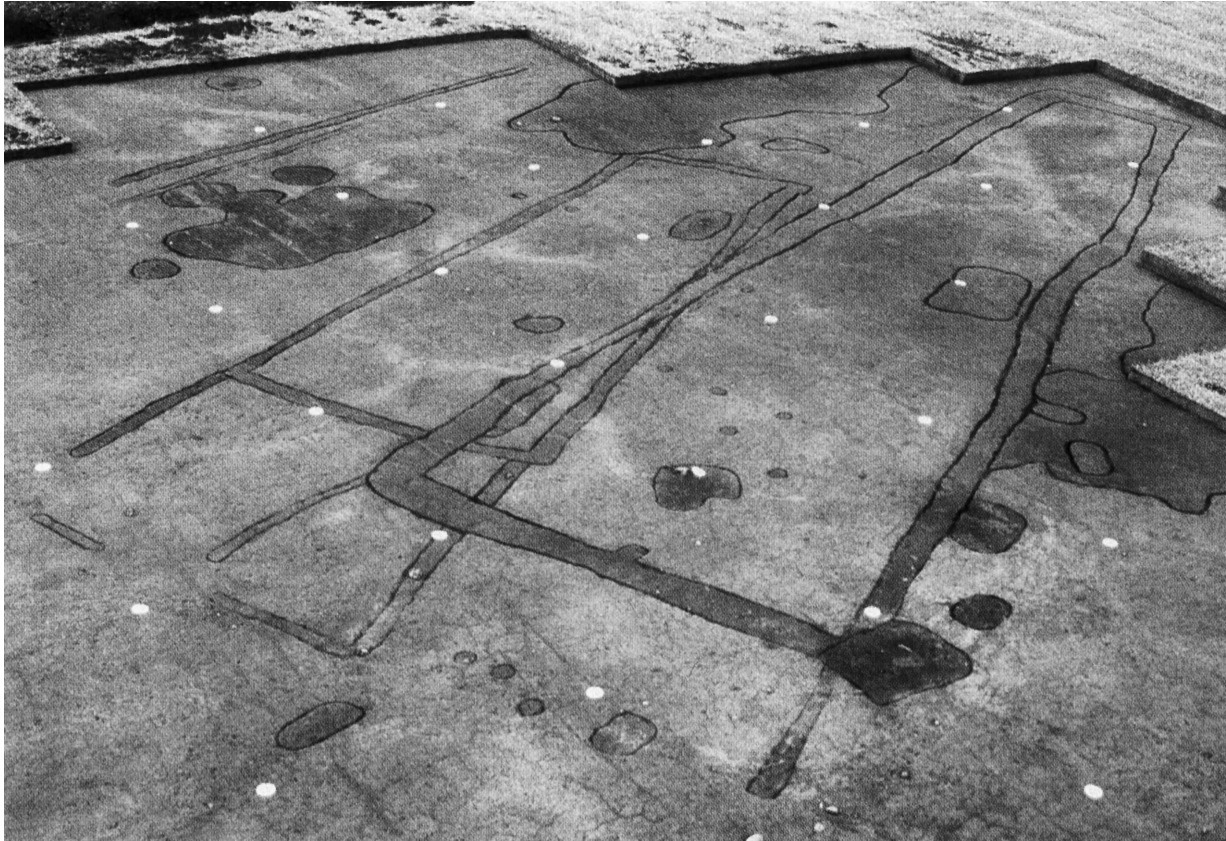


Figure 5.2 Longhouses of the Brześć Kujawski Group at Miechowice (Photo by Ryszard Grygiel; used with permission). Dots form a 5-meter grid.

a development from the cattle-dominated Linear Pottery animal economies toward a more mature diversified animal economy. In the burial rite, there is some divergence from the Linear Pottery practice of burying the dead in cemeteries set apart from the residential areas, although settlement burials are indeed also known from Linear Pottery sites and thus the Brześć Kujawski Group's practice of settlement burial is not entirely novel.

#### 5.4 THE ERTEBØLLE FORAGERS

The inhabitants of the southwestern part of the Baltic World during the fifth millennium BC are familiar characters in European prehistory, known from the kitchen middens of northern Jutland, the cemeteries of Zealand and Scania, and the submerged and waterlogged sites in and along lagoons and bays that collectively define the Ertebølle culture. There is no 'typical' Ertebølle site, and the variability and richness of Ertebølle finds continually bring new surprises and delights. Innovations such as industrial-scale fish trapping

facilities, a diverse inventory of equipment for exploiting the maritime and terrestrial habitats, new approaches to mortuary ritual, and an interest in the decorative arts all testify to communities that were inventive, curious, and creative.

An important development over the last 20 years has been the discovery of a robust and sustained Ertebølle presence on the northern coast of continental Europe during the sixth and fifth millennia BC. Settlements with artifacts that fall within the range of variation of Ertebølle finds have been found along the southern Baltic coast in northeastern Germany and northern Poland (Czerniak/Kabaciński 1997; Ilkiewicz 1997, Kabaciński 2001; Lübke 2002; Lübke/Terberger 2002; Kobusiewicz 2006; Terberger 2006; Schmölcke *et al.* 2006 among others). Many of these sites are now submerged due to rising postglacial sea levels. Others lie in estuarine habitats now close to the coast but which were some distance inland during the fifth millennium BC.

Sites like Timmendorf-Nordmole in the Wismar Bay have yielded a large inventory of Ertebølle wooden, bone, antler,

stone, and ceramic artifacts (*e.g.* Lübke 2002; Hartz/Lübke 2006). About 120 kilometres to the east, this presence is reinforced by additional Ertebølle sites on the island of Rügen and the adjacent mainland (Lübke/Terberger 2002). These finds are solidly dated to the fifth millennium BC and situate a significant Ertebølle community only 80 kilometres from the mouth of the Oder river, a major communication route into the interior of the North European Plain that connected with major rivers of north-central Poland including the Warta and the Noteć. Indeed, there is potential evidence for Ertebølle settlement along the Oder estuary at the site of Tanowo 3 (Galiński 1992).

Finally, there is the site of Dąbki, located on the Polish Baltic coast about 200 kilometres east of Rügen. Excavations in 1979-1985 and beginning again in 2004 have revealed a late Mesolithic settlement dated to the fifth millennium BC that has yielded Ertebølle-type pottery and an array of other Ertebølle-type artifacts including antler T-axes (Ilkiewicz 1989). The significance of Dąbki was slow to be appreciated, but it is now clear that it marks a definite Ertebølle presence on the northern coast of Poland, reinforced by the nearby site of Koszalin-Dzierżęcino 7 (Ilkiewicz 1997, Kobusiewicz 2006).

Thus, during the fifth millennium BC, the fires of Ertebølle camps were visible all around the western Baltic along the shores of its bays, estuaries, and straits. It is only a matter of time before more Ertebølle settlements come to light along the Pomeranian coast of northern Poland and its adjacent seabed. The next 20-30 years will surely bring new revelations. For now, however, it is clear that there was an Ertebølle presence along the southern Baltic coast throughout the fifth millennium BC, separated by 200 kilometres from the Danubian settlements in Kuyavia. What might have happened across this distance during the fifth millennium BC?

