Consuming and communicating identities
Dietary diversity and interaction in Middle Neolithic Sweden

Elin Fornander
Abstract


Isotope analyses on human and faunal skeletal remains from different Swedish Neolithic archaeological contexts are here applied as a means to reconstruct dietary strategies and mobility patterns. The chronological emphasis is on the Middle Neolithic period, and radiocarbon dating constitutes another central focus. The results reveal a food cultural diversity throughout the period in question, where dietary differences in part correspond to, but also transcend, the traditionally defined archaeological cultures in the Swedish Early to Middle Neolithic. Further, these differences, and the apparent continued utilisation of marine resources in several regions and cultural contexts, can only in part be explained by chronology or availability of resources depending on geographic location. Thus, the sometimes suggested sharp economic shift towards an agricultural way of life at the onset of the Neolithic is refuted. Taking the potential of isotope analyses a step further, aspects of Neolithic social relations and identities are discussed, partly from a food cultural perspective embarking from the obtained results. Relations between people and places, as well as to the past, are discussed. The apparent tenacity in the dietary strategies observed is understood in terms of their rootedness in the practices and social memory of the Neolithic societies in question. Food cultural practices are further argued to have given rise to different notions of identity, some of which can be related to the different archaeological cultures, although these cultures are not to be perceived as bounded entities or the sole basis of self-conceptualisation. Some of these identities have been focused around the dietary strategies of everyday life, whereas others emanate from practices, e.g. of ritualised character, whose dietary importance has been more marginal. Isotope analyses, when combined with other archaeological indices, have the potential to elucidate both these food cultural aspects.

Keywords: Middle Neolithic, Neolithisation, Sweden, Baltic Sea, Funnel Beaker Culture, Pitted Ware Culture, Battle Axe Culture, megaliths, isotopes, δ13C, δ15N, δ34S, 87Sr/86Sr, radiocarbon dating, palaeodiet, mobility, interaction, identity, ethnicity
Till vår kära mormor Britt
med djup saknad
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One might think that the writing of a PhD thesis is the optimal endeavour for a control freak such as myself. Well, I guess this is actually quite true, but perhaps not in the way that I first envisioned it to be. This process has turned out to be anything but a one-woman project. A number of papers in this book constitute joint ventures with a number of collaborators. Their knowledge, insights and skills have not only greatly contributed to the quality of the work, but also forced me to restrain these control issues (well, there is no denying that they’re still there, but even a small step is still quite significant). Further, it has been a process filled with challenging discussions and dialogues of various kinds, without which the present work would have taken a much different, and far poorer, form. There are thus a number of people to whom I want to extend my thanks for, in one way or the other, contributing to this work and for making my time as a doctoral student well worthwhile.

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Thank you, and good night!

/Elin
List of papers


VI. **Fornander, E.** Dietary diversity and moderate mobility – isotope evidence from Scanian Battle Axe Culture burials. *Journal of Nordic Archaeological Science*. Accepted manuscript.
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1. Introduction

Premises and perspectives

“Wolde ye bothe eate your cake, and have your cake?”
John Heywood’s *Prouerbes* (1546, 2nd part, ch. 9)

In the process of composing a thesis on Neolithic social relations with foundations in the methodological field of isotope analysis of skeletal remains, one inevitably has to confront the introspective question of whether this can really be achieved in a coherent manner. Does the decision to concentrate on a specific methodology by necessity lead to a correspondingly narrow and two-dimensional scope in the research questions addressed? The answer to the former question, I suppose, will have to be both yes and no, although with a distinct emphasis on the affirmative. On a general, philosophical level, I see no discernible dichotomy between laboratory analyses, evolved within the natural sciences, on archaeological remains on the one hand, and theoretical discussions on human relations on the other (cf. Jones 2002; Parker Pearson 2003). This thesis is specifically focused on the methodological application of stable isotopes as a means to reconstruct patterns of palaeodiet and mobility, further complemented by radiocarbon dating. However, this rather specific analytical span is by no means irrelevant to the more general questions concerning Neolithic social relations. On the contrary, I argue that these analyses, when complemented by other empirical data and theoretical discussions, can be applied to illuminate an array of different aspects of human social life, reaching far beyond what people have eaten or where they have spent their lives. As for all archaeological methods, the scope of this application naturally has its boundaries, and the themes approached here are defined and limited as much by the analytical observations as by my general archaeological research interest. This is not to say that the methodological point of departure in itself poses a restraint – a number of objectives and insights have emerged in the process of compiling, processing and trying to make sense of the data at hand.

The writing of a doctoral thesis is in many respects a process of elaborating and evolving ones premises, perspectives and understandings, and the present case is no exception. While my general interest in Neolithic social relations and, more notably, the role of food culture within these relations
have stayed with me throughout the course of this work, the scope has become broadened and, to some extent, transformed. From a food cultural perspective, the Neolithic period, with the introduction and subsequent implementation of agriculture, presents a multitude of thought provoking paths to follow. Initially, these were considered predominantly in terms of how social relations, through the study of food culture and interaction, could be examined in relation to the traditionally identified archaeological cultures within the Swedish Neolithic, which are ever present and often challenged in the archaeological debates concerning the time span in question. In short, the archaeological record of the Early to Middle Neolithic of south and central Sweden was early on classified in terms of three different, partly coeval cultures; the Funnel Beaker Culture, the Pitted Ware Culture and the Battle Axe (or Boat Axe) Culture, often associated with different economies and/or social systems. These categories remain in the archaeological discourse, albeit with varied connotations and exposed to substantial criticism. It was within the context of these discussions that the isotope analyses were deemed to constitute a vital contribution. A further question concerned how the introduction of agriculture was perceived and incorporated into Neolithic societies on the levels of economy and mentality. Although there are numerous finds attesting to the presence of agricultural practices and products during the Early and Middle Neolithic of south and central Sweden, their extent and nutritional importance within different regions and periods remain largely unclear. These themes constitute a central focus in several of the included papers, as do the aspects of mobility and residential patterns which can be so intriguingly illuminated through isotope analyses. However, my main area of interest has grown to include other aspects of Neolithic social relations. The questions and insights into how food culture can shed light on issues of identity have, in part, evolved beyond the initial focus on Neolithisation and the culture debate. Here, the results from the isotope analyses and obtained radiocarbon dates have, naturally supported by other empirical and theoretical inspirations, revealed their wide potential and thus led the way towards a more nuanced and integrated approach to social practices.

This thesis includes six different papers, all employing isotope analysis on skeletal remains from different Middle Neolithic burial contexts as a tool for approaching issues of Neolithic food culture, mobility and interaction. Although the chronological focus is primarily on the Middle Neolithic, inferences on adjacent periods will in some cases be included in the following chapters, as well as in the papers. This is, in part, a natural consequence of the fact that radiocarbon dating constitutes another central part of the different studies. The obtained dates for analysed human and fauna rarely coincide completely with the periods to which the burials are conventionally attributed.

In the following chapters, the obtained results from the isotope analyses and radiocarbon dates will be discussed from the perspective of social relations in the Neolithic; including relations between people, relations to places,
and relations to the past. Inherent here is the focus on food cultural practices and perceptions of identity within different social contexts. This perspective constitutes the general path taken, although with some detours to other themes deemed relevant for discussion based on observations made in connection to the laboratory analyses. Aspects of more strict methodological concern will only be dealt with briefly, as they are more thoroughly elaborated in the respective papers.

**Why study food culture?**

My interest in the food culture(s) of Neolithic societies does not concern so much the basic economic aspects of what people ate, but rather the *meaning of* what people ate, or the role of food cultural practices in self-conceptualisation. Saying that eating constitutes a socially and culturally embedded practice may of course be a stating of the obvious. The choices of utilised food sources, and the context and manner in which they are consumed, are governed not only by factors of technological knowledge, availability and nutritional gain but also result from cultural conventions surrounding what, and what not, to eat on a general as well as a situational level (e.g. Douglas 1966; Lévi-Strauss 1969; Bourdieu 1977; Wiessner & Schiefenhövel (Eds.) 1996; Counihan & Van Esterik (Eds.) 1997; Isaksson 2000, 2010; Parker Pearson 2003; Ashley *et al.* (Eds.) 2004). These conventions and meanings emerge through the practices associated with food culture in which people engage and participate. A practice oriented perspective (cf. Bourdieu 1977, 1990) will thus be central in the coming discussions of food culture and its relation to perceptions of identity.

Just as a number of different aspects of human life, food culture includes both what I define as *realities* and *representations*, where the realities refer to *what is actually eaten* and, in more or less self sustainable societies, the practices through which these foods are acquired or produced. Representations, on the other hand, include the conceptions of *what we think we eat*, or what we consider and portay as *central components* of our food culture and our identity as producers/acquirers/consumers, regardless of the actual nutritional importance of these components. This can be illustrated by the University of Arizona’s “Garbage project”, initiated in 1973 by archaeologist William Rathje, and resulting in numerous enlightening and amusing insights into the use and disposal of material culture and foods. Here, the difference between people’s perceived and actual behaviour became evident through the comparison of personal interviews on food consumption, and the actual remains found in the informants’ garbage (Rathje & Murphy 2001).

Naturally, these two aspects are far from mutually exclusive as the representations can reflect the actual dietary reality. Further, food cultural representations certainly reflect foods that have actually been eaten and related activities that have been engaged in, although not necessarily to a quantita-
tive extent. Further, in archaeological contexts it can be problematic to identify or separate the two. For example, how can we understand the remains of a faunal bone assemblage recovered in a refuse pit, or lipid residues absorbed in a ceramic vessel? Can we really, from such finds, make inferences on economic and dietary strategies within the population in question, or might these materials just as likely reflect certain occasions where something other than the everyday actual subsistence was manifested? It is in light of these aspects, I argue, that the study of dietary patterns by means of isotope analyses on skeletal remains presents one of its most interesting advantages. The overall dietary pattern reflected in these analyses is one of the few, if not the only, straightforward indicators of the food cultural realities that we as archaeologists have access to. This method further allows us to illuminate the representations of food culture, and their relation to a dietary reality, through comparison with other archaeological materials such as recovered bone assemblages, investigations into pottery use, identities manifested in burials etc.

In a Neolithic context, this potential of stable isotope analysis to elucidate identities, or norms, in relation to a dietary reality, can be exemplified by a study of human remains from Zvejnieki, Latvia (Eriksson et al. 2003). Here, the deposition of tooth pendants in a number of burials seems to signal a common identity as hunters of big game. The isotope data, however, shows a dietary reliance predominantly on freshwater fish, thus revealing a discrepancy between the manifested identity and the realities of everyday life for these people.

On the concept of culture

It goes without saying that the problems inherent in the application of the term culture in archaeological discourses encompass a wide array of research foci. Definitions, as well as implications, have varied markedly in different times and paradigms. However, since academic discussions concerning the Early and Middle Neolithic of Sweden frequently touch upon the suggested different cultures in one way or another, I find it relevant to briefly recapitulate the history and some of the earlier denotations, as well as my own use, of the term.

The embryo to the concept of archaeological cultures can be found in Prehistoric Times (1865) by John Lubbock, applying a unilinear evolutionary approach, inspired by the thoughts of Darwin, to the explanation of prehistoric and modern human societies. Lubbock argued that natural selection, governed by environmental factors, resulted in biological as well as cultural differences between human races and societies. Technologically primitive people were thus not only culturally, but also intellectually and emotionally, inferior to more evolved and civilised (western) societies (Trigger 1993:142pp). The use of the term “culture” in an archaeological and anthropological discourse was, however, really established and defined some years
later, in Edward B. Tylor’s book *Primitive Culture* (1958 [1871]:1), as “that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society.” Cultures were perceived as evolving independently, but since, according to Tylor, all human beings had a similar psychological make-up, they tended to come up with similar solutions to cultural problems (Bowie 2000:15p).

It was with the cultural-historical archaeology of the early 20th century that the notion of different cultures, implicitly or, more often, explicitly equating different “peoples”, was to become a central theme and basis for classification within archaeology. Whereas the earlier categorisations of prehistory focused on chronological divisions into different evolutionary stages or periods, the increasing awareness of the complexity of the European archaeological record called for additional explanations taking regional differences into account. Inspired by the *Kulturkreisllehre* within German geography and ethnology, archaeological cultures came to be defined on the basis of stylistic, spatial and temporal proximity (Trigger 1993:196pp; Olsen 2003:26pp). Early works within this tradition were heavily influenced by the nationalistic currents of the time, with the influential German archaeologist and philologist Gustaf Kossinna standing out, not only as a pioneer of this application of culture in archaeological research, but also as one of the most distinctly racist scholars of the discipline. In his *Die Herkunft der Germanen* (1911), Kossinna systemically analysed material distributions in order to identify archaeological cultures, a term used as synonymous with *peoples* and in turn with the term *race*, in search of the ancestral home of the Indo-Europeans, assuming that cultural continuity indicated ethnic continuity (see further e.g. Trigger 1993:199pp; Jones 1997:2; Olsen 2003:29pp).

To some extent, the methods of Kossinna came to inspire Vere Gordon Childe, who, in his influential works *The Dawn of European Civilization* (1957 [1925]) and *The Danube in Prehistory* (1929), also adhered to the notion of culture as synonymous with people. However, the term “people” could not, according to Childe, be substituted for “race” unless there was unambiguous evidence that the culture was associated with skeletal remains of a specific physical type (Childe 1929; Trigger 1993:208). Childe further produced a definition of culture as “a complex of regularly associated traits” (Childe 1929:vi), and past groups of people could thus be traced via material distributions. The works of Childe came to constitute one of the defining moments of archaeology as a discipline, with his concept of culture becoming widely adopted within the cultural-historical discourse and beyond. However, as early as in the 1930s Childe himself started to express some scepticism regarding the potential and validity of an archaeology focusing almost solely on ethnicity and the mapping of cultural groups through space and time (Childe 1930:240pp; Trigger 1993:291). Indeed, modified approaches to archaeological cultures were about to prevail within the discipline in the aftermath of World War II, inspired by the structural-functionalism movement of British anthropologists (Trigger 1993:291pp; Olsen 2003:35pp, 114pp).
This new approach to culture entailed criticism of the earlier ethnocentric perspectives, and can be exemplified by the pioneering work *Archaeology and Society* (1957 [1939]) by the functionalist archaeologist Grahame Clark. In line with the perception of human cultures as rational, adaptive systems of interdependent elements, Clark (1957:174pp) stated that the primary function of culture was to ensure the perpetuation of society by upholding a state of equilibrium. Archaeology should focus on how past people lived through the reconstruction of their economic, social and political organisation, beliefs and value systems, as well as the suggested dependence on environmental factors and the necessary adaptations of the different elements of culture (Clark 1957; Trigger 1993:315p). A similar view within New Archaeology was presented by Lewis Binford, in the papers *Archaeology as Anthropology* (1962) and *Archaeological systematics and the study of culture process* (1965). According to Binford, cultural change was to a large extent the result of adaptations to external pressure, often brought about through changing environmental conditions. The aim of archaeology was to formulate general explanations of similarities and differences in cultural behaviour (Binford 1962, 1965; Trigger 1993:352pp).