#### 5.5 BALTIC MESOLITHIC ELEMENTS IN THE BRZEŚĆ KUJAWSKI GROUP

Evidence of contact between the Baltic and the Danubian Worlds across the 200 kilometres that separated them can be seen in the appearance of elements that could be argued to be fundamentally Mesolithic at sites of the Brześć Kujawski Group. Foremost among these are antler axes, often considered to be something that the Ertebølle foragers picked up from the Danubian farmers but which have no visible Danubian roots, the practice of geometric decoration on bone, and the production of chisels on the metatarsals of ungulates.

##### 5.5.1 *T-Axes (Antler-Beam Mattocks)*

One of the most characteristic artifacts of the Brześć Kujawski Group are the antler beam mattocks, also known as 'T-axes' due to their presumed appearance when hafted through a hole drilled where a tine was removed (fig. 5.3).

These are commonly found in male graves, and a pit containing manufacturing scrap and repaired axes excavated at Brześć Kujawski in 1982 points toward their production on-site and also their use in everyday activities (Grygiel 1986; Grygiel/Bogucki 1990). A skull of an old sheep excavated at Osłonki has a round hole 43 mm in diameter punched in the side, and it is tempting to suggest that an antler T-axis is the only implement that would have had the density and circular profile to punch a hole so cleanly in this skull (Bogucki 2008).

Antler T-axes are confined to the southern and western areas of the Ertebølle settlement. It seems to be an article of faith that the T-axis represents an introduction to the Baltic World of a Danubian artifact type (interestingly, along the coast of the southern North Sea, this type is often seen as having a Mesolithic derivation; see paper by Crombé and Sergant in this volume which views the T-axis as evidence for continuity between Swifterbant and Michelsberg). Specific Danubian analogs are usually not put forth, but often the fact that T-axes have been found at sites like Hüde am Dümmer in northern Germany (Deichmüller 1974; Kampffmeyer 1983) is sufficient to infer a bridge to the Danubian World. Andersen (1973, 36 reprinted 2002) referred to them as a 'western' form, although subsequently (1998) he characterized them as evidence of contact with 'north Continental Europe'. Klassen (2002) points to their 'wide European distribution' as reflected in the map published by Zvelebil (1994, fig. 5) as evidence of their derivation from the Danubian World.

Yet antler T-axes are not a Danubian Neolithic form. The ones reported from sites in the Danube basin, as mapped by Zvelebil in 1994, are from Mesolithic contexts such as Lepenski Vir. The farmers of the Linear Pottery culture of the sixth millennium BC, and their Danubian descendants of the fifth millennium BC, did not typically make antler T-axes. This is not to say that the Danubian Neolithic people did not use antler as a raw material, but rather simply that they did not characteristically make the T-shaped antler beam mattocks. The only place in the Danubian World where antler T-axes were habitually made and used is in Kuyavia during the fifth millennium BC.

The T-axes or antler beam mattocks are a distinctly northern form, found both in the Baltic World and in the lands along the southern and eastern coasts of the North Sea. Many are found in the Netherlands and Belgium, notably at Spoolde (Clason 1983), Hardinxveld (Louwe Kooijmans 2004, 615), and along the lower Scheldt (Crombé/Sergant this volume), while in Germany an undated deposit has been found in the Leine river near Hannover (Riedel *et al.* 2004), plus the examples from Hüde am Dümmer have already been mentioned. But during the sixth and fifth millennia BC, they are most ubiquitous at sites of the Ertebølle culture in the



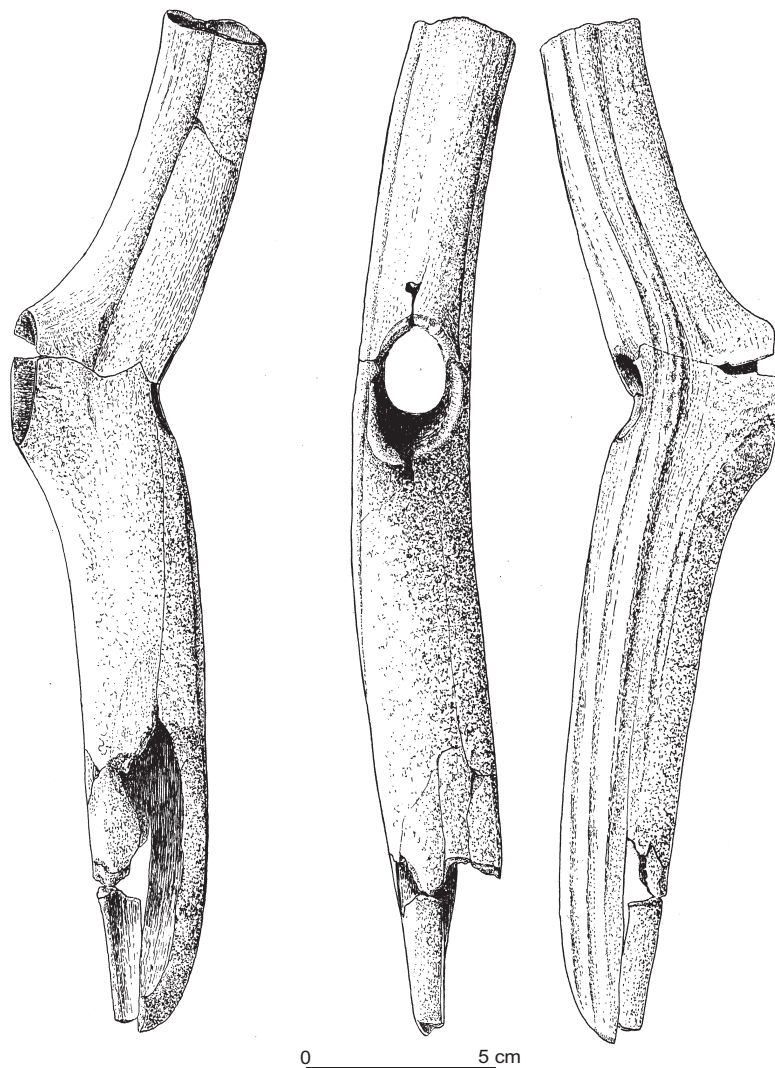


Figure 5.3 An antler-beam mattock (“T-axe”) from Brześć Kujawski (after Grygiel 1986).

western Baltic, where they are found in settlement contexts and have secure dating (Hartz/Lübke 2006, 64-65).

Thus the manufacture and use of antler T-axes is a cultural practice that spans the Danubian and Baltic world, with its particular touchstone in the former being the Brześć Kujawski Group of the Polish lowlands. The proximity of Kuyavia to the Baltic littoral and the contemporaneity between Ertebølle and the Brześć Kujawski Group means that this connection is unlikely to be accidental. At the same time, the incorporation of the antler T-axe into the burial rite of the Brześć Kujawski Group suggests that there was a translation of some sort between the functional and the

symbolic domains. Antler racks and beams are common in the Ertebølle burial ritual at sites like Skateholm (Larsson 1993), whereas finished T-axes are uncommon as grave finds anywhere in the Baltic World and occur mainly in settlement refuse.

#### 5.5.2 *Ornament on Bone*

Another potentially-overlooked connection between the Baltic World and the Danubian frontier in Kuyavia is the practice of decorating bone objects and making bone ornaments, again not something widely encountered in interior Danubian Europe during the fifth millennium BC.

At sites of the Brześć Kujawski Group, this ornamentation is displayed most vividly in the large bone armlets or brassards found in graves, mainly female burials (fig. 5.4). The surface of these brassards is covered, almost completely, with bands of incised chevrons and triangles. Although there are no analogues for such brassards in the Baltic World, the tradition of bone ornamentation is more a Baltic trait than a Danubian trait.

A piece of decorated bone excavated in 1925 at Ralswiek-Augustenhof on the island of Rügen (Petzsch 1928), whose surface is decorated very much like the brassards of the

Brześć Kujawski Group (fig. 5.5), is often offered as evidence of contact with the Brześć Kujawski Group (Gramsch 1973, 63; Terberger 1999, 227). While it indeed points to a connection, it does not mean necessarily that it was an import from the Danubian World. Instead, it may be part of an indigenous Baltic tradition of bone ornamentation which then entered the Danubian World at its Kuyavian outpost and was employed on the bone brassards.

Of particular interest is a bone spatula found in 1990 at Oślonki (fig. 5.6). Close examination revealed two opposed triangles formed from regularly-spaced punctures made with

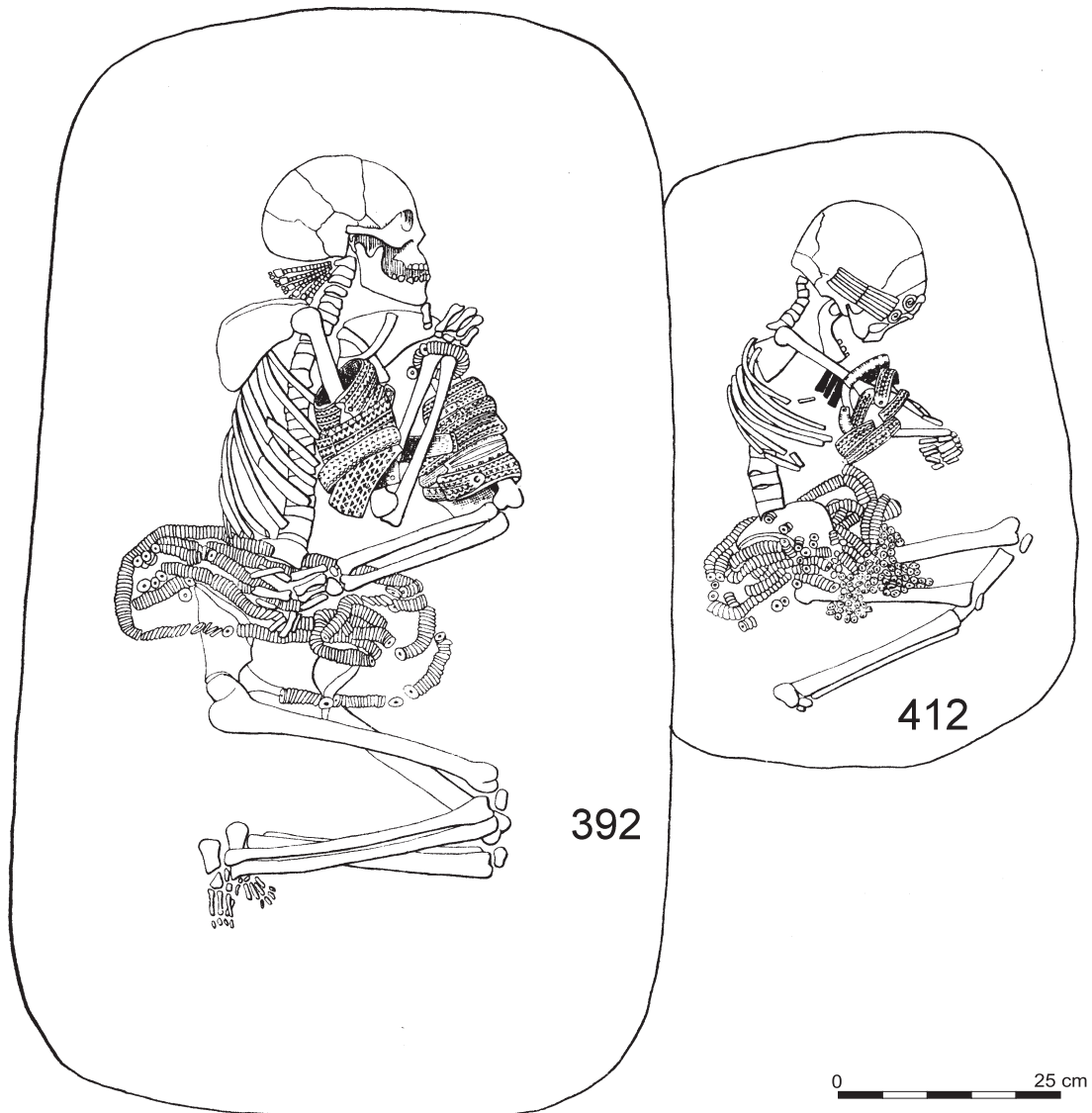


Figure 5.4 Burials at Krusza Zamkowa showing decorated bone armlets (after Czerniak 1980).

a very thin tool. Grahame Clark (1975) illustrated a variety of Mesolithic motifs of bone ornamentation from the Baltic zone, and such opposed triangles of dots are clearly shown. The ornamented spatula found at Osłonki fits well with the repertoire of Mesolithic ornamentation of the Baltic World, in my view, and I am not aware of an analog in the Danubian World.

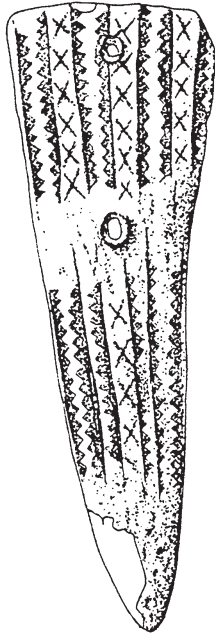


Figure 5.5 Decorated bone from Ralswiek-Augustenhof (after Terberger 1999).

Andersen (1973, reprinted 2002 with addition of fig. 15.2) characterizes similar dotted decoration on Ertebølle ceramics, which is illustrated in the 2002 version with a fragment of a pot from the Norsminde kitchen-midden. While not exactly composed of opposing triangles, the dotted decoration on the Norsminde pot does have a similar opposing pattern nonetheless. It appears that similar dotted decoration was found on a sherd from Lietzow-Buddelin on Rügen, which is said to point to contact with the Stroke-Ornamented Pottery Culture of the early fifth millennium in central Europe (Umbreit 1940 cited in Terberger 1999). Again, such dotted decoration does not look like the characteristic Danubian ornament, in my view. It is unlike the stab-and-drag ornament of Stroke-Ornamented Pottery, which is more of a stroke than a dot.

### 5.5.3 *Metatarsal Chisels or Cleavers*

Another indicator of a Baltic-Danubian connection can be seen in large bone tools made using the metapodials, usually metatarsals, of large animals, specifically cattle. In these tools, the broken proximal shaft is sharpened to a flat edge, leading to their characterization as chisels or cleavers, while the proximal articulation of the bone served as a handle or striking platform. In the German literature, these tools are called '*Tüllenknochenhacke*' for which I cannot devise an adequate English form, so I will refer to them as 'metatarsal cleavers or chisels'.