With the post-processual archaeologies of the 1980s and 1990s, the focus shifted from the search of cultural universals to a recognition of the variety, specificity and dynamism of human culture. Change was now perceived as internally driven rather than imposed from external factors, and there was an increased interest and awareness of aspects such as ideology and the role of culture in manifesting and sustaining status and domination. The symbolic and communicative nature of material culture was emphasised, and there was a substantial critique of the previous equation of archaeological cultures with ethnic groups (Hodder 1982; Trigger 1993:415pp; Olsen 2003:50pp). This perspective can be exemplified by Ian Hodder’s book *Symbols in action* (1982), where ethnographic analogies and inspirations were used in order to study the communicative aspect of ethnicity. Here, the material culture was argued to be actively, and variedly, used in social interaction as a means to signal status and identity. Ethnicity and other forms of identity could be made conscious and communicated in different ways and to varied extent, depending on the context. Hodder, as well as a number of other contextual archaeologists, was strongly influenced by the social anthropologist Fredrik Barth who, in the introduction to the edited volume *Ethnic Groups and Boundaries* (1969) presented a theory on ethnic identity as communicative, dynamic and situational. Since expressions of ethnicity appeared in the context of interaction with other groups, dissimilarities in material culture should not be assumed to result from decreased interaction, but could rather reflect the opposite situation. With the new theoretical developments of post-processual archaeology, the bounded entities implied in the use of the term culture, as well as the application of the term itself, often became questioned. In the context of the Scandinavian Neolithic, some archaeologists proposed to substitute this oversimplifying term with other expressions, such as “traditions” (e.g. Andersson 1998).
In the following, I will adhere to the traditional nomenclature when discussing the material assemblages of the Swedish Early and Middle Neolithic in terms of the Funnel Beaker Culture, the Pitted Ware Culture and the Battle Axe Culture. Here, these definitions refer to the observed differences in material culture and burial practices of the periods in question, whereas other potential implications of these variations will be elaborated and discussed further on in this text. This strategy results in part from the fact that these categories are widely applied, albeit questioned, in Swedish archaeology, and as such they constitute a point of departure for further discussions. As pointed out by e.g. Larsson (2009:34), we are always subjectively sorting and grouping the archaeological remains in one way or the other in order to communicate. Although we must continuously challenge and question our constructed categories, we may still apply, and discuss, the traditional terminology. As will be elaborated further on, I argue that our analytical constructions of the Scandinavian Early and Middle Neolithic cultures may, to some extent, encapsulate some prehistorically relevant distinctions. Nevertheless, one must be aware of the fact that the implications of bounded entities of material culture and/or people inherent in the concept of culture are far too rigid to directly reflect prehistoric realities (cf. Papmehl-Dufay 2006).
2. The Neolithic background

The following section comprises a brief overview of the current archaeological knowledge and interpretations of the Early to Middle Neolithic in south and central Sweden (Table 1), primarily concerning themes and geographic regions relevant to the focus of this thesis. This is far from an all encompassing account, and more comprehensive reviews of the topics at hand can be found in e.g. Larsson & Olsson (Eds.) 1997, Stenbäck 2003, Pasphehl-Dufay 2006, Edenmo 2008, Hallgren 2008, von Hackwitz 2009 and Larsson 2009.

The Funnel Beaker Culture and the onset of the Neolithic

The onset of the Neolithic has been described as a phase of economic transition. All over north-western Europe, it is suggested, the old hunter-gatherer lifestyle was rapidly substituted by the henceforth prevailing farming economy (e.g. Tauber 1981; Zvelebil & Rowley-Conwy 1984; Schulting & Richards 2002; Richards et al. 2003b; Rowley-Conwy 2004). The economic aspects of the Neolithisation were given prominent focus under the influence of the “New Archaeology”, where factors of environmental stress and population pressure were often emphasised (in a Swedish context e.g. by Malmer 1973, 2002; Welinder 1973; Burenhult 1999). With this new way of life followed a new set of material culture and social structure. However, although the increased appearance of inland sites, remains of domesticated animals, and indications of agriculture all provide evidence for the introduction of new means of production, the economic importance of these novelties has been

Table 1. Chronology and abbreviations for the Neolithic and Bronze Age periods, as used in this study.

<table>
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<th>Abbr.</th>
<th>Period</th>
<th>Approximate date</th>
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<tbody>
<tr>
<td>EN</td>
<td>Early Neolithic</td>
<td>4000–3300 BC</td>
</tr>
<tr>
<td>EN I</td>
<td>Early Neolithic I</td>
<td>4000–3650 BC</td>
</tr>
<tr>
<td>EN II</td>
<td>Early Neolithic II</td>
<td>3650–3300 BC</td>
</tr>
<tr>
<td>MN</td>
<td>Middle Neolithic</td>
<td>3300–2300 BC</td>
</tr>
<tr>
<td>MN A</td>
<td>Middle Neolithic A</td>
<td>3300–2800/2700 BC</td>
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<tr>
<td>MN B</td>
<td>Middle Neolithic B</td>
<td>2800/2700–2300 BC</td>
</tr>
<tr>
<td>LN</td>
<td>Late Neolithic</td>
<td>2300–1800 BC</td>
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<tr>
<td>E BA</td>
<td>Early Bronze Age</td>
<td>1800–1100 BC</td>
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<td>L BA</td>
<td>Late Bronze Age</td>
<td>1100–500 BC</td>
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</table>
put into question. A number of studies have dealt with the mental/social/ideological aspects of the Neolithisation, where economic change is perceived as secondary to the more symbolic associations of seeds, live-stock and other Neolithic traits (e.g. Jennbert 1984; Hodder 1990; Thomas 1991, 2007; Kihlstedt et al. 1997, see also discussions in Whittle & Cummings (Eds.) 2007). Further, in studies on the Swedish archaeological material of the Early Neolithic, regional differences are emphasised. The concept of Neolithisation will be returned to and elaborated on in chapter 5.

As a consequence of the economic focus, the Funnel Beaker Culture (TRB), marking the appearance of these Neolithic traits and visible in the archaeological record of southern and central Scandinavia during EN and MN A, has generally been associated with a farming economy and ideology. However, the continued additional importance of wild terrestrial and/or marine resources has been stressed (e.g. Kihlstedt et al. 1997; Segerberg 1999; Hallgren 2008). The Funnel Beaker Culture is primarily characterised and defined by distinctly ornamented pottery including funnel shaped beakers, thin bladed flint axes, ritual enclosures and, from late EN onwards, megalithic burial monuments. In eastern central Sweden, the regional version of the TRB, termed “Vrå Culture”, generally does not seem to include monumental architecture, and radiocarbon dates from TRB contexts post-dating the EN–MN transition are absent in this region (Kihlstedt et al. 1997; Hallgren 2008). Megalithic dolmens and passage graves are abundant in Scania, along parts of the Swedish west coast, and at Falbygden in Västergötland, whereas only occasional occurrences are registered in southeastern Sweden; in Östergötland and on the islands of Öland and Gotland (Sjögren 2003).

The Pitted Ware Culture: emergence, economy and relation to the Funnel Beaker Culture

At the end of the Early Neolithic, and continuing throughout the Middle Neolithic, a partly new set of material culture, associated with the Pitted Ware Culture (PWC), emerge in eastern central Sweden, and slightly later on in the western and southern parts of Scandinavia. The culture is traditionally characterised and identified by the presence of pottery decorated with pits, cylindrical cores and tanged arrowheads. However, the evident regional variations within this culture have caused several researchers to suggest a division of the PWC into several groups, with eastern central Sweden together with the Baltic Sea islands standing out as a region of its own, and should perhaps be regarded as the only region where the PWC can be identified (see e.g. Edenmo et al. 1997). It is this eastern part of the PWC phenomenon, characterised by coastal localities displaying vast amounts of fragmented pottery and in some cases occurrences of flat earth inhumation graves within the sites, that is of relevance in this thesis. The early PWC pottery has evident roots in TRB styles, and some artefacts, such as double edged battle axes, are present in both cultures (Browall 1991; Malmer 2002).
The evident coastal focus, combined with the scarcity of evidence of agricultural activities and the abundance of seal bones on the sites, has inspired interpretations of the eastern PWC as representing (marine) hunter-gatherers. Further, the (sometimes substantial amounts of) pig bones found at PWC sites have been interpreted as representing domestic pig herds, possibly constituting a buffer resource in case hunting would fail (Österholm 1989:28; Welinder 1998:183). In line with the economic interpretations of the Neolithisation, the emergence of the PWC has thus been explained in terms of an economic degeneration, where previous farming communities returned to a more Mesolithic way of life, possibly as the result of changed environmental conditions (Malmer 1973, 2002; Welinder 1973, 1998; Löfstrand 1974; Janzon 1983; Burenhult 1999). These rather reductionist views have been challenged in more recent works, where aspects of mentality/ideology, and of the active role of the material culture, are once again emphasised. Kihlstedt et al. (1997:122p) focus on the regional differences during EN II where, simultaneous with the construction of megalithic monuments in southern Sweden, the emanation of the PWC in eastern central Sweden includes the use of material culture rather than monumental architecture as a structuring feature. The PWC is consequently perceived as groups of people acting in the periphery of the southern TRB adopting different strategies concerning economy as well as social and ideological relations. It is, according to Kihlstedt et al., quite possible that Neolithic ideals never became incorporated in this ideology. According to Browall (1991), the development of the PWC can be explained in terms of ideological and social changes within the TRB, and he argues that although somewhat contemporaneous on a regional level, the two cultures are never overlapping in any given place.

Critiques of the suggested economic and ideological differences between the PWC and the TRB have focused on the previous, more categorical, interpretations of both cultures. Challenging the notions of a TRB economy heavily reliant on agriculture, as well as the absence of such activities on PWC sites, the proposed differences are regarded as clearly overstated (e.g. Carlsson 1987, 1998; Kihlstedt et al. 1997; Strinnholm 2001; Gill 2003; Stenbäck 2003. For a contradictory view, see Lidén & Eriksson 2007). For example, Stenbäck (2003) argues that the Neolithic concepts associated with the TRB, including knowledge of agriculture as well as new perceptions of time and space, in eastern central Sweden led to a discrepancy between the world of ideas and the everyday lives of people who were still, to a large extent, hunter-gatherers in both action and thought. The PWC is regarded as an adjustment of these Neolithic concepts where the (maritime) hunting identity was emphasised although agriculture and animal husbandry were probably maintained to some extent.

The maritime focus, and especially the role of seals, in the identity of the PWC has been emphasised by several authors (e.g. Österholm 1997; Stenbäck 1998, 2003; Storå 2001). Further, the influence from the Comb Ceramic Culture east of the Baltic Sea on the eastern PWC has been stressed, espe-
cially regarding the Åland islands, where its influence is most apparent and the PWC chronologically succeeds this culture (e.g. Welinder 1973; Wyszomirska 1984; Carlsson 1998; Stenbäck 1998, 2003; Papmehl-Dufay 2006).

The Battle Axe Culture and the Middle Neolithic B discussion

At around 2800 BC a new set of artefacts appear in the archaeological record in south and central Sweden, traditionally referred to as the Battle Axe Culture (BAC, also called the Boat Axe Culture). Forming a regional variation of the northern and eastern European Corded Ware Culture complex, the Swedish BAC exhibits both similarities with, and distinct differences from, continental practices of the time, implying a wider region of contacts and influences as well as more regional traditions. The BAC appears to be directly subsequent, or in part briefly contemporary, to the TRB in south Sweden, whereas there is a chronological gap between the two cultures in eastern central Sweden. It is further contemporary with the PWC in both regions. Material culture associated with the BAC includes boat shaped groundstone axes, in older research often interpreted as battle axes. Apart from the early Type A axe (according to Malmer’s (1962) classification), the battle axes are clearly different from those present in the Danish parallel, the Single Grave Culture, but similar to Finnish types. Roger Edenmo (2008) argues for the presence of not only chronological but also distinct regional and sub-regional traditions among the Swedish axes. Other common BAC artefacts include rounded beakers with highly regulated decoration, thick-bladed hollow edged flint axes and multi-faceted grinding stones. The Battle Axe Culture is most frequently represented in burials, some 250 of which are known in Sweden, with the majority found in Scania. These graves follow rather strict conventions concerning placement of the dead, construction and burial goods. They generally comprise flat earth inhumation graves, usually containing one or two individuals, and the buried are as a rule placed in crouching position facing east. Whereas older burials lack stone constructions and rather seem to have contained wooden coffins or a log placed in a pit, graves from the later part of MN B generally include a subsurface stone construction. The grave inventories include beakers and axes placed according to common rules, where battle axes have, so far, only been found in association with male burials. Gravestones are generally oriented roughly N–S, and are sometimes agglomerated into linear cemeteries. The burials often seem to be associated with settlements, although BAC settlement remains are generally scarce in Sweden. Again, the majority of the known dwelling sites, often encountered during recent years’ contract archaeology, originate from Scania. The BAC sites are often located inland but also occur in coastal areas, although never in such direct proximity to the contemporary shoreline as the

Animal bone assemblages in BAC contexts are rather scarce, but the burials include predominantly red deer followed by sheep. Among the rare occurrences of grain impressions in pottery, the majority represent seeds of barley (Malmer 2002:150p). The economy of the BAC has consequently been described as based on small-scale horticulture and sheep pastoralism, complemented with inland hunting (e.g. Knutsson 1995; Welinder 1998; Malmer 2002; Larsson 2009).

The fact that both the Pitted Ware Culture and the Battle Axe Culture are present in the archaeological record of MN B has given rise to numerous discussions concerning the nature of, and relation between, these two cultures. In this debate, two general trajectories, albeit with many inherent variations, can be discerned. On the one hand, the PWC and BAC are interpreted as representing different groups of people, for example different ethnic groups (Welinder 1976; Tilley 1982; Knutsson 1995; Hallgren 1996; Edenmo et al. 1997; Graner & Larsson 2004; Artursson 2007; Larsson 2009), or an emerging elite (Olausson 2000; Lindström 2002; Edenmo 2008). A second line of reasoning perceives the variations in the material culture of MN B as representing different aspects within the same society (e.g. Carlsson 1991; Andersson 1998; Strinholm 2001; Gill 2003; von Hackwitz 2009). The first of these different interpretational traditions is represented in recent research by e.g. Åsa M. Larsson (2009), who argues that the BAC identity was first assumed by people born into, and breaking away from, local PWC communities in eastern central Sweden. This identity subsequently evolved, and spread westwards, into an elaborately manifested regional cultural and social identity existing side by side with the PWC communities. Partly based on the identified break in the operational sequence of pottery production in BAC beakers compared to other Swedish Neolithic traditions, Larsson further suggests that the BAC influence, and perhaps some of the early potters, originated from the Finnish area. With these interpretations, Larsson steps away from the traditional and rather monopolising theory on the origin of the Swedish BAC, stipulated by Malmer (1962, 2002), as emerging in Scania as the result of influences from the Danish area.