At Osłonki, two cattle proximal metatarsals from particularly robust individuals had been sharpened to a transverse working edge on their shafts (fig. 5.7). They weighed 147 g and 210 g respectively. In addition, in one of these specimens, the articular surface had been hollowed out down to the marrow cavity, an opening of over a centimeter

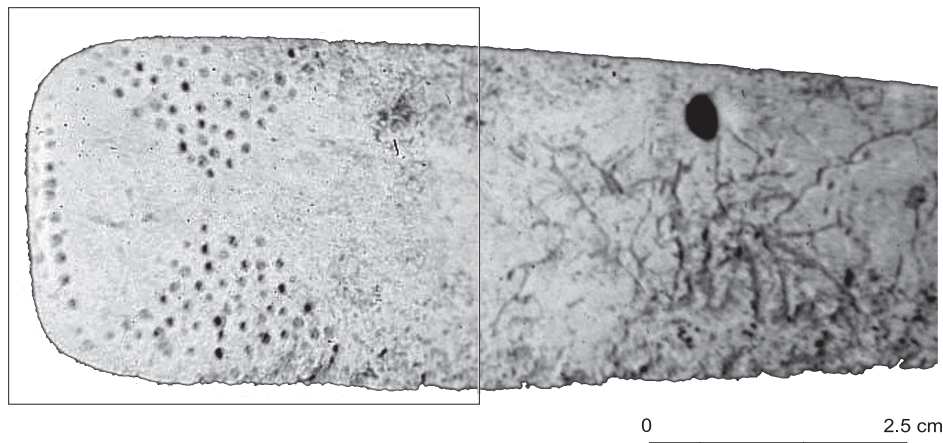


Figure 5.6 Decoration on bone spatula from Osłonki (edge of rectangle approximately 5 cm).

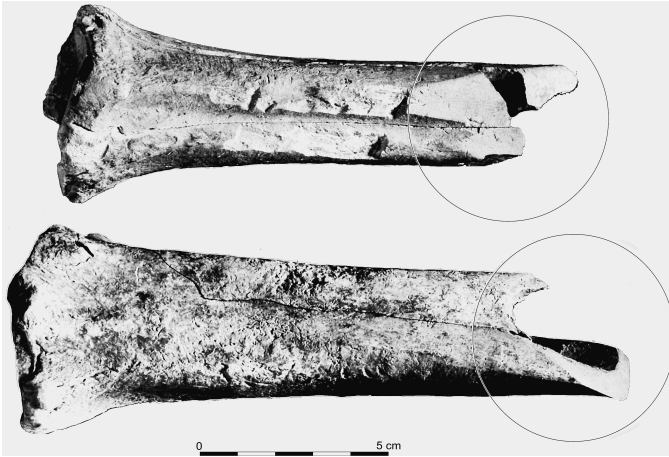


Figure 5.7 Chisels made from cattle metatarsals from Osłonki.

in diameter. Both were found in rubbish deposits in the large pits used initially for clay extraction.

Such metatarsal tools have very similar counterparts in the Baltic world, as well as in the Rhine-Maas Delta where they are manufactured from the metatarsals of wild cattle. Indeed, such tools have a long Mesolithic heritage, appearing first in Maglemosian sites like Hohen Viecheln (Dellbrügge 2002), where one specimen has a hole bored into its articular surface just like the one from Osłonki (fig. 5.8). From the North Sea basin, Louwe Kooijmans (1970, fig. 5) illustrates an aurochs metatarsal tool from the Brown Bank region, also with a hole in the proximal articulation, and during the fifth millennium BC, the inhabitants of Hardinxveld in the Rhine-Maas Delta made analogous tools (Louwe Kooijmans 2004). Later in the fifth millennium, after the floruit of the Brześć Kujawski Group, the inhabitants of early Neolithic sites in the west Baltic zone, clearly derived from the Mesolithic tradition, made similar tools.

Yet searching for such massive metatarsal cleavers or chisels among Danubian bone tools elsewhere in central Europe has not turned up any examples. They very much appear to be a characteristic of the Baltic World and its neighbours along the North Sea, with deep roots long before the fifth millennium BC. Along with antler T-axes, the metatarsal cleavers may represent another trait adopted along the Danubian frontier in northern Poland from the foragers to the north.

#### 5.6 DANUBIAN NEOLITHIC ELEMENTS IN ERTEBØLLE CONTEXTS

At the same time, various Danubian elements do appear in the Baltic World, even if we should no longer count the antler T-axes among them. These intrusive elements include domestic cattle and stone axes with shaft holes.

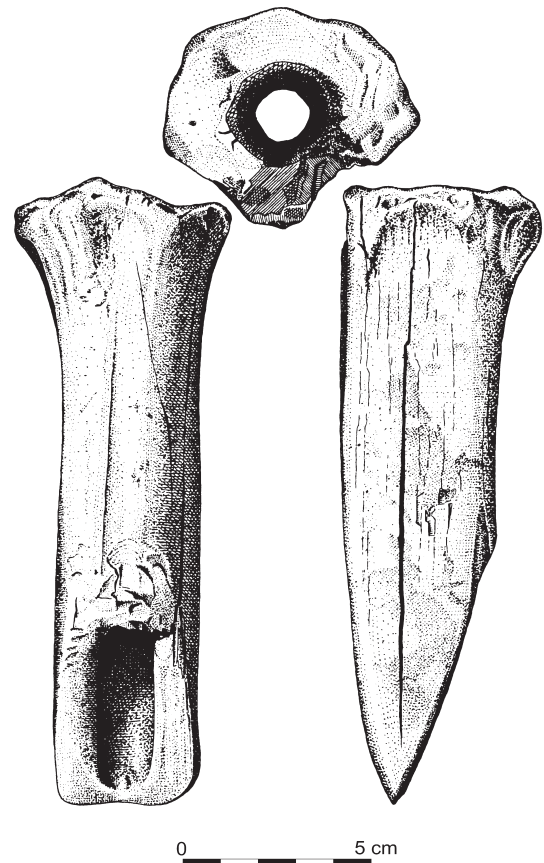


Figure 5.8 Chisel made from an aurochs metatarsal at Hohen Viecheln (after Dellbrügge 2002, fig. 33). Long axis of tool approximately 16 cm.



### 5.6.1 Domestic Cattle

It appears that the earliest element of the Neolithic economy to reach the foragers of the Baltic basin near the end of the fifth millennium BC was domestic cattle (Noe-Nygaard/Hede 2006). The initial agricultural expansion of the Linear Pottery culture during the sixth millennium BC had brought domestic cattle to the North European Plain along the lower Oder and Vistula rivers, theoretically within reach of the Baltic World. Yet there is currently no definite evidence of domestic cattle in the south Baltic area contemporaneous with the Linear Pottery culture, despite its proximity. Apparently the passage of domestic cattle through the borderland between the Danubian and the Baltic Worlds did not take place until the second half of the fifth millennium BC. A recent summary of the evidence (Noe-Nygaard *et al.* 2005) points toward a fairly sudden and widespread introduction of domestic cattle to Denmark around 4000 BC, although there does appear to be a domestic cattle bone from Lollikhuse in northern Zealand dated c. 4600-4700 BC (Noe-Nygaard/Hede 2006). The Lollikhuse date is striking because wild cattle had been extirpated on Zealand by 6000 BC according to Noe-Nygaard and Hede, but at the moment it is the only domestic cattle bone in southern Scandinavia dated significantly before 4000 BC.

The case for *de novo* local domestication of wild cattle in northern Europe, heard so often in the 1970s and 1980s, appears to have collapsed (Rowley-Conwy 1995). Although the forests of central Europe did contain wild cattle (aurochs, *Bos primigenius*), recent studies have demonstrated that the mitochondrial DNA of European Neolithic cattle remains reflects a Near Eastern origin almost exclusively (Bollongino *et al.* 2006). Since mtDNA is passed through the maternal line, this indicates that the female breeding population of European Neolithic cattle was derived from Near Eastern stock. At the same time, this does not exclude the possibility of introgression of local aurochs genes from males, and indeed the analysis of Y-chromosomes from ancient and modern wild and domestic cattle in temperate Europe appears to support this (Götherström *et al.* 2005). Thus, while there appears to have been no bovine maternal line among Neolithic and later domestic cattle that was derived from aurochs, there is a strong possibility of local hybridization from occasional mating between aurochs bulls and domestic cows. This is much different from *de novo* local domestication from an exclusively indigenous population of wild cattle, however. Domestic cattle, or at least cows, must have reached the Baltic World sometime during the fifth millennium BC.

### 5.6.2 Shaft-Hole Axes

Anders Fischer (1982) was the first to call attention to the presence of non-flint ground stone axes, usually with drilled shaft holes, in Ertebølle contexts in Denmark and Scania

(see also Pedersen *et al.* 1997 and map in Fischer 2002, fig. 22.1). Unlike the antler T-axes, such stone tools have a strong Danubian heritage, appearing ubiquitously on Linear Pottery, Rössen, and Lengyel sites during the sixth and fifth millennia BC. Moreover, the stone from which they are made is characteristic of the amphibolitic rocks of upland central Europe rather than the raw material available in the Baltic basin. Thus a very clear link can be made on the basis of these materials between the Danubian World and the Baltic World.

### 5.7 ROUTES THROUGH THE BORDERLAND

The foragers of the Baltic World present an apparent paradox of communities that were simultaneously highly sedentary yet at the same time capable of great mobility. Watercraft were the key to Ertebølle sedentism. Most foraging communities adjust to temporal and spatial variations and imbalances in resources by moving their settlements. Maritime foragers with watercraft, however, can paddle their canoes over a much greater territory than can be covered by terrestrial foragers and return to a base settlement in a timely fashion. At the same time, the base settlement and its environs can be developed into a multi-year installation with permanent facilities. In the Baltic World, the most evident permanent facilities are the large structures for trapping fish that have been documented along the bays and inlets of the Danish islands and dated to the sixth, fifth, and fourth millennia BC (Fischer 2007, table 5.2). Such structures would have required the presence of a long-term resident community to construct them, maintain them, and to assert ownership of their yields.

The numerous dugout canoes (cataloged by Christensen 1997 and Skaarup/Grøn 2004) and paddles (*e.g.* at Tybrind Vig) found in submerged and waterlogged sites in southern Scandinavia testify to the ubiquity of Ertebølle watercraft, and while no examples of hide or bark boats have yet been recovered, these were probably not beyond the reach of Ertebølle technology. It is easy to envision Ertebølle watercraft being used in the bays and inlets around the islands of the western Baltic, and for crossing straits between bodies of land. Yet there is no reason why these same watercraft could not have been taken into interior waterways, especially by the Ertebølle communities on the southern Baltic coast. Many of the rivers of the south Baltic coastal plain are short. In Pomerania, many only extend as far as the moraines that define the southern margin of the Baltic coastal plain. Yet large rivers, such as the Oder and the Vistula, would have provided points of entry into the vast hydrological network of the North European Plain.

The most important feature of this hydrological network, comprising not only rivers and creeks but also lakes and marshes, is that it is relatively flat in contrast to the streams



of upland interior Europe. Its rivers and creeks would be considered to be 'low-energy streams' with their normal flow moving relatively slowly. These streams are very popular among recreational canoers and kayakers today, who are certainly not expert white-water adventurers! Over the last 6,000 years, many of the watercourses of the North European Plain have dried up, either naturally or due to modern drainage work, but during the fifth millennium BC there would have been a network of rivers, small streams, and lakes in which the obstacles would have been woody debris, shallows, and overhanging vegetation rather than rapids and cascades.

#### 5.8 ERTEBØLLE VOYAGEURS

There would have been very little to prevent venturesome Ertebølle canoers from paddling up the languid streams of the North European Plain. After all, if they were capable of dealing with maritime currents, waves, and weather, journeys into the interior of northern continental Europe would not have been a problem. A more recent example of determined, purposeful canoers exploring interior rivers is known to us from the *voyageurs* of 17th and 18th century Canada (Podruchny 2006), who travelled immense distances each year collecting furs from inland trappers and bringing them back to the eastern coast for export. The bark canoes of the *voyageurs* were more sophisticated than the Ertebølle dugouts in their lighter weight, but nonetheless it is possible to draw some broad comparisons.

Ertebølle *voyageurs* would have been able to reach the Danubian communities of Kuyavia relatively easily and without any significant portages. After leaving their coastal habitat and traveling approximately 100 kilometres inland on the Oder River, they would have come to its confluence with the Warta River. Approximately 50 kilometres up the Warta, the Notec River branches off. From there, it is about 200 kilometres to the lands of the Brześć Kujawski Group and easy travel through the stream network of the Kuyavian Plateau. A short portage near the modern city of Bydgoszcz would have brought them to the Vistula River, but traveling further along to pass through the Bachorza tunnel valley (which probably contained a brook during this period) would have brought them to the Zgłowiączka River near Brześć Kujawski which connects directly to the Vistula. Of course, Ertebølle canoers could also have continued up the Oder and Warta Rivers and encountered other Danubian communities eventually but at a greater distance from the Baltic World.

All this is in the realm of fanciful speculation, but the point is that there were no significant geological or hydrological barriers to communication between the Baltic World and the Danubian communities of Kuyavia during the fifth millennium BC. We know that the Ertebølle communities of the Baltic coast had the watercraft. A search of recreational

canoeing websites suggests that 5 km/hour on a flat stream is a reasonable assumption, so assuming 8 hours of paddling per day, it would be possible to cover 40 kilometres of river. Of course, Ertebølle canoers who were in good condition from paddling against sea currents may well have been able to exceed this distance. Indeed, accounts indicate that *voyageurs* in 18th century Canada could cover almost twice that daily distance in good weather and without much portaging (Podruchny 2006, 100). Nonetheless, it is clear that it would have been possible to cover the 350 or so kilometres of river between the Baltic Coast and the headwaters of the Notec in ten days or less in the spring, summer, or early fall.

#### 5.9 A NEOLITHIC PRESENCE ON THE BALTIC?

The question then arises, if the Baltic foragers had the technology to travel long distances on water, would not the Danubian farmers also have had a similar capability? The evidence for Neolithic watercraft in interior Europe during the sixth and fifth millennia BC is virtually nonexistent. The principal factor in this is the unfavorable conditions for the preservation of wood in much of this region, and hence no Linear Pottery or Lengyel boats have been recovered. In interior Neolithic Europe, another constraint on watercraft would have been the nature of the rivers, in that their steeper gradients give them a faster current than the low-energy streams of the North European Plain. Thus going downstream would have been easy, but getting back upstream would have required considerable effort. For that reason, watercraft in the upland Danubian World may have functioned more as ferries, permitting the crossing of streams much in the style of the Venetian *traghetto*, rather than a means of transport along watercourses.