Roger Edenmo (2008) discusses the boat axes as part of a gift exchange network within a novel prestige economy. A new elite, he suggests, formed through the adoption by certain PWC groups of a new life style, including inland farming and gift exchange on a regional and interregional level. Other PWC groups, however, chose to remain as hunter-gatherers on the coast. This cultural dualism, Edenmo argues, only persisted during the earliest part of MN B, after which the social and cultural challenges imposed upon the remaining PWC groups resulted in abandonment on the old ways of life.

In contrast to the dualistic approach, Kim von Hackwitz (2009) perceives the remains of BAC and PWC material culture in eastern central Sweden as representations of the diverse events and actions of one community. The
MN B social landscape comprised a number of different places, inland as well as coastal, dedicated to diverse activities and thus associated with depositions of various kinds of material culture. Based on analysis of the distribution of different MN B archaeological sites and stray finds in the Lake Hjälmaren region of eastern central Sweden, von Hackwitz further challenges the notion of a spatial separation between the PWC and BAC cultures to coastal and inland sites, respectively.
3. The methodology of isotope analysis

“Since no elixir of life has yet been discovered, all humankind continues to end up as dust, ashes and bones, to the great advantage of archaeology”

Alan F. Harding 2000:73

The present chapter comprises an introduction to the methodology of isotope analysis and its potentials and limitations in the study of archaeological skeletal remains.

Bone and teeth in dietary reconstructions

Bone is made up of approximately 65% inorganic material, predominantly hydroxyapatite, whereas c. 35% consists of organic materials. About 90% of the organic part is composed of the fibrous protein collagen, the residual c. 10% consists of non-collagenous proteins, carbohydrates and lipids (Schwarcz & Schoeninger 1991; Bloom & Fawcett 1994:199p). Due to the stable composition of the collagen chains, this protein is known to have survived for more than 100,000 years under favourable conditions, such as cold, dry or anoxic environments (Gernaey et al. 2001). The constant remodelling of bone collagen during the course of life results in a continuous conversion of the isotope signatures relevant to this study. Bone collagen turnover varies between c. 5–30 years depending on age and bone element (Lidén & Angelbjörn 1999; Hedges et al. 2007). Stable isotope data from this compound thus represents the average protein intake during an individual’s later stage in life.

Teeth consist of the three components dentine, enamel and cement. The chemical properties of dentine are similar to those of bone, so this component can also be subjected to collagen stable isotope analysis. However, in contrast to bone, dentine collagen is not remodelled to any significant extent, and consequently the stable isotope signatures are fixed at the time of tooth formation. This presents possibilities to reconstruct individual life histories in terms of diet and mobility by analysing a sequence of tooth and bone elements (Sealy et al. 1995; Cox & Sealy 1997; Eriksson 2003) (Fig. 1).
Enamel consists to c. 95% of inorganic material, mainly hydroxyapatite, and is thus not suitable for collagen stable isotope analysis. However, the high resistance to degradation and contamination of enamel presents possibilities to analyse strontium isotope ratios in the hydroxyapatite. Similar to dentine collagen, there is essentially no in vivo remodelling of enamel (Hilson 1996:224). Therefore, the isotope ratios reflect the stage in life when the enamel was formed.

Stable isotope analysis
Since collagen in skeletal elements is made up by the ingested protein, it contains a dietary archive that can be traced by means of stable isotope analyses. It should be emphasised that it is the protein component in the diet that will be reflected in the analyses, and that the data provides information on the average diet during a certain period of time rather than singular events. Stable isotope fractionation of the elements of relevance here; carbon, nitrogen and sulphur, occurs during different geological and biological processes and thus vary between different reservoirs. As a result, the isotope analyses of these elements will yield information on a spectrum of dietary aspects. Whereas stable carbon and nitrogen isotopes present insights into the nature of the food sources, thus aiding in dietary reconstructions, the sulphur isotopes can provide information on their geographic origin (DeNiro 1985; Ambrose & Norr 1993; Richards et al. 2003a).

Figure 1. The mandible from feature A2 at Korsnäs (Olsson et al. 1994) after sampling. Both tooth and bone samples have been analysed in order to reconstruct the intra-individual dietary pattern. Photo by the author.
Stable isotope data is expressed in per mille relative to a standard, and is (exemplified by carbon) calculated as

\[ \delta^{13}\text{C} (\text{‰}) = \left( \frac{R_{\text{sample}}}{R_{\text{standard}}} - 1 \right) \times 1000 \]

where \( R \) is the isotope ratio, in this case \( ^{13}\text{C}/^{12}\text{C} \)

**Carbon isotopes**

Carbon has three naturally occurring isotopes; the stable \( ^{12}\text{C} \) and \( ^{13}\text{C} \), and the radioactive \( ^{14}\text{C} \). The \( \delta^{13}\text{C} \) value refers to the \( ^{13}\text{C}/^{12}\text{C} \) ratio relative to the standard PBD (Pee Dee Belemnite). Whereas atmospheric \( \text{CO}_2 \) has a \( \delta^{13}\text{C} \) value of approximately \(-8\%o\), fractionation during photosynthesis leads to an enrichment of the lighter isotope in the plant, the extent of which is dependent on the photosynthetic pathway of the organism. Three different pathways, yielding different plant \( \delta^{13}\text{C} \) values, have been identified. The \( \text{C}_3 \) pathway includes extensive discrimination of \( ^{13}\text{C} \) and consequently low plant \( \delta^{13}\text{C} \) values averaging \(-27\%o\). \( \text{C}_3 \) plants include close to all species native to temperate environments such as Scandinavia, together with, for example, wheat, barley, oat and rice, and thus form the only group that is represented in this particular region during Neolithic times. The lower discrimination of \( ^{13}\text{C} \) in \( \text{C}_4 \) plants, including domesticated tropical grasses such as maize and millet, results in \( \delta^{13}\text{C} \) values around \(-13\%o\). \( \text{CAM} \) (Crassulacean Acid Metabolism) plants are capable of switching between the \( \text{C}_3 \) and \( \text{C}_4 \) pathway and consequently display a wide variety of \( \delta^{13}\text{C} \) values. The \( \text{CAM} \) pathway is found among succulents such as cactus and agave (van der Merwe 1989; Boutton 1991; Ambrose & Norr 1993; Sealy 2001).

Enrichment in \( \delta^{13}\text{C} \) due to carbon isotope fractionation between plant and consumer amounts to around \(+5\%o\) in large herbivores, whereas the shift seems to be more moderate for smaller animals (Ambrose & Norr 1993; Sealy 2001). Higher up in the food chain, an increase in \( \delta^{13}\text{C} \) of c. \(+1\%o\) per trophic level has been identified (Schoeninger & DeNiro 1984; Schoeninger 1989).

Marine and aquatic organisms incorporate carbon from dissolved carbon dioxide or bicarbonate. The complex carbon isotope fractionation in marine ecosystems is further dependent on the biosynthetic pathway (marine algae use both the \( \text{C}_3 \) and, to a lesser extent, \( \text{C}_4 \) pathway), salinity, temperature and \( \text{CO}_2 \) availability, and marine plants can thus display highly varied \( \delta^{13}\text{C} \) signatures. However, this diversity is evened out on higher levels of the food chain, where marine animals in temperate oceans in general exhibit values around \(-16\%o\) (Chisholm 1989; Boutton 1991; Sealy 2001).

Stable carbon isotope values in the marine and terrestrial environments of the Baltic region have varied chronologically due to fluctuations in climate and salinity. A terrestrial \( \delta^{13}\text{C} \) end value for the Baltic region during the Neolithic has been estimated to between \(-20\) and \(-21\%o\), whereas the marine
end value for the Baltic Sea for the same period is estimated to between -14 and -15‰ (Lidén & Nelson 1994) (Fig. 2).

Nitrogen isotopes

Nitrogen is composed of the two stable isotopes $^{14}$N and $^{15}$N, and the $\delta^{15}$N value refers to the $^{15}$N/$^{14}$N ratio relative to the standard AIR (Atmospheric Inhalable Reservoir). Atmospheric nitrogen is incorporated into the biological system via nitrogen fixation by bacteria and soil microorganisms, or enters the root systems in the form of ammonium or nitrate. Nitrogen is absorbed by humans and animals via the consumed protein (DeNiro 1987; Sealy 2001). Through the emittance of waste products depleted in $^{15}$N, such as urea, the $\delta^{15}$N value becomes enriched by about 2-4‰ for each step up the food chain (Minagawa & Wada 1984; Schoeninger & DeNiro 1984), present-

![Diagram of nitrogen isotope values](image1)

**Figure 2.** Approximate $\delta^{13}$C values in terrestrial versus marine fauna (graph by Gunilla Eriksson).

![Diagram of nitrogen isotope fractionation](image2)

**Figure 3.** Outline of approximate $\delta^{15}$N values in different organisms, resulting from trophic level isotope fractionation (Lidén 1995).
ing possibilities to study the trophic level of humans and animals. The excretion of urea-enriched urine can become rather excessive in animals and humans under drought stress or other states of physiological strain, explaining why extremely high δ¹⁵N values have been observed in arid regions (Schwarcz & Schoeninger 1991; Schwarcz et al. 1999).

Due to the substantial trophic level fractionation, nitrogen isotope analysis can further be applied in studies on the duration of breastfeeding, since the child will exhibit elevated values relative to the mother during this phase (Fogel et al. 1989). Following the same principle, consumption of substantial proportions of suckling animals will lead to elevated values, as will a diet based on freshwater fish (or marine fish or mammals) since aquatic food chains are much longer than their terrestrial counterparts (Fig. 3).

Sulphur isotopes

Sulphur has four naturally occurring isotopes (³²S, ³³S, ³⁴S and ³⁶S), all of which are stable, where δ³⁴S refers to the ³⁴S/³²S ratio relative to the standard VCDT (Vienna Canyon Diablo Troilite). Sulphur enters the biological system of plants mainly via the soil, the sulphur isotope signature of which reflects that of the local bedrock. To a lesser extent, processes of atmospheric deposition and microbial activities in the soil further affect the plant’s δ³⁴S value. Due to the relatively low food to consumer isotope fractionation of sulphur (c. -1 to +2‰), the δ³⁴S value in the analysed collagen will reflect the isotope composition of the diet which, in turn, is primarily controlled by the geological environment where the food sources originated (Peterson et al. 1985; Richards et al. 2003a). Consequently, sulphur isotope analysis can be applied to study residential and mobility patterns in archaeological populations.

Terrestrial environments exhibit highly varied sulphur isotope compositions, primarily governed by the geology (Fig. 4). The variation is most extreme in sedimentary rocks, with δ³⁴S values ranging between -40 and +40‰ on a global level. Metamorphic rocks also display a wide δ³⁴S range.

![Figure 4. Schematic figure showing approximate global ranges in δ³⁴S values in different rocks and modern day seawater (data from Rees et al. 1978; Krouse 1980; Faure & Mensing 2005).](image-url)
from -20 to +20‰. The igneous rocks, on the other hand, exhibit more moderate variations, where the δ³⁴S signatures in European granitic rocks are known to vary between -4 and +9‰, and mafic rocks display values around 0‰. In freshwater environments the wide range of observed δ³⁴S values, between -22 to +20‰, can be explained by the depletion of ³⁴S due to reduction of sulphate ions to hydrogen sulphide (Krouse 1980; Faure & Mensing 2005). In contrast, the δ³⁴S signature of marine ocean water sulphate is rather uniform, averaging +21‰ (Rees et al. 1978; Peterson & Fry 1987). In exposed coastal areas, terrestrial plants can exhibit marine δ³⁴S values due to the so-called sea spray effect, where marine sulphur particles are carried inland. Although the geographic reach of this effect is generally limited to a few kilometres, it can, as in the case of the highly exposed New Zealand, extend to include entire islands (Kusakabe et al. 1976; Wadleigh et al. 1994).

**Strontium isotopes**

There are four naturally occurring isotopes of strontium (⁸⁸Sr, ⁸⁷Sr, ⁸⁶Sr and ⁸⁴Sr), where radiogenic ⁸⁷Sr is formed by decay of ⁸⁷Rb (rubidium, half-life 4.88 × 10¹⁰ years). The strontium isotope composition (expressed as ⁸⁷Sr/⁸⁶Sr) in bedrock, and consequently also in minerogenic soils, will thus vary depending on the age and initial Rb/Sr ratio of the rock. On a global level, these ⁸⁷Sr/⁸⁶Sr ratios generally range between 0.702 and 0.750. Rubidium is most abundant in high-potassium rocks, while Sr appears in higher concentrations in rock formations rich in calcium. With this follows that old low-Ca granites display the highest ⁸⁷Sr/⁸⁶Sr ratios, whereas lower ratios can be found in younger basaltic and carbonate rocks (Bentley 2006; Faure & Mensing 2005:75pp). The ⁸⁷Sr/⁸⁶Sr ratios in present day seawater are very uniform, averaging 0.7092 (Faure & Mensing 2005:436p).

Strontium in plants originates from the weathering bedrock via soil- and groundwater (Åberg 1995; Capo et al. 1998), and it becomes incorporated into skeletal tissues through substitution for Ca (Elias et al. 1982). Since isotope fractionation of strontium in biological processes is negligible, the ⁸⁷Sr/⁸⁶Sr ratios in plants and animals reflect the local isotope geology (Blum et al. 2000). Although the ratios of bio-available strontium in the local environment can vary considerably within soils and, to a lesser extent, plants, the variation is balanced out further up the food chain (Ezzo et al. 1997; Price et al. 2002). Analysis of ⁸⁷Sr/⁸⁶Sr in human enamel can thus be applied to study patterns of provenience and mobility (e.g. Cox & Sealy 1997; Price et al. 2001; Bentley et al. 2003).
Methodological considerations

Collagen degradation and diagenesis

Experimental analyses have shown that diagenesis is generally not a prominent concern when dealing with bone collagen (Dobberstein et al. 2009). However, although collagen can be preserved in an unaltered state for substantial time spans under favourable conditions, a number of post-mortem chemical, physiological and biological processes can degrade or alter the material, thus disturbing the original stable isotope signal. These processes are not primarily a function of age, and they are highly dependent on the post-mortem environment. The continuous degradation of collagen that occurs regardless of the environmental factors will be speeded up by microbial attack, with a resulting increase in crystallinity. Soil ionic strength, pH and, in hot climates, hydrolysis are all factors that will affect collagen preservation. Split of peptide bonds due to microbial breakdown can cause an increase in δ¹⁵N of several per mille, whereas alteration of the amino-acid composition can affect the δ¹³C value of the collagen. (DeNiro 1985; van Klinken 1999; Grupe et al. 2000; Gernaey et al. 2001; Collins et al. 2002; Hedges 2002). Further, isotopic signatures can be altered by heating, meaning that the analyses can only be applied to unburnt skeletal material (DeNiro 1985).

In order to ensure a sufficient preservation of the analysed collagen, a number of quality criteria have been developed, including collagen yields, C/N and C/S ratios, and C, N or S concentrations (DeNiro 1985; Ambrose 1990; van Klinken 1999; Nehlich & Richards 2009). For carbon and nitrogen isotopes, these criteria are well established and tested, whereas sulphur isotope integrity in collagen is less well understood. An evaluation and estimation of plausible C/S ratios and sulphur concentrations for prehistoric Scandinavian samples have therefore been undertaken in Paper I.

Representativity

It is important to bear in mind that stable isotopes in collagen reflect the protein intake rather than the overall dietary components (Ambrose & Norr 1993). Consequently, low protein food sources will be under-represented in the collagen isotope data. This will not only affect δ¹⁵N, where meat and dairy products will have a much higher impact on the collagen isotope value than vegetarian products, but it can also result in a seemingly marine δ¹³C signal in cases of a mixed marine-terrestrial diet where the terrestrial component is derived from vegetabilia (van Klinken et al. 2000).

The plant to consumer enrichment factor in δ¹³C average 5‰ in bone collagen, but this value varies between different skeletal components. The presence of lipids, carbohydrates and, of course, degraded collagen and contaminants in the analysed samples can thus distort the δ¹³C signal (Brown et
Establishing local isotope ecologies

The $\delta^{13}C$ values of atmospheric CO$_2$ are known to have varied due to climatological variations and, since the industrial revolution, primarily through burning of fossil fuel. This has resulted in corresponding changes in plant $\delta^{13}C$ (van Klinken et al. 1994). Further, stable carbon isotope values in C$_3$ plants are sensitive to micro-environmental variations (Ambrose & Norr 1993). Thus, even though one can have a general appreciation of terrestrial $\delta^{13}C$ values, potential regional and chronological variations need to be taken into account. These concerns are even more relevant when dealing with marine values from the Baltic Sea. Not only will this estuarine like environment exhibit $\delta^{13}C$ values differing from the larger oceans, but the complex Holocene natural history of the region, including temporal fluctuations in salinity, is likely to have caused corresponding variations in the Baltic Sea $\delta^{13}C$ end value. One fruitful way to get around these problems involves establishing the local isotope ecology for a particular time and place by analysing local fauna contemporary with the analysed human remains (see further e.g. Eriksson 2003). The ideal scenario includes analyses of terrestrial wild fauna with small home ranges as well as species constituting potential marine and terrestrial food sources. However, the archaeological reality usually stands in the way of such wide encompassing studies, and we are all too often left with few or no suitable reference materials. Inferences on prehistoric dietary patterns are in such cases usually quite possible, but the isotope data should be regarded with these problems well in mind.

The establishment of a local isotope ecology is even more helpful when studying geographic origin and mobility by means of sulphur or strontium isotopes. Since the bedrock, soil and plant isotope values are known to vary even on a local level, whereas these differences are evened out further up the food chain, local faunal reference samples constitute the most appropriate proxies for the average sulphur or strontium isotope ecology of a particular region. In terrestrial environments, the isotope values of these elements are not as sensitive to climatological factors as $\delta^{13}C$, and hence it is not as important to use fauna of the same age as the studied human populations. However, atmospheric deposition of sulphur post-dating the industrial revolu-
tion can cause distorted $\delta^{34}S$ signatures in plants, making modern faunal samples unsuitable as references. In correspondence with the concerns for $\delta^{13}C$, the estuarine like environment of the Baltic Sea results in $\delta^{34}S$ and $^{87}\text{Sr}/^{86}\text{Sr}$ ratios differing from the larger oceans, and the chronological variations in the inflow of ocean water sulphate and strontium will yield chronologically varied isotope ecologies. The establishment of Neolithic isotope baseline data for the southern Baltic Sea basin is therefore essential.

Mobility and mixed diets
An altogether crucial concern when studying geographic origin and mobility in populations where the food sources could potentially have derived from both marine and terrestrial environments is the impact of marine strontium or sulphur isotope signals on the measured values in the human samples. This problem is the primary focus of Paper IV regarding strontium isotopes, and is also elaborated in Papers III and VI in connection with the sulphur isotope analyses presented there. Without insights into, and consideration of, the dietary pattern implied in the specific sample, inferences on mobility can be considerably flawed since isotope variations interpreted as operating on a geographic level can just as well be related to dietary differences. This further emphasises the importance of establishing marine isotope baseline data with which to compare the analysed human samples.
4. Analysed material and overview of results

In this chapter, the analysed sites and their archaeological contexts will be outlined, together with short summaries of obtained results from the isotope analyses and radiocarbon datings presented in the respective papers.

Strategies of selection

In the analyses, I have worked with skeletal remains from different Swedish geographical regions and archaeological contexts (Fig. 5, Table 2). All represent Middle Neolithic burial sites, the majority of which are located in relatively close proximity to the Baltic Sea coast, thus presenting possibilities to utilise a variety of different food sources. An exception is Alvastra in Östergötland, where instead Lake Vättern, the second largest lake in Sweden, promotes a potential for resource utilisation comparable to coastal sites. The different sites further represent associations with the three Middle Neolithic cultures; the Pitted Ware Culture sites Köpingsvik on Öland and Korsnäs in Södermanland, the Funnel Beaker Culture megalithic tombs in Alvastra (Östergötland) and Resmo (Öland), both located in the “periphery” of the megalith building tradition, and the Battle Axe Culture burials in Scania. The included Scanian burial sites represent varied distances from the coast, between c. 1 and 15 km.

In the respective papers, some of the localities are already presented in detail, whereas some are only schematically introduced. Below, more extensive accounts of all sites are included, regardless some iteration.

The Pitted Ware Culture site Korsnäs

The PWC site Raää 447 at Korsnäs in Grödinge parish, Södermanland, is situated on the northwestern part of the Södertörn peninsula in eastern central Sweden. The nearby area, utilised since the Mesolithic onwards, includes a number of PWC sites, all located in direct vicinity of the Neolithic shore. The geology of the region consists of granites and gneisses, and the central parts of the Korsnäs site extend over the southern slopes of a ridge leading down to a Neolithic inlet. The area comprised an inner archipelagic environment during the period in question (Olsson et al. 1994; Olsson & Kihlstedt 2000).
Since the discovery of the site in the 1930s, a number of different archaeological investigations have been conducted at Korsnäs (Olsson et al. 1994; Olsson & Kihlstedt 2000; Werthwein 2002; Forander 2010, 2011; ATA 4197/30, 3683/33, 3347/64). From phosphate surveys, the extension of the site has been estimated to c. 95,000 m² (Eriksson 1971), and consequently only limited portions of this area have been excavated. The most extensive investigations, including excavation of a total of 136 m², phosphate surveys and pollen analyses of a nearby peat bog, were initiated in 1970 following damages to the central parts of the site in connection to a planned gravel quarry (Eriksson 1971; Miller & Robertsson 1981; Olsson et al 1994). Between 2009 and 2011, the Department of Archaeology and Classical Studies, Stockholm University, has conducted seminar excavations at the site (Forander 2010, 2011).

A total of four definite graves have been investigated in the central parts of the site, and at least four additional features containing human remains have been identified. Human remains have further been found scattered through the cultural layers (Olsson et al. 1994; Forander 2010). The preservation of the skeletal material varies between different areas of the site, ranging from heavily fragmented remains to completely intact skeletons or bone elements.

Figure 5. Map showing Neolithic sites analysed in connection to this thesis (circles) and other sites analysed with regard to stable isotopes mentioned in the text (triangles). 1) Korsnäs, 2) Resmo, 3) Torsborg, 4) Köpingsvik, 5) Alvastra, 6) Lilla Bedinge, 7-10) Dösemärken, Norra Hyllievång, Svågertorp, Kastanjegården, 11-13) Skepparslöv, Åralöv, Håslöv, 14) Västerbjer (Eriksson 2004), 15) Jettböle (Lidén et al. 1995a), 16) Frälsegården (Hinders 2011), 17) Rössberga (Linderholm et al. 2008).
The find material from Korsnäs is dominated by large quantities of pottery, primarily of Fagervik III and, to a lesser extent, Fagervik IV character, followed by stone material such as grindstones, axe fragments, arrowheads and chisels. A wide array of different lithic materials has been utilised, including quartz, greenstone, sandstone, quartzite, flint, slate and rhyolite. The inorganic find material further includes ceramic figurines and clay beads. Among the rather unique assemblage of bone/antler artefacts, chisels, peckers, harpoons, points, an anthropomorphic figurine, and tooth beads have been identified (Olsson et al. 1994; Fornander 2010, 2011, Broström et al. 2008, 2009, 2011). The faunal bone material is dominated by seal, followed by pig (Aaris-Sørensen 1978; Olander 2010).

As of yet, no traces of building constructions have been found at the site. Apart from the graves, identified features consist primarily of pits, (generally small) postholes and unexcavated hearths (Olsson et al. 1994; Fornander 2010, 2011). It is here worth mentioning presumably Iron Age hearths have been identified in the southeastern peripheral parts of the site (Werthwein 2002), and excavated hearths on other PWC sites in the region have also yielded Iron Age dates (Olsson 1996).

<table>
<thead>
<tr>
<th>Site</th>
<th>Archaeological context</th>
<th>n analysed human individuals (MNI)</th>
<th>Archaeological periods represented in obtained $^{14}$C dates</th>
<th>Included in paper(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korsnäs</td>
<td>PWC site, burials and disarticulated remains from cultural layers</td>
<td>8</td>
<td>MN</td>
<td>I</td>
</tr>
<tr>
<td>Resmo</td>
<td>Megalith (passage grave)</td>
<td>31</td>
<td>EN, MN, (LN), BA</td>
<td>II, III, IV</td>
</tr>
<tr>
<td>Torsborg</td>
<td>Stone cists</td>
<td>25</td>
<td>MN, LN, BA</td>
<td>II, III</td>
</tr>
<tr>
<td>Köpingsvik</td>
<td>PWC site, burials and disarticulated remains from cultural layers</td>
<td>30</td>
<td>MESO, EN, MN, (LN)</td>
<td>II, III</td>
</tr>
<tr>
<td>Alvastra</td>
<td>Megalith (dolmen)</td>
<td>11</td>
<td>MESO, EN, MN, IA</td>
<td>V</td>
</tr>
<tr>
<td>Lilla Bedinge</td>
<td>BAC inhumation graves</td>
<td>16</td>
<td>MN, (LN), BA</td>
<td>VI</td>
</tr>
<tr>
<td>Dösemarken</td>
<td>BAC inhumation grave</td>
<td>1</td>
<td>MN</td>
<td>VI</td>
</tr>
<tr>
<td>Norra Hyllievång</td>
<td>BAC inhumation grave</td>
<td>1</td>
<td>MN</td>
<td>VI</td>
</tr>
<tr>
<td>Svägertorp</td>
<td>BAC inhumation grave</td>
<td>1</td>
<td>MN</td>
<td>VI</td>
</tr>
<tr>
<td>Kastanjegården</td>
<td>BAC inhumation grave</td>
<td>1</td>
<td>-</td>
<td>VI</td>
</tr>
<tr>
<td>Skepparslöv</td>
<td>BAC inhumation grave</td>
<td>1</td>
<td>MN</td>
<td>VI</td>
</tr>
<tr>
<td>Åraslöv</td>
<td>BAC inhumation grave</td>
<td>1</td>
<td>MN</td>
<td>VI</td>
</tr>
<tr>
<td>Häslöv</td>
<td>BAC inhumation graves</td>
<td>3</td>
<td>MN</td>
<td>VI</td>
</tr>
</tbody>
</table>
On the basis of typology and radiocarbon dates, the Korsnäs site seems to have been utilised primarily during the Middle Neolithic, although occasional occurrences of Early Neolithic finds have been identified. Further, a few BAC pottery sherds have been recovered from the peripheral parts of the site (Olsson et al. 1994; Werthwein 2002; Fornander 2011, see further Paper I).

Human skeletal remains from four features have been analysed with regard to stable isotopes, together with stray finds. Grave A1 (Olsson et al. 1994), recovered from underneath the cultural layer, held the remarkably well preserved skeleton of a child aged 4-5 years placed in crouching position with the head to the northeast. The only find associated with the burial is an undecorated potsherd. Grave A2 (Olsson et al. 1994) is interpreted as an uncertain grave, since the only human remains in this dark coloured feature consisted of some cranial fragments and a mandible from an adult individual, placed close to a pile of burnt stones. The feature further included a dog cranium without mandible, with a clay bead placed in one of the eye sockets, and an assemblage of tightly packed fish bones. A curved chisel was retrieved from underneath the human mandible (Fig. 6). In Grave A3 (Olsson et al. 1994) the poorly preserved remains of an adult individual placed stretched out on its back with the head oriented to the west was identified, together with a few potsherds of Fagervik III character with some elements of Fagervik IV. The fourth Grave, A12 (Fornander 2010), was recovered in 2009 and has been analysed in a later study (Fornander 2011 App. 11). The feature, identified directly underneath the cultural layer, held the partly preserved remains of a young adult male, where only the cranium and a poorly preserved vertebral column remained. The mandible had been re-

![Figure 6. Feature A2 at Korsnäs from the north, including a human mandible and a dog cranium (Olsson et al. 1994:22).](image)

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moved from the cranium and placed upside down at the northwest edge of
the shallow feature. Whether the remains represent an originally complete
skeleton is uncertain, but the location of the vertebral column and cranium,
together with vague colourings in the soil potentially representing a femur,
indicate a crouching position. Potsherds, including bases and rim sherds,
together with a quartz flake, hazelnut shells and fish bones were retrieved
from the grave.

In Paper I, human and faunal remains from Korsnäs were analysed with
regard to stable carbon, nitrogen and sulphur isotopes. The results reveal a
more or less exclusively marine protein intake predominantly composed of
seal for all human samples with the exception of bone and tooth elements
from the mandible in A2 where marine fish seems to have represented the
main protein source. The isotope data also indicates that the pig bones found
in large quantities on the site cannot be explained in terms of economy, and
this material further seems to represent wild or feral pigs. It is suggested
that the pig bones on Korsnäs, as well as on a number of other PWC sites,
represent occasional hunting of, and possibly ritual feasting on, wild boar.
This animal, alongside the seal, thus seems to be central in a hunting iden-
tity. Obtained radiocarbon dates all fall, with a high probability, within MN
A, in a few cases possibly including the beginning of MN B.

The Resmo Passage grave and the Neolithic of Öland

The island of Öland is located in close proximity to the Swedish mainland
coast in the Baltic Sea. Its geology consists of Ordovician limestone, with the
exception of a c. 1 km wide band of Cambrian and Ordovician shales extend-
ing along the west part of the island. Due to shoreline displacement, the area
of the island has increased substantially since Neolithic times, although the
present day western coastline, and thus also the proximity to the mainland,
more or less mirrors Neolithic conditions (Svensson 2001).