Still, once established on the North European Plain, Danubian communities in Kuyavia and elsewhere may also have adopted the practice of long-distance travel by water, and thus a Neolithic presence in the Baltic basin cannot be excluded. Such a presence would have left little trace archaeologically but it is fun to speculate nonetheless. It is likely that during the sixth millennium BC Linear Pottery farmers saw the estuaries of the Oder and the Vistula, perhaps even the Baltic itself. Their settlements were certainly close enough. During the fifth millennium BC, the inhabitants of sedentary foraging communities along the Baltic and the farmers in the large centres of Neolithic settlement in Kuyavia must have encountered each other as the former ventured upstream and the latter explored downstream in the Vistula drainage.

#### 5.10 FERAL CATTLE

The domestic cattle that were introduced into the Baltic World late in the fifth millennium BC must have come Danubian communities with substantial populations of

domestic from the Danubian communities of the North European Plain, where the closest cattle were the settlements of the Brześć Kujawski Group of the Lengyel Culture. There are no other such large concentrations of Neolithic settlements with domestic cattle above 52° N latitude in continental Europe at this time. It thus seems likely that the starting point for at least some of the cattle that found their way north to the Baltic basin toward the end of the fifth millennium BC was the Kuyavian plateau.

In light of the fact that cattle appear to have passed through the borderland between the Danubian and the Baltic Worlds with relative ease, in 1995 I proposed that feral livestock that had escaped from the control of farming communities found congenial habitats in the artificial glades of the North European Plain that had been created by foragers. For me, the question was not 'if' Neolithic livestock escaped but rather 'how many?' Given a chance, cattle will often run away, and over several centuries of Danubian settlement in Kuyavia and adjacent regions, such escapes probably happened often. Numerous historical examples exist of cattle that wandered off into the wilderness in areas as disparate as colonial North America and Australia. Domesticated cattle that propagated and dispersed among the artificial glades of the North European Plain would have found their way to the Baltic World and into the hands of the foragers of the southern Baltic coast during the fifth millennium BC. From there, it did not take long before they were distributed widely among Ertebølle communities of the southwestern Baltic.

The idea that the dispersal of feral cattle on the North European Plain required anthropogenic glade habitats to flourish may be revisited in light of the Vera Hypothesis, which is that wild herbivores maintained the understory vegetation of the primeval European woodlands as a park-like habitat, very different from what it might have been in their absence (Vera 2000). It must be acknowledged that the Vera Hypothesis has been criticized by Mitchell (2005) and other reviewers, but nonetheless it provides an intriguing mechanism for the dispersal of feral livestock from the Danubian frontier settlement that does not require the intervention of foragers to create artificial glades. Instead, under the Vera model, the understory vegetation of the primeval forest was itself hospitable to escaped cattle, who then could spread far to the north of their Danubian homes on their own before reaching the southern edge of the Baltic World. Moreover, the landscape engineering of beavers would have created wetland habitats that would have been attractive to feral cattle (Brown 1997; Rosell *et al.* 2005).

Ultimately, the source of the earliest cattle in the Baltic World will have to be addressed through DNA analysis. The accumulating number of Ertebølle cattle bones dated very close to 4000 BC should provide some useful

archaeogenetic material. When this research is undertaken, it will also be necessary to sample the cattle bones from sites of the Brześć Kujawski Group to see whether the speculation here can be substantiated.

While feral cattle are fully within the realm of possibility, feral grain certainly is not, and thus the introduction of wheat and barley to the Baltic World required direct human contact across this borderland. The earliest evidence for grain cultivation in the Baltic World comes from the first centuries of the fourth millennium BC, after the disappearance of the Brześć Kujawski Group from its Kuyavian settlements. It will probably be some time before we have a better understanding of the pathway for cereals between the Danubian and the Baltic Worlds.

#### 5.11 CONCLUSION: THE NORTH EUROPEAN FARMING FRONTIER

The goal of this paper has been to characterize the lowlands of northern Poland as a porous and interactive borderland between the worlds of the Danubian farmers and the Baltic foragers during the fifth millennium BC. During this time, the Ertebølle communities of the south Baltic coast and the farmers of the living on the Kuyavian plateau were separated by only a few hundred kilometres of sparsely-populated land, and connected by easily navigable inland waterways. Interaction would have been constrained only by cultural separation and by limits on individual initiative and curiosity.

The presence in Brześć Kujawski Group settlements of bone and antler tool types, particularly the T-axes and the cattle metatarsal chisels, along with richly decorated bone objects at settlements of the Brześć Kujawski Group provides a hint of this interaction, for these are all out of character with traditional Danubian finds but familiar elements in the Baltic World. Previously, more attention has been paid to what was going north from the Danubian World to the Baltic World, especially ground stone axes and the cattle. Yet as this paper has argued, the interaction across this borderland was a two-way street, and it may well have contributed to the distinctive character of the Brześć Kujawski Group and to the vigor and persistence of its settlements.

Over the next few decades, several things will probably occur. First, additional large settlements of the Brześć Kujawski Group will be discovered and excavated, amplifying the archaeological signature of these communities even more. Second, the south Baltic coast, particularly the Polish part, will be explored more thoroughly and additional Ertebølle sites will surely be found, some of them submerged. Finally, a comparison of the archaeogenetics of the earliest cattle of the Baltic World and those of the Brześć Kujawski Group may be illuminating. Eventually we will discover how the interaction between the Danubian and the Baltic Worlds led to a 'new Neolithic' that was acceptable both to the

successors of the Brześć Kujawski Group and to the Ertebølle foragers around 4000 BC.