The most prominent manifestation of the Funnel Beaker Culture on
Öland is represented by a cluster of four megalithic tombs in Mysinge,
Resmo parish on the western ridge of the island. The only identified dolmen
is located c. 2 km north of a cluster of three passage graves, all of which have
been situated in mounds with entrances towards the east or southeast. Only
the southernmost passage grave, Raä 85, has been subjected to archaeologi-
cal excavations, covering the burial chamber and entrance area (Arne 1909;
Alexandersson 2005; ATA 2991/37) (Fig. 7). Recovered finds from the c. 1 m
thick stratigraphy of the chamber include unburnt skeletal material from at
least 56 individuals (Ahlström 2009), faunal bones and amber beads, to-
gether with flint and bone artefacts of predominantly Neolithic character.
The flint material consists of a polished axe, which Malmer (1962:930) attri-
butes to the BAC, a blade, two arrowheads, a fragment of a dagger or point,
and some flakes. The bone artefacts include needles and awls, together with
a thin, perforated bone plate (Arne 1909, see further Papmehl-Dufay 2006).
The latter has been interpreted by Malmer (1962:467) as a wrist guard associated with the BAC, although this interpretation has been questioned (Papmehl-Dufay 2006:72p). Regardless of the nature and dating of this particular object, finds of BAC as well as Late Neolithic character can be identified in the artefact assemblage from inside the chamber (Arne 1909; Malmer 1962; Papmehl-Dufay 2006). Fragmented TRB and post-Neolithic pottery have been deposited outside the entrance (Alexandersson 2005; ATA 2991/37). This entrance has subsequently been covered by a stone packing with close parallels to Late Neolithic/Early Bronze Age “entrance cairns” known from megalithic tombs in southern and western Sweden (Persson & Sjögren 2001:214p; Alexandersson 2005; Papmehl-Dufay 2006). Further, fragments of a pot with associated cremated human bones recovered from the uppermost part of the stratigraphy have been interpreted as representing a secondary Bronze Age burial (Arne 1909). Four previously published radiocarbon dates on human bones from the chamber fall within the Early and Middle Neolithic periods (Papmehl-Dufay 2006).

At a distance of c. 250 m from the dolmen, recent excavations have produced finds of TRB pottery, fragments of polished flint axes and cattle teeth in an area interpreted as an Early Neolithic settlement site (Papmehl-Dufay 2009). Some other Early Neolithic dwelling sites, only a few of which have been subjected to any archaeological investigations, are found throughout the island (see further Papmehl-Dufay 2006; Alexandersson & Papmehl-Dufay 2009). A noteworthy find from Pettersholm, located about 30 km north of Resmo on the western coast of the island, is a sunken feature holding the almost intact remains of a calf, radiocarbon dated to between 3500–3100 cal. BC (2σ). The animal had been deposited together with some flint flakes and fragments of burnt bone (Papmehl-Dufay 2008).

The Pitted Ware Culture is represented at several locations on Öland. The burial and settlement site at Köpingsvik (included in the analyses in Papers II and III), located c. 50 km northeast of the Resmo megaliths, constitutes the largest known PWC locality on the island, including some 20 graves attributed to this culture. The site further includes finds and features chronologi-
cally ranging from the Late Mesolithic to the Medieval period, and there is thus often extensive commingling and overlapping of diachronic cultural deposits. Apart from the burials with PWC related artefacts, one Neolithic feature (A1 at Klinta 2:11/Klinta 5:20) interpreted as a stone cist construction included highly fragmented human remains together with a BAC boat axe and pottery associated with both the PWC and BAC (Schulze 2004; Papmehl-Dufay 2006). Another partly excavated PWC site is located by the Ottenby Royal Manor on the southern tip of Öland. Excavations at the site have revealed large amounts of Pitted Ware pottery together with worked stone material and faunal skeletal remains dominated by seal and fish. However, no human remains have been identified at the site (Papmehl-Dufay 2005b, 2006).

Apart from the Köpingsvik and Resmo finds reviewed above, the rather modest representations of the BAC on Öland include an excavated settlement at Möllestorp, some stray finds and two single burials located in the vicinity of Mysinge and Köpingsvik, respectively. Unfortunately, the skeletal remains from these graves have been lost during the century that has passed since their retrievals (see further Papmehl-Dufay 2006). Further, bone rings of BAC character have been recovered from two of the stone cists (burials 4 and 8) investigated at Torsborg in Torslunda parish (Petersson 1956; Malmer 1962:290, 930), the human disarticulated remains from which have been analysed in Papers II and III (see also Kanstrup 2004).

Papers II and III include analyses on stable carbon, nitrogen and sulphur isotopes together with radiocarbon dates for skeletal remains from Öland. Strontium isotope data on the Resmo material is presented in Paper IV, constituting a methodological evaluation of dealing with $^{87}\text{Sr}/^{86}\text{Sr}$ analysis in populations with mixed marine-terrestrial diets. Radiocarbon dates obtained for 30 individuals from Resmo display a remarkably long continuity in the burial practices. Whereas 20 dates span the entire Middle Neolithic period, possibly also including parts of EN and LN, 10 dates fall within the Early Bronze Age, possibly stretching into the surrounding periods. The $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ data from Resmo implies a rather homogenous, mixed marine-terrestrial diet during MN A, whereas the MN B phase is characterised by diverse dietary patterns ranging from a more or less exclusively terrestrial protein intake to a rather even mixture of marine and terrestrial protein. Further, intra-individual dietary changes during this phase are sometimes quite extreme. It is not until the Late Neolithic or Early Bronze Age that a transition to utilisation of more or less exclusively terrestrial (probably domestic) resources takes place, showing that the often alleged sharp economic transition at the onset of the Neolithic in this case rather took place at the end of this period.

The sulphur and strontium isotope data from Resmo display similar patterns in terms of residence and mobility, where non-local individuals have been identified during all three chronological phases. However, there is a trend of increasing proportions of non-locals through time, where more than half of the analysed Bronze Age individuals seem to have spent at least their
The 22 Neolithic Köpingsvik individuals have a chronological range roughly corresponding to the Neolithic Resmo dates, whereas the diet for all these subjects, with one exception, has clearly been marine. Except for the Köpingsvik individual displaying the latest date, falling around the MN–LN transition, who displays values indicative of a mixed marine-terrestrial diet, there is no overlap in the $\delta^{13}C$ and $\delta^{15}N$ values between Resmo and Köpingsvik. The study thus shows that Middle Neolithic Resmo and Köpingsvik represent separate groups, where the differences in burial traditions correspond to distinctly different economies.

From Torsborg, five individuals date to MN B or the MN/LN transition. Apart from one of the latest dated individuals, these subjects present $\delta^{13}C$ and $\delta^{15}N$ values indicative of diets ranging from mixed marine-terrestrial to more or less exclusively marine, thus overlapping with values from both MN B Resmo and Köpingsvik. For the two subjects, both adults, where intra-individual data is available, pronounced dietary changes are evident. One of these individuals has experienced two profound dietary changes; from a mixed to a marine diet during childhood, followed by a subsequent shift towards a more terrestrial protein intake. The second subject displays evidence of a change from a mixed to a marine diet taking place between childhood and early teenage, with a continued consumption of primarily marine protein during the later stage in life. This MN B individual, who further displays the most pronounced marine $\delta^{13}C$ values among the Torsborg individuals, originates from Grave 4 where one of the BAC associated bone rings were recovered.

The dolmen in Alvastra

The hitherto only known megalithic tomb in Östergötland is a dolmen in Alvastra, Västra Tollstad parish, situated just south of Mount Omberg and close to the eastern shore of Lake Vättern. The Middle Neolithic Alvastra Pile Dwelling is located less than 2 km northeast of the grave. Other Early to Middle Neolithic activities in the region include a partially excavated TRB settlement site at Charlottenborg (Väversunda parish) west of Lake Tåkern, where pottery is dated to c. 3300 BC (Fig. 8). Stray finds of TRB character indicate the presence of further settlements around Lake Tåkern, as well as in the southern parts of the Alvastra region in present day Ödeshög parish. The region further holds Sweden’s northernmost find of an Early Neolithic flat copper axe, found at an unknown location along the western shore of Lake Tåkern in Rogslösa parish (Browall 2003:35pp). The varied geology of the Alvastra region includes Precambrian granites to the south and the
Östergötland Cambro-Silurian plain, comprised of limestones, shales and sandstones, in the north (Loberg 1999; Janzon 2009).

The Alvastra dolmen was discovered and severely damaged in 1916 when its larger stone blocks, hindering tillage in the field where it is situated, were blasted away. During the following excavation, a partly preserved stone paved floor of water polished stones in an open space between the preserved bases of larger stone blocks was identified (Fig. 9a). Although the majority of the recovered bone material was found scattered over the site, a c. 10 cm thick layer of sediments with commingled bone fragments remained seemingly undisturbed (Frödin 1918). A concentration of skulls together with vertebrae and extremity bones was identified in the northwest corner of the chamber. More extensive excavations of the site were conducted by Gunborg O. Janzon between 1979–1983, where the original ground plan of the monument was reconstructed (Janzon 2009) (Fig 9b). The slightly rounded chamber, with a stone paved floor and a diameter just under 2 m, was originally surrounded by larger wall slabs, of which only one has been preserved, with drystone filling between the blocks. Apart from the destruction in 1916, stone material is likely to have been removed from the site during the frequent Medieval building activities in the region. A possible dislocated capstone of granite has been identified, with a cupmark placed on top of the block, a tradition with parallels to several megalithic roof slabs in Sweden and Denmark (Janzon 2009:30p). An entrance is indicated in the SSE by increased frequencies of pottery and flint finds as well as by a small paved compartment, c. 20×30 cm and holding finds of human
Figure 9.
a) Plan drawing of the Alvastra megalith by Frödin (1916), showing remaining stone blocks and bases, and the stone floor of the chamber (Janzon 2009:20, after Frödin 1918).
b) Plan drawing of the Alvastra megalith from the excavations 1979-1983, showing the kerb, the remaining stone blocks and bases, and the stone floor of the chamber (after Janzon 2009:32).
bones, located just outside the chamber in the imagined passage. Surrounding the chamber, a kerb of stones with an original diameter of approximately 6 m has been located. Traces of fire are found directly beneath the paved floor of the chamber, parallelling pre-building activities indicated in several megaliths, primarily in Scania (Janzon 2009:35). The osteological material from the tomb has been analysed in several stages. Carl M. Fürst performed an initial identification of the bones retrieved in 1916 (Frödin 1918), and a subsequent analysis of this early material was performed by Ebba During (1980). However, it subsequently became clear that more than half of the 1916 bones had been adrift in the Museum of National Antiquities and thus omitted from During’s study. When, in 1984, Torstein Sjøvold was engaged in analysing the material recovered during the 1981–1983 excavations, he also included this newly rediscovered material (see Janzon 2009:68p). Another discovery of lost bones presumed to originate from the site occurred in 1997 when a box Fürst had labeled “Alvastra” was found in connection with disassembling the Department of Anatomy at Lund University. The most recent osteological dissection of the material, including all human skeletal remains from the tomb, was performed by Helene Wilhelmsson and Torbjörn Ahlström (2009).

Wilhelmsson & Ahlström (2009) estimate the number of interred individuals to over 30, half of which are children or juveniles. Both sexes are represented in the material. Among the eight previously published ¹⁴C dates on human remains, three yielded consistent, Neolithic dates falling around 4500 BP (Janzon 2009). However, two individuals were dated to the Iron Age whereas three dates from one individual, a male aged over 60 years, all fall within the Mesolithic period. Since these three individuals all represent the material rediscovered in Lund it has been suggested that perhaps all, or at least the Iron Age individuals, originate from the nearby Iron Age cemetery at Smörlunken, the bone material of which Fürst had previously analysed (Janzon 2009:69; Wilhelmsson & Ahlström 2009:96p).

The diverse faunal assemblage from the tomb, clearly dominated by unburnt bones, includes 25 different identified species. However, the majority of the bones are likely to represent later activities by wild animals. Identified domestic species comprise dog, pig, sheep/goat, cattle and horse. Eight previously published radiocarbon dates on animal samples (representing buzzard, goshawk, wolf(?), cattle, horse and pig) range from the Bronze Age to the Early Medieval period (Janzon 2009:68pp).

Some 900 g of pottery sherds have been identified during the excavations, including the remains of a pedestalled bowl with vertical comb-stamped bands, typologically dated to MN I (i.e early MN A). Pottery decoration is generally dominated by angled lines and strokes, although only undecorated sherds have been recovered from within the chamber. A ring-shaped pattern, generally interpreted as an eye- or sun-pattern, places another identified sherd stylistically in MN III–IV (i.e. late MN A) (Bagge & Kaelas 1952; Janzon 2009). Apart from flakes and fragments, the flint material includes a blade knife, a fragment of a polished flint axe, and four scrapers. Other re-
covered finds include amber bead fragments, grindstone/whetstone fragments, and fragments of stone axes or axe preforms. Two slate pendants imply Late Neolithic activities in the tomb (Janzon 2009). Two or three pointed stone tools are paralleled in the Pile Dwelling find material, where they have been interpreted as strike-a-lights (Frödin 1910; Browall 1986:59pp). The occurrence of worked and unworked quartz, partly recovered from underneath the cultural layer and displaying a bifacial reduction method, indicate earlier, possibly Mesolithic, activities on the site (Ahlbeck 2009). About 1–2 m north of the tomb a hearth yielding a Viking Age date, with associated pottery, has been identified (Janzon 2009).

In Paper V, stable carbon, nitrogen and sulphur isotope data together with radiocarbon dates are presented and discussed in relation to the nearby Pile Dwelling and the dolmen’s place and function in the social landscape of the time. The obtained dates reveal a longer duration of burial practices than previously implied, and the dolmen is shown to still have been in use when the Alvastra Pile Dwelling was built. Stable carbon and nitrogen isotope data from the Neolithic individuals represents a terrestrial diet of predominantly meat and (presumably) vegetabilia, where moderate proportions of freshwater fish and/or suckling animals may have been consumed in some cases. Intra-individual dietary variations are limited, with the exception of one subject where some contribution of marine resources during a later stage in life is plausible. The varied sulphur isotope values imply dispersed geographic origins among the interred, a trend also discernible in published $^{87}\text{Sr}/^{86}\text{Sr}$ data on five tooth enamel samples from the site (Sjögren et al. 2009). Spatial, material and chronological connections between the dolmen and the Pile Dwelling are discussed. It is suggested that Alvastra, with the dolmen as a focal point, was established as a meeting place and sacred space centuries before the construction of the Pile Dwelling, and that the two sites are intertwined in terms of occupying the same ritualised space.

Scanian Battle Axe Culture burial sites

Lilla Bedinge, Lilla Beddinge parish, Raä 1:1

Lilla Bedinge in southern Scania comprises the largest known cemetery associated with the Swedish Battle Axe Culture. The site, extending over an area of about 240×30 m, is located only about 1 km from the present day coastline. The majority of the at least 14 identified and excavated flat earth inhumations graves are located on a NE–SW oriented moraine embankment, whereas four of the graves are found on the flatter grounds to the SE. The site also includes a number of Late Bronze Age cremation graves, and two other find spots for BAC inhumation graves are known in the nearby region. Several different excavations of the inhumation graves (Graves I–XIV, correlating with Graves 41–54 in Malmer 1962) have been carried out between
1915 and 1951, by Folke Hansen, Otto Frödin and, later on, Mats P. Malmer (see further Malmer 1962). According to Malmer (1962:180) three of the inhumation graves, all lacking grave goods, probably date to the Late Neolithic, possibly together with the mass burial Grave 47. The remains of one to four destroyed graves with stone constructions in the southern part of the site (termed Grave 14) cannot be dated. The remainder of the features typologically fall within Period 3–5. In the present study, skeletal remains from Graves 47, 49, 52 and 53 were included in the analyses.

Grave 47 was excavated by Malmer in 1951. It consisted of a subsurface oval stone construction of about 2.5×1 m, oriented NNE–SSW and constructed in several layers, the lower parts of which were distinctly boat shaped with the “stem” facing SSW. On the level of the lowest stone layer an assemblage of bones, predominantly postcranial material and some teeth, was identified in the northeast part of the grave. At a somewhat lower level, five craniums, all lacking the lower jaw, had been placed on the stones that formed the “floor” of the boat. Four of these skulls have been identified as adult males, whereas one represents a juvenile or adult of indeterminate sex. Underneath the craniums, bones representing a tibia and a fragmentary femur were retrieved. Below the “floor” of the boat, skeletal remains interpreted as a primary burial was identified. This fragmentary bone material represents a woman aged around 19 years, placed stretched out on the back with the head to the southwest. Osteological analyses indicate the presence of periostitis in the lower leg, and the left arm seems to have been shorter and weaker than the right one. Among the remains in the primary burial, cranial fragments from yet another individual have been identified. A few other assemblages of deposited bones were found in association with Grave 47. One of these, located about 0.5 m east of the SW end of the stone construction, held the remains of at least three individuals; one adult and two children aged around 10 years. The identified finds in Grave 47 include two fragments of sandstone grinding stones from within the stone construction, one decorated Type J pottery sherd found by the floor of the construction, some seemingly undecorated sherds by the assemblage of skulls, a bone awl and a lump of red-brown pigment (Malmer 1962:158pp). Malmer (1962:180, 2002:141) suggests a Period 5 or, more likely, Late Neolithic date for the burial. Two available radiocarbon dates on skeletal material from the primary burial and one of the crania (cranium 1) fall within the ranges 2870–2210 and 1450–910 cal. BC, respectively (2σ, 3995±110 and 2975±115 BP, During 1989).

Grave 49 was excavated by Hansen 1934. It constitutes a N–S oriented subsurface oval stone construction with pointed edges, measuring about 4.5×2 m, where flat stone slabs form a roof over a chamber with an original height estimated to about 0.6–0.7 m. Fragments of wood indicate the presence of planks in the chamber. On the stone paved floor of the chamber three adult individuals had been placed in a line in sitting crouched positions facing southwest. Between the northern and middle skeleton fragmented remains of three children (initially only two were identified), representing
two infants and a juvenile, were recovered. Further, some very brittle diaphyses of a fourth adult have been identified. The only recovered find is a bone needle deposited next to the northern skeleton (Hansen 1934; Malmer 1962:162p; During unpublished notes). According to Malmer (2002:141) the grave can be dated to Period 4, and an unpublished radiocarbon date from the northern skeleton falls within the interval 2580–1980 cal. BC (2σ, 3850±105 BP, Ua-2758, During unpublished notes).

Grave 52 (Fig. 10) was excavated by Malmer in 1950. It consists of a NE–SW oriented subsurface stone construction measuring about 3.7×1.6 m. A wooden construction is indicated by colorations in the soil as well as by the sunken position of the central parts of the stone construction. The chamber is divided into two parts, each holding a poorly preserved skeleton placed in crouched position with the head oriented outwards from the centre of the grave, facing southeast. Both skeletons represent young individuals, where the SW individual, a possible male, has an age of about 14–15 years and the NE individual, of indeterminate sex, is aged around 12–13 years. Grave goods include four ceramic vessels of Malmer’s Types G:3, H:1 and H:2, two thick bladed hollow edged flint axes of Malmer’s Type 1, three bone awls and four flint blades. Further, more than 100 amber beads were recovered, evenly distributed between the two individuals, and sheep bones were identified in the central parts of the chamber. The SW individual further had a comb stamp, which seems to have been used for decorating two of the ves-

Figure 10. Grave 52 at Lilla Bedinge. The subsurface stone construction drawn from the southeast, and plan drawing of the inhumation level (after Malmer 1962:171).
sels, deposited under his lower arm, and a piece of sheet copper interpreted as an earring was found by the head of the individual (Malmer 1962:168pp; During 1989). Malmer (1962:180) suggests a typological Period 4 date for the grave.

Grave 53 was excavated by Malmer in 1951. The subsurface stone construction, oriented NNW–SSE, has a rounded oval shape measuring at most 2.5×2.3 m. The sunken position of the central parts of the stone construction, and colorations in the soil, suggest the presence of a wooden construction in the chamber. A relatively well preserved skeleton of a male aged around 24–29 years was found in crouching position with the head to the NNW. The head had been bent forward so that the man was facing east. Finds include a chopping weapon made of antler, a thick bladed flint axe of Malmer’s Type 6, a bone awl and three flint flakes. Further, bones from sheep and golden eagle were retrieved from within the chamber (Malmer 1962:176pp; During 1989). Malmer (1962:180) places the grave typologically in Period 5, but in a later publication, a Period 3–4 date is suggested (Malmer 2002:138p). An available radiocarbon date falls within a surprisingly early interval of 3370–2680 cal. BC (2σ, 4375±120 BP, During 1989).

Dösemarken, Hyllie parish, Raä 129:4

Dösemarken is located in southwestern Malmö, about 2 km from the present day coastline. The flat topography of the site descends slightly toward a dried out wetland area in the east. A number of Neolithic sites are known from the nearby region, including the EN burial site Almhov (Gidlöf et al. 2006), with long barrows, dolmens and an abundance of Early Neolithic pits, less than one km to the south. Middle and Late Neolithic settlements have also been identified in the area. A destroyed dolmen has allegedly been located somewhere in the direct vicinity of the site, the existence of which is further implied in the name “Dösemarken” (the Swedish term “dös” translates to “dolmen”) (Ifverson 2007). The site, investigated in 2006, presents archaeological features and finds ranging from the Neolithic to the Viking Age or Early Medieval period. The remains, including houses dated to EN I, MN B and LN, imply a continuous settlement throughout the Neolithic. Finds from the associated wetland might represent ritual contexts within the settlement. Apart from the burial with preserved human remains analysed here, three other possible flat earth graves of similar character but without preserved human remains have been identified during the excavations of the settlement, implying the presence of an associated Middle to Late Neolithic cemetery (Ifverson 2007).

The grave A1671 was located in the southwestern part of the site, about 15–25 m north of some Neolithic house remains. The grave comprised a rectangular subsurface stone construction, measuring about 1.9×1.2 m and oriented N–S, under which the remains of a woman aged about 15–18 years had been placed in crouching position facing east. The only burial gift found in association with the body was a bone awl placed by the woman’s feet.
Further, pottery sherds and flint flakes were retrieved from the filling in the stone construction. The orientation of some of the bone elements indicate that the grave had been disturbed soon after the burial, which might explain the scarcity of burial gifts. Enamel hypoplasia on some of the woman’s teeth implies a period of nutritional stress or sickness during the age of about 5–8 years. A radiocarbon date from a tooth falls within the range 2470–2210 cal. BC (2σ, 3885±35 BP, Ifverson 2007).

Norra Hyllievång, Hyllie parish, Raä 79

The archaeological site at Norra Hyllievång, excavated primarily in 2006, is located in the southern part of Malmö, about 4 km from the present day coastline (Lindhé & Gren 2008). Neolithic activities are well attested in the direct vicinity of the site, including a palisade enclosure from early MN B located a few hundred metres to the southeast. At the same site, an investigated large pit with abundant flint refuse from the production of axes and/or chisels together with some decorated pottery have been dated to late MN B (Brink & Hydén 2006).

The site in question extends over the slopes and top of a ridge, and dried out wetland areas are present to the east and west. Finds and features date to the Neolithic, Bronze Age and Early Iron Age periods. A number of pits include deposited Funnel Beaker Culture pottery of MN A character together with flint, and a furnace holding large quantities of charred seeds is dated to the same period. Apart from the two, or possibly three, BAC burials, features from MN B include a radiocarbon dated well. The Late Neolithic is represented at the site by a house structure and at least four burials (Lindhé & Grehn 2008).

The two graves attributed to the Battle Axe Culture were located about 11 m apart, and the subsurface stone constructions were both oriented N–S. In grave A14169, included in the present study, the fragmented remains of an individual aged 17–25 years, of unknown sex, was found in crouching position with the head to the north, facing east. The stone construction measured c. 2.6×1.3 m. Burial goods include two hollow edged flint axes of Malmer’s Types 1 and 3, both located close to the head of the individual, and a ceramic bowl of Malmer’s type H placed by the feet. One flint blade and a scraper were retrieved from the filling of the grave. A cerealia seed from the filling has been radiocarbon dated to 3370–3100 cal. BC (2σ, 4540±35 BP), which is significantly earlier than the MN B Period 4–5 date implied by the burial goods (Lindhé & Grehn 2008).

The second BAC grave at the site included only fragmentary dental remains from an individual aged 17–25 years, and is not included in the present analyses. The abundant burial goods included a hollow edged flint axe of Malmer’s Type 1, a thin bladed flint axe of Malmer’s Type 2, a hollow edged flint chisel of Malmer’s Type 1, a ceramic vessel of Malmer’s Type H and some fragmented amber beads. Further, eleven blade arrowheads were found clustered together by the hypothetical foot end of the grave. The ar-
rowheads all pointed south, indicating that they may have been shafted and placed in a quiver. Analyses of micro-wear reveal that none of the arrowheads have been used. A radiocarbon date from a cerealia seed falls within the range 2290–2040 cal. BC (2$\sigma$, 3755±35 BP), which is somewhat later than the typological Period 4–5 date implied by the finds (Lindhé & Grehn 2008).

In association with the two burials a larger stone packing, measuring about 4.2×1.8 m, with remains of charred wood possibly representing a larger construction was identified. The feature further included charred remains of a wooden object of rounded shape with a diameter of c. 0.3 m, interpreted as a possible lath walled vessel, radiocarbon dated to 2290–2040 cal. BC (2$\sigma$, 3755±35 BP) (Lindhé & Grehn 2008).

**Svågertorp, Bunkeflo parish, Raä 53:2**

The site at Svågertorp industrial park, excavated primarily during 2000, is located in the southern part of Malmö, about 5 km from the present day coastline. The site extends over the ridge and slopes of a N–S oriented ridge and further include several dried out wetland areas. Early to Middle Neolithic activities in the surrounding area are attested from several sites, including settlement remains and ritual deposits of axes. Two destroyed long dolmens have allegedly been located within the site. The Svågertorp site presents features and finds ranging from the Late Mesolithic/Early Neolithic transition to the Viking Age. Building remains on the site include two long houses radiocarbon dated to around the MN A/MN B and LN/BA transitions, respectively. The Neolithic remains further include some hearths, a possible flint knapping site and a number of pits, of which several may have contained ritual deposits. Among the finds from a cultural layer in one of the wetland areas, interpreted as possibly being of a sacrificial character, is an arrowhead pre-form typologically dated to MN B. The only identified and excavated burial on the site (A279) is a flat earth inhumation grave located close to the crest of the before-mentioned ridge. Underneath a sparse, N–S oriented stone construction, a brittle but largely intact skeleton of a male aged about 30–39 years had been placed in crouching position with the head to the south, facing east. Burial goods include a bowl shaped vessel which can probably be attributed to Malmer’s Type J:2, placed by the man’s feet. A boat axe of Malmer’s Type E:1 and a hollow edged flint axe were both placed in the vicinity of the skull with the edges pointing away from the body. Further, three flint blades, a perforated shell of a sea-urchin, a ceramic bead, and some shells were retrieved from the same stratigraphical layer as the skeleton. The grave has been typologically dated to Period 5, and a radiocarbon date from a shoulder blade falls within the range 2460–2050 cal. BC (2$\sigma$, 3805±55 BP) (Koch & Tuominen 2006).
Kastanjegården, Fosie parish, Raä 57:1

Kastanjegården in southwestern Scania, excavated in 1973, constitutes a cemetery of flat earth inhumation graves located on a local sandy embankment. The distance to the present day coastline is about 6.5 km. Apart from the four identified and excavated burials, settlement remains from the Neolithic and Iron Age periods are found scattered over the area. The graves are located on a line along a section of c. 17 m on the northern part of the embankment. Whereas three of the graves are oriented N-S or NO-SW, following the lengthwise direction of the embankment, one has been positioned transverse to the others, along an E-W axis. All four graves include subsurface stone constructions. Based on the typology of pottery and a boat axe in the burials, as well as the morphological characteristics of the stone constructions, the graves have been dated to Malmers’ Period 5, with one grave possibly dating back to Period 4. Three of the burials included only fragmentary dental remains or colorations in the soil indicating the positions of decayed bodies, and all seem to constitute single graves. Remains from these features represent a possible teenager, placed in crouched position, and two children, aged about 4–6 and 8–10 years. Skeletal material analysed in Paper VI originates from one of the three individuals recovered from the fourth grave, Grave 105. The tomb had been partly destroyed by sand quarrying, but the stone construction, measuring about 2.5×1.4 m, remained largely intact. The stone construction included a grinding stone and a stone with cupmarks, and pottery sherds, flint flakes and a scraper were retrieved from the filling. Some of the sherds, with comb stamp ornamentation, are stylistically identified as Middle Neolithic Funnel Beaker Pottery, of earlier age than the underlying burials (Winge 1976). The tomb included fragmentary skeletal remains from three different individuals. The skull and upper torso of a woman aged 25–30, placed on the side facing east, were identified in the southern part of the tomb. Dental remains from a child of about 5–7 years, probably placed at the woman’s side, were found to the south, and parts of the cranium and teeth of a second child of similar age were identified to the north, next to the presumed original position of the woman’s feet (Johanson & Mårtensson 1976; Persson 1976; Winge 1976). Burial goods included two bowl shaped vessels typologically classified as Malmer’s Type J:3; a thin bladed flint axe of Malmer’s Type 2, seven amber beads, two flint scrapers, four flint blades and some flint flakes (Winge 1976). In this study, only the buried female has been included in the isotope analyses. Previously published stable carbon and nitrogen isotope data from the third molar of this individual has been interpreted as representing a terrestrial diet (Lidén et al. 2004).
Skepparslöv, Skepparslöv parish, Raää 17:1

A flat earth inhumation grave (Grave 77 in Malmer 1962) was discovered at Skepparslöv, northeast Scania, probably in the early 1930s. The site, located about 17 km from the present day coastline, has not been the object of any professional excavation, and only sporadic information about the grave is available. No stone construction is mentioned in association with this grave, holding the relatively well preserved skeletal remains of a child. The grave goods comprise a low ceramic bowl of Malmer’s Type G:2, an undecorated bowl shaped ceramic vessel of Malmer’s Type N, a narrow flint chisel of Malmer’s Type 1, a bone awl, a flint blade and three zig-zag ornamented bone rings (Forssander 1933:221p, 1934:256; Malmer 1962:921). Malmer (1962:147,291) dates the grave inventory typologically to Period 3.