## References

- Andersen, S.H. 1973. Overgangen fra ældre til yngre stenalder i Sydsandinavien set fra en mesolitisk synsvinkel. In: P. Simonsen/G. S. Munch (eds), *Bonde – veidemann, bofast - icke bofast i nordisk forhistorie. Foredrag og diskusjoner fra 13. nordiske arkeologmøte i Tromsø*, Tromsø, 26-44. [reprinted as Andersen, S.H. 2002. The transition from the Early to the Late Stone Age in southern Scandinavia, seen from a Mesolithic point of view. In A. Fischer/K. Kristiansen (eds) *The Neolithisation of Denmark. 150 Years of Debate*, Sheffield, 221-240].
- Andersen, S.H. 1998. Ringkloster. Ertebølle trappers and wild boar hunters in eastern Jutland, a survey, *Journal of Danish Archaeology* 12, 13-59.
- Bieniek, A. 2002. Archaeobotanical analysis of some early Neolithic settlements in the Kujawy region, central Poland, with potential plant gathering activities emphasised, *Vegetation History and Archaeobotany* 11, 143-144.
- Bogucki, P. 1995. Prelude to agriculture in North-Central Europe. In: D.V. Campana (ed.), *Before Farming: the Role of Plants and Animals in Early Societies*, Philadelphia (Research Papers in Science and Archaeology, 12 Supplement), 105-116.
- Bogucki, P. 1996. The spread of early farming in Europe, *American Scientist* 84, 242-253.
- Bogucki, P. 2008. Animal Exploitation by the Brześć Kujawski Group of the Lengyel Culture. In: R. Grygiel (ed.), *Neolit i Początki Epoki Brązu w Rejonie Brześcia Kujawskiego i Ostonek (The Neolithic and Early Bronze Age in the Brześć Kujawski and Ostonek Region)*, volume II, Łódź.
- Bogucki, P./R. Grygiel 1983. Early farmers of the North European Plain, *Scientific American* 248, 104-112.
- Bollongino, R./C.J. Edwards/K.W. Alt/J. Burger/D.G. Bradley 2006. Early history of European domestic cattle as revealed by ancient DNA, *Biology Letters* 2, 155-159.
- Childe, V.G. 1949. The origin of Neolithic culture in Northern Europe, *Antiquity* 23, 129-135.
- Christensen, C. 1997. Boats and navigation in the Stone Age. In: L. Pedersen/A. Fischer/B. Aaby (eds), *The Danish Storebalt Since the Ice Age – Man, Sea and Forest*, Copenhagen, 282-289.
- Clark, G. 1975. *The Earlier Stone Age Settlement of Scandinavia*, London/New York.
- Clason, A.T. 1983. Spoolde. Worked and unworked antlers and bone tools from Spoolde, de Gaste, the IJsselmeerpolders and adjacent areas, *Palaeohistoria* 25, 77-130.
- Coles, B.J. 2006. *Beavers in Britain's Past*, Oxford (WARP Occasional Paper 19).
- Czerniak, L. 1980. *Rozwój Społeczeństw Kultury Późnej Ceramiki Wstęgowej na Kujawach*, Poznań.
- Czerniak, L. 1994. *Wczesny i Środkowy Okres Neolitu na Kujawach: 5400-3650 p.n.e.*, Poznań.
- Czerniak, L./J. Kabaciński 1997. The Ertebølle culture in the southern Baltic coast. In: D. Król (ed), *The Built Environment of Coast Areas During the Stone Age: a Symposium at the Centenary of Archaeological Excavations at Rzucewo*, Gdańsk, 70-79.
- Czerniak, L./W. Rączkowski/W. Sosnowski 2003. New prospects for the study of Early Neolithic longhouses in the Polish Lowlands, *Antiquity* 77 project gallery: <http://antiquity.ac.uk/projGall/czerniak/czerniak.html>
- Deichmüller, J. 1974. Eine Geweihaxt mit Flintbohrer aus der Siedlung Hüde I am Dümmer, Kr. Grafschaft Diepholz., *Archäologisches Korrespondenzblatt* 4, 197-199.
- Dellbrügge, S.B. 2002. *Steinzeitliche Knochen- und Geweihfunde im nördlichen Schleswig-Holstein*, Bonn (Universitätsforschungen zur prähistorischen Archäologie Bd. 83).
- Fischer, A. 1982. Trade in Danubian shaft-hole axes and the introduction of Neolithic economy in Denmark, *Journal of Danish Archaeology* 1, 7-12.
- Fischer, A. 2002. Food for feasting? An evaluation of explanations of the neolithisation of Denmark and southern Sweden. In: K. Kristiansen/A. Fischer (eds), *The Neolithisation of Denmark. 150 Years of Debate*, Sheffield, 343-393.
- Fischer, A. 2007. Coastal fishing in Stone Age Denmark – evidence from below and above the present sea level and from human bones. In: N. Milner/O.E. Craig/G.N. Bailey (eds), *Shell Middens in Atlantic Europe*, Oxford, 54-69.
- Galiński, T. 1992. *Mezolit Pomorza*, Szczecin.
- Götherström, A./C. Anderung/L. Hellborg/R. Elburg/C. Smith/D.G. Bradley/H. Ellegren 2005. Cattle domestication in the Near East was followed by hybridization with aurochs bulls in Europe, *Proceedings of the Royal Society of Biology B: Biological Sciences* 272, 2345-2350.
- Gramsch, B. 1973. *Das Mesolithikum im Flachland zwischen Elbe und Oder, Teil 1*, Berlin.

- Grygiel, R. 1986. Household cluster as a fundamental social unit of the Brześć Kujawski Group of the Lengyel culture in the Polish lowlands, *Prace i Materiały Muzeum Archeologicznego i Etnograficznego w Łodzi* 31, 43-334.
- Grygiel, R. 2004. *Neolit i Początki Epoki Brązu w Rejonie Brześcia Kujawskiego i Ośłonek (The Neolithic and Early Bronze Age in the Brześć Kujawski and Ośłonki Region)*, volume I, Łódź.
- Grygiel, R. 2008. *Neolit i Początki Epoki Brązu w Rejonie Brześcia Kujawskiego i Ośłonek (The Neolithic and Early Bronze Age in the Brześć Kujawski and Ośłonki Region)*, volume II, Łódź.
- Grygiel, R./P. Bogucki 1990. Neolithic manufacture of antler axes at Brześć Kujawski, Poland, *Archeomaterials* 4, 67-76.
- Grygiel, R./P. Bogucki 1997. Early farmers in north-central Europe: 1989-1994 excavations at Ośłonki, Poland, *Journal of Field Archaeology* 24, 161-78.
- Hartz, S./H. Lübke 2006. New evidence for a chronostratigraphic division of the Ertebølle Culture and the earliest Funnel Beaker Culture on the southern Mecklenburg Bay. In: Claus-Joachim Kind (ed.), *After the Ice Age. Settlements, Subsistence and Social Development in the Mesolithic of Central Europe*, Stuttgart, 59-74.
- Ilkiewicz, J. 1989. From studies on cultures of the 4th millennium B.C. in the central part of the Polish coastal area, *Przeгляд Archeologiczny* 36, 17-56.
- Ilkiewicz, J. 1997. From studies on Ertebølle type cultures on the Koszalinian coastal area (Dabki 9, Koszalin-Dzierzeczino 7). In: D. Król (ed.), *The Built Environment of Coast Areas During the Stone Age. The Baltic Sea-Coast Landscape Seminar Session No. 1*, Gdansk, 50-65.
- Jażdżewski, K. 1938. Cmentarzyska kultury ceramiki wstęgowej i związane z nimi ślady osadnictwa w Brześciu Kujawskim. *Wiadomości Archeologiczne* 15, 1-105.
- Kabaciński, J. 2001. The Mesolithic-Neolithic transition in the southern Baltic coastlands, *Fontes Archaeologici Posnaniensis* 39, 129-161.
- Kampffmeyer, U. 1983. Der neolithische Siedlungsplatz Hüde I am Dümmer. In: G. Wegner (ed.), *Frühe Bauernkulturen in Niedersachsen. Linienbandkeramik, Stichbandkeramik, Rössener Kultur*, Oldenburg, 119-134.
- Klassen, L. 2000. *Frühes Kupfer im Norden: Untersuchungen zu Chronologie, Herkunft und Bedeutung der Kupferfunde der Nordgruppe der Trichterbecherkultur*, Århus/Højbjerg.
- Klassen, L. 2002. The Ertebølle Culture and Neolithic continental Europe: traces of contact and interaction. In: A. Fischer/K. Kristiansen (eds), *The Neolithisation of Denmark. 150 Years of Debate*, Sheffield, 305-317.
- Klassen, L. 2004. *Jade und Kupfer. Untersuchungen zum Neolithisierungsprozess im westlichen Ostseeraum unter besonderer Berücksichtigung der Kulturentwicklung Europas 5500-3500 B.C.*, Aarhus.
- Kobusiewicz, M. 2006. Paraneolithic – obstinate hunter-gatherers of the Polish Plain. In: C.-J. Kind (ed.), *After the Ice Age. Settlements, Subsistence and Social Development in the Mesolithic of Central Europe*, Stuttgart, 181-188.
- Larsson, L. 1993. The Skateholm Project: late Mesolithic coastal settlement in southern Sweden. In: P. Bogucki (ed.), *Case Studies in European Prehistory*, Boca Raton, 31-62.
- Louwe Kooijmans, L.P. 1970. Mesolithic bone and antler implements from the North Sea and the Netherlands, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 20-21, 27-73.
- Louwe Kooijmans, L.P. 1976. Local developments in a borderland; a survey of the Neolithic at the Lower Rhine, *Oudheidkundige Mededelingen van het Rijksmuseum van Oudheidkunde te Leiden* 57, 227-297.
- Louwe Kooijmans, L.P. 1993. Mesolithic/Neolithic transformation in the lower Rhine basin. In: P. Bogucki (ed.), *Case Studies in European Prehistory*, Boca Raton, 95-145.
- Louwe Kooijmans, L.P. 2004. The Hardinxveld sites in the Rhine/Meuse Delta, the Netherlands, 5500-4500 cal BC. In: L. Larsson/H. Kindgren/K. Knutsson/D. Loeffler/A. Åkerlund (eds), *Mesolithic on the Move*, Oxford, 608-624.
- Louwe Kooijmans, L.P. 2005a. The Netherlands in Prehistory: some long term trends. In: L.P. Louwe Kooijmans/P.W. van den Broeke/H. Fokkens/A.L. van Gijn (eds), *The Prehistory of the Netherlands*, Amsterdam, 695-721.
- Louwe Kooijmans, L.P. 2005b. Hunters and farmers side by side. In: L.P. Louwe Kooijmans/P.W. van den Broeke/H. Fokkens/A.L. van Gijn (eds), *The Prehistory of the Netherlands*, Amsterdam, 249-272.
- Lübke, H. 2002. Submarine Stone Age settlements as indicators of sea-level changes and the coastal evolution of the Wismar Bay area, *Greifswalder Geographische Arbeiten* 27, 203-210.
- Lübke, H./T. Terberger 2002. New evidence on the Ertebølle Culture on Rügen and neighbouring areas, *Greifswalder Geographische Arbeiten* 27, 47-53.