Åraslöv, Nosaby parish, Raää 27:1

In the 1930’s, two flat earth inhumation graves were discovered within the same field in Åraslöv, northeastern Scania, in connection with gravel quarrying. None of the features, discovered at two different occasions, have been professionally excavated and it is uncertain whether more graves are present at the site. The burials were located on a western sandy slope, the proximity to the present day coastline is about 12 km. The first discovered grave (Grave 68 in Malmer 1962) was allegedly found about 0.4 m under the soil surface and included a stone construction. The remains of a man placed stretched out on his back, oriented N–S, were identified in the burial. Identified grave goods include a chopping weapon of antler, a thick bladed flint axe of Malmer’s Type 3, a bone awl and a flint blade (Forssander 1932, 1934; Malmer 1962:920). Malmer (1962:313pp) places the grave in Period 5. Only the skeletal remains of this individual have been included in the stable isotope analyses.

The later discovered grave (Grave 69 in Malmer 1962) was allegedly located about 60 m south of grave 68, and the fragmentary skeletal remains indicate a single burial where the subject had been placed in crouching position with the head to the south, facing east (Forssander 1934). No stone construction was identified in connection with the disturbed inhumation. Retrieved grave goods include four ceramic vessels of Malmer’s Types H:2, H:3 and J:3, a thick bladed hollow edged flint axe of Malmer’s Type 2, two bone awls and two flint blades (Forssander 1934; Malmer 1962:921). Based on the occurrence of several vessels in the tomb, Malmer (1962:201) argues in favour of interpreting the feature as a double grave, typologically dated to Period 5. However, Forssander only accounts for one individual among the skeletal remains.
Håslöv, Gustav Adolf parish, Raä 13:1

The burial site at Håslöv, northeast Scania, was discovered and investigated at a gravel quarry in connection to road construction work in 1956 (Malmer ATA dnr 4.7.1957). The site is found just over 2 km southeast of the burial site at Åraslöv, and the present day proximity to the coastline is about 10 km. Three flat earth inhumation graves, all of which are included in the present analysis, have been identified at the site, located on a southern slope.

Grave I (Grave 26 in Malmer 1962) comprised a funnel shaped stone construction under which a more or less intact skeleton was found in crouching position with the head to the north, facing east. Remains of a wooden construction were identified around the body. The grave goods consisted of a bone awl, a flint blade and a fragmented amber pendant (Malmer 1962:917, ATA dnr 4.7.1957). Due to the amber find, Malmer (1962:221) interprets the feature as a woman’s grave, but an osteological analysis identifies the skeletal remains as a man (Jantsch & Ranåker 2001:32). The grave has been typologically dated to Period 5 (Malmer 1962:198).

Grave II (Grave 27 in Malmer 1962), located directly northwest of Grave I, was severely damaged and only included some remains of a subsurface stone construction. Fragmentary dislocated skeletal remains interpreted as originating from the feature were identified at the bottom of the gravel quarry. No additional finds were identified in association with the grave (Malmer 1962:917, ATA dnr 4.7.1957). About 9 m north of Grave I, fragmentary skeletal remains from a third grave (Grave III) were found. No constructional elements of this feature were identified (Malmer ATA dnr 4.7.1957).

Results from the analyses of the Scanian material

The Scanian BAC burial sites are analysed in Paper VI with regard to stable carbon, nitrogen and sulphur isotope analyses and radiocarbon dating. The results confirm the utilisation of diverse resources among the analysed individuals, where a predominantly terrestrial diet, in several cases, has been complemented with varied amounts of marine protein. To some extent the contribution of marine dietary protein correlates with the sites’ proximity to the coast, although there are several deviations from this pattern. From these results, it is suggested that the association of the BAC with a farming/pastoralism economy needs some revision. In correspondence with the results from Öland, the suggested all encompassing dietary shift at the onset of the Neolithic, where the economic focus has been entirely turned inland, has no support in the Scanian MN B material. The sulphur isotope data implies a rather moderate level of mobility; the majority of the analysed individuals seem to represent members of the MN B communities of Scania. Movements between different parts of this region are, however, plausible in a few cases, and at least one individual, from Årsalöv, display values indicative of a more regional residential change with a corresponding change in diet.
5. Insights and outlooks

Some chronological concerns
Since radiocarbon dating constitutes a central theme in this thesis, some chronological considerations have inevitably surfaced and demand attention. In the following section, some aspects relating to typology versus absolute dating in Scanian BAC burials, as well as to the longevity of burial practices and the presence of domestic animals in megalithic monuments, will be elucidated and discussed.

Radiocarbon dates and typology in Scanian Battle Axe Culture burials
In Malmer’s (1962) relative chronology of the Swedish–Norwegian Battle Axe Culture, the first occurrences of different pottery types form the framework for the five periods (Fig. 1). The classifications of constructional elements in the graves and of other artefacts are chronologically determined on the basis of occurrences in combination with these pottery series. Partly due to the highly regulated decoration schemes in BAC pottery, Malmer’s classification system, or at least the ceramic material representing its foundation, is still generally considered to be valid and useful (e.g. Larsson 2009, although see Tilley (1982) and Edenmo (2008) on partly revised classification schemes suggesting tripartite periodical divisions of the BAC). However, this system is not perceived as flawless, the most apparent weakness being the selectivity in typological traits chosen for classification and the marginalisation of regional differences (Edenmo 2008; Larsson 2009). The latter is in part a consequence of Malmer’s assumption that all cultural innovations within the MN B emanated and spread from Scania. Due to the abundance of finds in Scania, Malmer’s ceramic chronology for southern Sweden may be regarded as more robust than those for other regions. Further, the periodical scheme of different types of boat axes only refers to Scania/Blekinge (Malmer 1962, see further Edenmo 2008 and Larsson 2009).

In light of the radiocarbon dates presented in Paper VI, the typological dating of the graves seems problematic in several cases. Calibrated ranges for the dates are unfortunately often rather wide, but some chronological patterns can still be discerned (Table 3). Previously published dates from Lilla Bedinge, from During 1989, will not be considered in the following
discussion, since they have very high confidence intervals and further display deviating dates concerning both Grave 47 and 53. The herein presented dates for Grave 47 are also somewhat problematic regarding the dating of the burial activities. Whereas the radiocarbon date for the primary burial falls around the transition between the Late Neolithic and Early Bronze Age, cranium 4, presumably deposited after the woman in the primary burial was interred, dates to MN B. The type J pottery sherd constitutes the only BAC associated find in the burial. This was found at the bottom of the boat shaped stone construction, and Malmer suggests that it came with the filling. It may thus represent earlier activities at the site, and perhaps a Late Neolithic date for the grave is more plausible (Malmer 1962:180, 2002:141). Malmer further bases his chronological interpretation of the burial on parallels of skull collections in Late Neolithic Scanian burials (Strömberg 1952). Grave 47 deviates from the general pattern of BAC burials in several respects, including the boat shaped construction, the placement of the woman in the primary burial in a stretched position, and the assemblage of disarticulated skulls (Fig. 12). If the burial is attributed to the Late Neolithic, the radiocarbon date for this woman becomes less problematic. Although we cannot rule

Figure 11. Malmer’s Battle Axe Culture pottery chronology, showing occurrences and hypothetical amounts of production of the different series relative to the five periods (after Malmer 1962:117).
out the possibility of analytical errors, it is further possible that cranium 4, and perhaps several of the five assembled skulls, represent the disarticulated remains of past members of society, which for some reason became re-deposited in this puzzling burial.

Apart from Grave 47, all analysed Scanian burials have been presumed to originate from the second half of MN B, based on typological dating, including the general association of subsurface stone constructions with Malmer’s Period 3–5. The earliest radiocarbon dated burials among the analysed material seem to be represented by Grave 53 at Lilla Bedinge and Norra Hyllievång. Surprisingly, these two individuals fall within a range including the later part of MN A to the earlier part of MN B. The typological attribution of the Norra Hyllievång burial to Period 4–5 is based on the occurrence of Type H pottery (Lindhé & Grehn 2008), whereas the Period 5 attribution of Grave 53 is suggested by Malmer (1962) on the basis of its funnel shaped stone construction. However, in Malmer 2002 (138p), a Period 3–4 date is suggested. The reason for this is not clarified, but is probably connected to the spatial correlation with other graves presumed to originate from these periods. However, the funnel shaped stone constructions in general are in the same publication still dated to Period 5. Almost correspondingly early
radiocarbon dates are represented by the individuals from Håslöv’s Grave 26 and Skeppsbrönn, although the probability distributions indicate a higher likelihood of these samples falling within the first half of MN B. Analogous to Grave 53 at Lilla Bedinge, the funnel shaped stone construction forms the basis of Malmer’s (1962) dating of the burial at Håslöv to Period 5, whereas the Skeppsbrönn burial includes Type G pottery attributed to Period 3. Skeppsbrönn thus represents the typologically earliest feature in this study, and is the only one of these early burials where the relative and absolute chronologies seem to correspond. The considerably more narrow probability distributions for the Åraslöv and Svågertorp burials place these graves within the middle of MN B. The Period 5 date suggested for Svågertorp is based on the presence of Type J pottery. It should be noted, that the J pottery has been

Figure 12. Grave 47 at Lilla Bedinge. Plan drawings showing descending stratigraphical levels (from top to bottom) with recovered human remains. The primary burial was found underneath the boat shaped subsurface stone construction (after Malmer 1962:160p).
described as somewhat problematic, since it constitutes a stylistically rather heterogeneous group (Larsson 2009:126p). The more tentative Period 5 date suggested for Åraslöv is based on the correspondence between the antler chopping weapons found here and in Grave 53 at Lilla Bedinge (Malmer 1962:313pp); the periodical assignation of the latter has already been proven highly problematic. Grave 52 at Lilla Bedinge has been suggested to be of older date than Grave 53, since the combination of Type G and H pottery in this burial suggests a Period 4 date (Malmer 1962). However, the 14C date indicates that Grave 52 is the latest feature of the two, falling within the second half of MN B or possibly the earliest part of the Late Neolithic, and there is hardly any overlap between the probability distributions for these two burials. Possibly overlapping with Grave 52, the two radiocarbon dated individuals from Grave 49 fall within the second half of MN B or the Late Neolithic. This burial has been typologically dated Period 4 (Malmer 2002:141) based on its constructional features as well as a bone needle. The burial from Dösemarken, with a 14C date falling within the second half of MN B, does not include any artefact or constructional feature promoting a typological dating.

In conclusion, the funnel shaped stone constructions seem to be highly problematic to apply in chronological classifications. Further, significant chronological overlaps between Periods 3–5, based on the ceramic typologies, are indicated by the presented radiocarbon dates. The results presented here may suggest some revision and rethinking of Malmer’s ceramic typologies and periods, although more absolute dates on material from closed contexts with associated ceramic, and other types of, artefacts and constructional elements are needed in order to fully appreciate the extent of the problems implied (cf. Brink 2009).

Continuity and reuse of megalithic monuments

It is a well known fact that artefacts and skeletal remains post-dating the occurrence of the Funnel Beaker Culture are regularly found in megalithic contexts. Among the artefacts, Late Neolithic finds dominate, represented in about two thirds of the excavated megaliths in Scania and along the Swedish west coast. Although not as frequent at Falbygden, Late Neolithic artefacts have still been documented in about one third of the region’s investigated passage graves. Artefacts attributed to the Battle Axe Culture, predominantly flint axes and pottery, are not as common. In 1992, such occurrences were documented in at least 15 megalithic contexts, the majority of which are situated in Scania (Malmer 1962; Bägerfeldt 1992:82pp). From the Resmo passage grave included in this thesis, finds of both BAC and LN character have been identified, whereas the Alvastra dolmen include slate pendants of assumed Late Neolithic origin. Both graves further exhibit other features indicative of later activities; the entrance cairn of supposed Late Neolithic/Early Bronze Age date at Resmo and the cupmark on the presumed roof slab at Alvastra. Cupmarks appear in connection to between 20–50% of
Sweden’s dolmens and passage graves, and are often interpreted as representing Late Neolithic or Bronze Age events (Bägerfeldt 1992:70). Entrance cairns, usually covering older depositions of pottery, occur frequently at Falbygden and are generally dated to LN or later periods (Persson & Sjögren 2001:214p).

Apart from these identified artefacts and features, a number of dolmens and passage graves further include human remains radiocarbon dated to MN B or later periods. Such later elements do not occur in all radiocarbon dated bone assemblages, and generally consist of only a few or solitary individuals (see further Persson & Sjögren 2001:229p). Whether or not this pattern is the result of the generally few radiocarbon dates available from each megalithic context remains to be seen. An exception is the Rössberga passage grave at Falbygden, where a total of 31 dates are available. Here, at least four, and possibly as many as eight, individuals post-date MN A, whereas the oldest individuals are of Early Neolithic date (Hedges et al. 1992; Linderholm et al. 2008). Many of the dates from Rössberga have rather high standard deviations, and the calibrated interval in several cases include the second half of MN A to MN B. The later dates further include the Late Neolithic and Bronze Age periods, possibly stretching into the early Iron Age. Other noteworthy materials in this respect include the passage grave at Landbogården in Falbygden, where the seven available radiocarbon dates reveal a similar longevity of burial practices. Apart from one date falling somewhere within the centuries around year 0 AD, the dates imply a period of use stretching from the Early Neolithic to, at least, the Late Neolithic (Persson & Sjögren 2001:201pp, 229). Unfortunately, the majority of the Landbogården material has some extremely high standard deviations (between ±100 and 445 uncalibrated 14C years). Among available data, however, the Resmo passage grave holds a unique position considering that 20 out of a total of 34 radiocarbon dated individuals originate from MN B, the Late Neolithic and the Bronze Age periods (see further Paper II). In this context, it is also worth mentioning the presumed secondary Bronze Age cremation burial retrieved from the filling of the Resmo megalith.