- Mitchell, F.J.G. 2005. How open were European primeval forests? Hypothesis testing using palaeoecological data, *Journal of Ecology* 93, 168-177.
- Noe-Nygaard, N./M.U. Hede 2006. The first appearance of cattle in Denmark occurred 6000 years ago: an effect of cultural or climate and environmental changes, *Geografiska Annaler, Series A: Physical Geography* 88, 87-95.
- Noe-Nygaard, N./T.D. Price/S.U. Hede 2005. Diet of aurochs and early cattle in southern Scandinavia: evidence from  $^{15}\text{N}$  and  $^{13}\text{C}$  stable isotopes, *Journal of Archaeological Science* 32, 855-871.
- Pedersen, L. 1997. They put fences in the sea. In: L. Pedersen/A. Fischer/B. Aaby (eds), *The Danish Storebælt Since the Ice Age – Man, Sea and Forest*, Copenhagen, 124-143.
- Pedersen, L./A. Fischer/N. Hald 1997. Danubian shaft-hole axes – long-distance transport and the introduction of agriculture. In: L. Pedersen/A. Fischer/B. Aaby (eds), *The Danish Storebælt Since the Ice Age – Man, Sea, and Forest*, Copenhagen, 201-205.
- Petzsch, W. 1928. *Die Steinzeit Rügens*, Greifswald (Mitteilungen aus der Sammlung vaterländischer Altertümer der Universität Greifswald 3).
- Podruchny, C. 2006. *Making the Voyageur World: Travelers and Traders in the North American Fur Trade*, Lincoln
- Rączkowski, W./D. Krasnodębski/A. Prinke 2005. European landscapes: past, present and future. First year report of the Polish team (2004-2005). Aerial survey in four main regions: Wielkopolska, Kujawy, Odra River catchment area and NE Poland, <http://www.muzarp.poznan.pl/europ/e1.html>, accessed November 28, 2007.
- Riedel, K./K. Pohlmeier/D.B. von Rautenfeld 2004. An examination of Stone Age/Bronze Age adzes and axes of red deer (*Cervus elaphus* L.) antler from the Leine Valley, near Hannover, *European Journal of Wildlife Research* 50, 197-206.
- Rosell, F./O. Bozser/P. Collen/H. Parker 2005. Ecological impact of beavers *Castor fiber* and *Castor canadensis* and their ability to modify ecosystems, *Mammal Review* 35, 248-276.
- Rowley-Conwy, P. 1995. Wild or domestic? On the evidence for the earliest domestic cattle and pigs in south Scandinavia and Iberia, *International Journal of Osteoarchaeology* 5, 115-126.
- Schmölcke, U./E. Endtmann/S. Klooss/M. Meyer/D. Michaelis/B.H. Rickert/D. Röbber 2006. Changes of sea level, landscape and culture: A review of the south-western Baltic area between 8800 and 4000 BC, *Palaeogeography, Palaeoclimatology, Palaeoecology* 240, 423-438.
- Skaarup, J./O. Grøn 2004. *Møllegabet II: A Submerged Mesolithic Settlement in Southern Denmark*, Oxford (BAR International Series 1328).
- Terberger, T. 1999. Aspekte zum Endmesolithikum der Insel Rügen (Mecklenburg- Vorpommern). In: E. Czeszla/T. Kersting/S. Pratsch (eds), *Den Bogen Spannen... Festschrift für Bernhard Gramsch zum 65 Geburtstag*, Weissbach, (Beiträge zur Ur- und Frühgeschichte Mitteleuropas), 229-234.
- Terberger, T. 2006. The Mesolithic hunter-fisher-gatherers on the Northern German Plain. In: K. Møller Hansen/K. Buck Pedersen (eds), *Across the Western Baltic*, Vordingborg, 111-184.
- Umbreit, C. 1940 Zur Chronologie der Lietzow-Kultur, *Mitteilung aus der Sammlung vaterländischer Altertümer der Universität Greifswald* 11/12, 30-61.
- Vera, F.W.M. 2000. *Grazing Ecology and Forest History*, Wallingford.
- Zvelebil, M. 1994. Plant use in the mesolithic and its role in the transition to farming, *Proceedings of the Prehistoric Society* 60, 35-74.
- Zvelebil, M. 2006. Mobility, contact, and exchange in the Baltic Sea basin 6000-2000 BC, *Journal of Anthropological Archaeology* 25, 178-192.

P. Bogucki  
 School of Engineering and Applied Science  
 Princeton University  
 New Jersey  
 USA  
 bogucki@princeton.edu