At the Alvastra dolmen (Paper V), the pattern seems to deviate somewhat from the materials presented above. Here, the only radiocarbon dates on human remains later than MN A fall within the Iron Age, whereas no later Neolithic or Bronze Age burials have been identified. Although the previously documented Iron Age remains have been suggested to originate from the nearby Smörkullen cemetery rather than the dolmen (see further chapter 4 and Paper V), there is still one new date falling within the Late Iron Age period. This individual was not recovered from Fürst’s debated box that resurfaced in Lund, and the date further corresponds chronologically to a radiocarbon dated hearth with associated Iron Age pottery discovered just outside the megalith. In conclusion, at least one individual, and possibly more, appears to have been interred in the chamber of the dolmen during the Iron Age period.
At Alvastra, there is further a plausible element of relating back towards a distant past in connection with the construction and use of the dolmen. That the attribution of the Mesolithic man to the tomb may be correct is implied in the description of specific morphological characters by Fürst in connection with the analysis of the skeletal remains retrieved in 1916 (see further Paper V and Janzon 2009). If so, the remains of this individual would have been moved from his original resting place to the megalith at least some thousand years after his death, which could explain the deviating patina on the bones identified by Wilhelmsson & Ahlström (2009). Almost all skeletal elements from the individual, at least from one side of the body, are represented, with the exception of the small hand and foot bones. Janzon (2009), hypothesising that the man was originally buried at the place where the dolmen was constructed some 3000 years later, suggests that the loss of smaller bones occurred when the skeleton was moved. Although this representation may very well be the result of taphonomic processes, the astonishing preservation of the recovered skeletal elements from the individual can be seen as supporting Janzon’s suggestion. Janzon (2009:67p) has further convincingly argued that the skull of this individual was recovered from among an assemblage of skulls in the tomb, implying that the individual was placed in the chamber sometime during the EN–MN A period of burial activities at the dolmen. We cannot know whether this took place at an initial stage, which would arguably be the case if the Mesolithic man was originally buried directly on the site of the subsequent megalith, or somewhat later during the MN A burial phase. However, the presence of suggested Mesolithic quartz underneath the cultural layer of the tomb still suggests that the very construction and placement of the dolmen included a relating back in time. The inclusion of an old skeleton, possibly perceived as an ancient ancestor, can be perceived as part of a similar process.

Monuments of the past – megaliths and historicity

The active relationship with, and references to, the past in prehistoric societies has gained a lot of attention from the 1990s onwards, most prominently among archaeologists focusing on landscape perspectives and social memory (e.g. Ingold 1993; Gosden 1994; Thomas 1996; Gosden & Lock 1998; Edmonds 1999; Bradley 2002; Van Dyke & Alcock (Eds.) 2003). In a discussion of historicity, Chris Gosden and Gary Lock (1998) distinguish between genealogical and mythical history, coexisting in all societies. The genealogical history is the creation of a link to a past of known and named ancestors. The time scope of such links to the past in non-literate societies is naturally limited, but genealogies can, according to Gosden & Lock, sometimes go back several centuries in time. The mnemonics of genealogical history are to a major extent centered around the nature of the landscape. The landscape is further central within the mythical history, where a more distant past, a previous state of the world, is evoked. The mythical history is thus not associated with the continuity characteristic of genealogical history. It should be
noted, that these different forms of historicity should not be confused with true versus fictional history. Social memory in all forms can be elaborated and manipulated, and Gosden & Lock’s perspective rather concerns the social efficacy of history.

In the perspective of the megalith monuments discussed above, the continuity of Early to Middle Neolithic burial practices, often stretching over a time span of several centuries, include references to, and upholding of, a genealogical social memory. This included commemoration not only of the buried ancestors, but also previous activities of depositions and other practices surrounding the monument. If and when, during this continuous use of the grave, the very construction of the monument transformed into a more mythical history would have been dependent on the longevity of use as well as the time depth of genealogy within the societies in question. Genealogical history should be perceived as a “moving moment” (Gosden & Lock 1998:6), where early kin became forgotten with the passage of time.

The megaliths can further be perceived as arenas for elaborating mythical histories during later periods, where the ancient monuments were given new meanings and values. The reuse of the Swedish megaliths apparently includes several periods in time as well as a number of different activities, such as burials, depositions and adding of new constructional elements. The attention that the megaliths have attracted throughout history can probably be connected not only to their monumental nature and air of permanence but also to the often dramatic natural environments in which they are situated. The spatial connection to mountains (e.g. at Falbygden or Alvastra) or waters (Öland, Gotland, Alvastra and several megaliths in Scania and on the Swedish west coast) may have enhanced the prominence of the monuments in the social landscape of different times.

The evidence of later activities connected to Swedish dolmens and passage graves outlined above is reflected all over the area of distribution of the megaliths, and the reuse of Neolithic burial monuments has been acknowledged and studied in a number of works (e.g. Daniel 1972; Hingley 1996; Holtorf 1998; Sopp 1999; Bradley 2002). The relating to, and reuse of, older monuments and places have often been perceived as associated with the legitimation and control of places through manifesting an ancestral link with past dwellers (e.g. Tilley 1994; Bradley 2002). Since reuse in megalithic (and other) contexts includes quite diverse activities as well as different periods in time, however, it would be far too assumptive to try and find a universal explanation to the reasons and meanings behind these practices. Strategies of legitimation through display of ancestral linkage to a place were probably central in many contexts of reuse but may have been peripheral or non-existent in others. Further, we cannot presume that all strategies of control over the landscape included the manifestation of ancestral links to the past. Here, the Resmo megalith and the radiocarbon and isotope data from the interred individuals can serve as an illustrating example.

At Resmo, there seems to be three phases of burial activities, coarsely representing EN–MN A, MN B and E BA, respectively (Paper II). A hiatus in the
burial traditions during a large part of the Late Neolithic is implied in the radiocarbon dates, and it is also quite possible that a similar disruption appeared around the transition to MN B. However, all three phases seem to include continuity in the use of the monument over at least some hundred years. Evidently, we cannot know whether the disruptions implied in the dates are the result of actual discontinuities or if more radiocarbon dated individuals from the tomb would fill these gaps. However, it must be perceived as unrealistic to assume a continuous genealogical history, albeit in the form of a “moving moment”, behind these burial practices, especially given the general singularity of megalithic burials in relation to dominant mortuary practices from MN B onwards. At least during the second and third phase, the Resmo megalith would have been an arena for the interplay between the mythological past of the monument itself and the genealogical social memory of continuous burial practices within the context of the present societies.

Interestingly, whereas the majority of the MN A individuals seem to originate from Öland, a number of MN B and, more notably, Bronze Age individuals in the tomb have spent their early years, and sometimes possibly more or less their entire lives, outside the confines of the island (Papers III and IV). Some individuals further appear to have moved between different geographical regions outside Öland during the course of life. We cannot, as of yet, know whether the provenience patterns of the buried in the megalith reflect a generally high degree of mobility on and into Öland during these periods in time, since we don’t have any data on contemporary remains from other contexts to compare with. The large dataset on MN B individuals from Köpingsvik cannot be compared with Resmo in the context of mobility, since the prevailing marine diet inhibits inferences on geographic origin and mobility. However, the high representation of mobile non-locals at Resmo seems striking. If the burials in the megalith during these periods were instigated and maintained predominantly as a more or less conscious means of legitimating the right to and control over land, these newly arrived individuals or groups probably did not have any local genealogical histories of named ancestors to connect to. Here, the megalith, a monument of old, may have constituted a means to manifest a link to the ancestors of a mythical past. On the other hand, perhaps it was the foreign origin, and the therein implied travelling, of several of the analysed individuals that motivated the special treatment of them after death, without any component of local ancestral linkage. Whether or not this was an especially honourable treatment or associated with specific roles and identities goes beyond the scope and limitations of our present knowledge.

In the context of historicity, it is further worth emphasising the above discussed implied mythological (for us archaeologists Mesolithic) past evoked at Alvastra in connection with the construction and early use of the dolmen. Here, the mythical history of the landscape was apparently central to the location of the monument. In this case, I argue, it is likely that the selected location above a Mesolithic area of activity and probable inclusion of the
ancient skeletal remains in the dolmen reflect the legitimation of place through manifesting ancestral links with the mythical past. At Alvastra, the relating back to past times may have been central for the sense of place. In the mythical history at Alvastra, Omberg held another prominent position as a central place in the social landscape. Naturally, the mythical history of any given society includes events connected to natural features, just as the genealogical past is tied up with, and maintained through, references to different loci in the landscape. These references rarely include tangible remains of past activities, such as the Mesolithic remains at Alvastra (cf. Edmonds 1999 on Neolithic landscapes of memory in a British context).

There are other examples of Neolithic places where a relating back in time is implied in different ways. For example, Fredrik Hallgren (2008:112p) suggests that the location of the Early Neolithic burial site at Fågelbacken in Västmanland, in an archipelagic environment characteristic of Late Mesolithic base camps, was chosen in order to connect with a historical and mythical past. It is worth mentioning that a feature discovered in the 1920s at Fågelbacken has been interpreted as a passage grave, the remains or exact location of which have unfortunately not been possible to identify in later times (see further Steineke 2001; Hallgren 2008). In a central Swedish perspective, Kim von Hackwitz (2009:199pp) has further elucidated the return to Early Neolithic inland locales during MN B. The presence of burials and pottery associated with the BAC on these sites is perceived as reflecting a deliberate reference to past times. A later example of the theme comes from Cladh Hallan on the outer Hebrides, Scotland, where a skeleton constituting a composite of elements from three male individuals had been deposited underneath a Bronze Age roundhouse, probably within the context of the construction of the building. Radiocarbon dates suggest that at least two of the three represented individuals, which may all be contemporary or differ in date with some hundred years, had died centuries before the actual burial (Parker Pearson et al. 2005).

Wild and domestic animals in megalithic contexts

The importance of radiocarbon dating becomes even more apparent when looking more closely into the occurrences of domestic, and other, animals in dolmens and passage graves. It is a well known fact that animals, especially small mammals and rodents, retrieved from the chambers of the megaliths may represent later, often altogether natural, intrusions resulting from the tombs being used as dens or nests by wild fauna. Such activities can also be represented by the presence of e.g. recently introduced animal species or gnaw marks. Of course, one must further be aware of potential later depositions of animal remains by human agency, which can be the case, for example, when larger domesticates introduced during later periods or yielding late dates occur. Where present, stratigraphic and contextual documentation may aid in the identification of recent faunal elements (see e.g. Ahlström 2009). However, since many dolmens and passage graves were excavated
during the early parts of the 20th century, such information is unfortunately often rudimentary at best.

In light of the general perception of domestic animals as having constituted an important symbolic and economic resource during the Early and Middle Neolithic, it is central to clarify whether such species have been deposited in the megaliths during the period in question, or if their presence reflects later activities. Naturally, the depositional patterns of any animals, wild or tame, in these contexts are of interest. Unfortunately, radiocarbon dates on animals from megalithic contexts are scarce since the human remains are generally prioritised. I have been fortunate to have sufficient funding to submit at least some domestic animal bones, in addition to the human samples, from Resmo and Alvastra to radiocarbon dating. From Resmo, two dates from sheep/goat and one from cattle are available (Paper II), where the oldest sample represents a sheep/goat dated to the Late Neolithic. The cattle sample falls within the Early Iron Age period, whereas the second specimen of sheep/goat is dated to modern times. In the osteological analysis of the animal bones from the Alvastra dolmen, During (1980) concludes that since these remains were found commingled with the human bones, they were likely to be of Neolithic date. However, among the total of nine available dates of cattle, pig and sheep/goat from the Alvastra dolmen (Paper V; Janzon 2009), the earliest sample, a cattle carpal bone, falls around the transition to the Late Neolithic. A second cattle specimen date to the Late Bronze Age, whereas all remaining samples date to the Late Iron Age or Early Medieval period. Further, five included samples of horse, some of which may represent the same individuals, date to the Late Iron Age. Interestingly, the majority of the horse samples, as well as several other dates from domestic animals, fall roughly within the same chronological span as the identified Late Iron Age individual and the dates obtained from charcoal in the adjacent hearth (see further Paper V and Janzon 2009). The animal radiocarbon dates from Alvastra published by Janzon (2009) further include a tooth from a wolf(?), falling within the Early Iron Age and two bird samples (buzzard and goshawk) yielding calibrated ranges corresponding to late MN B or the Late Neolithic. In conclusion, neither wild nor domestic animals seem to have been deposited within the megalith, at least not to any significant extent, during its EN–MN A period of use. However, it is plausible that domestic remains of horse and potentially other species were placed in the chamber by human agency during the Late Iron Age, perhaps in connection with the documented burial and/or use of the hearth.

Apparently, the meanings ascribed to livestock animals within TRB contexts are not manifested in the chambers of the megalithic tombs to any significant extent. Despite the generally very limited radiocarbon datasets, concerns on this matter have been articulated previously (Sjögren 2003:134pp; Ahlström 2001, 2009; Janzon 2009). The herein presented observations validate the proposed call for caution when evaluating the presence of domestic, or other, animal remains in megalithic contexts. Similar concerns, stressing the importance of thorough radiocarbon dating, are also relevant when deal-
ing with domesticates in PWC contexts. Illustrating examples can be found at the Västerbjergets cemetery on Gotland (Eriksson 2004) and Jettbölle on the Åland islands (Storå 2001), where cattle and sheep bones have yielded dates falling within the Late Neolithic, Bronze Age or historic times.

However, there are documented occurrences of animal remains in megaliths whose dates correspond to the graves’ main period of use. At the Rössberga megalith, a dog sample has been dated to the centuries around the EN–MN A transition, and a pig sample yielded an MN A date (Linderholm et al. 2008). A pig phalange from Karleby at Falbygden has also been dated to MN A (Sjögren 2003:134). It should be noted, however, that pig bones in megaliths can generally not be distinguished as wild or domestic.

Pig bones occur frequently, and sometimes abundantly, in megalithic monuments. Phalanges constitute the most common pig bone element in several megaliths, such as Rössberga and Frälsegården at Falbygden. This has caused Ahlström (2001, 2009) to suggest that buried humans at Falbygden were sometimes shrouded in pig hides (note that Ahlström argues in favour of perceiving the megaliths as graves, where articulated individuals were interred, rather than ossuaries). In accordance, Sjögren (2003:134p) suggests that pig bones, most notably phalanges, from within the chambers of the megaliths represent primarily Neolithic activities. Further, the presence of Neolithic pig remains is further implied in the regularly occurring tusks and (sometimes perforated) teeth in the Swedish megaliths (Ahlström 2009). Another species interpreted by Ahlström as often representing primary, human activities is the mountain hare, where an over-representation of extremity bones has been documented in some cases. Ahlström interprets this pattern as reflecting a use of hare’s-feet as talismans or personal adornments. In the absence of radiocarbon dated remains, such chronological attributions are probably valid when there is a clear over-representation of foot/extremity bones among the pig or hare remains. Otherwise, inferences on the dates of the pig or hare (or other animal) remains are highly uncertain, although meticulous stratigraphic and contextual observations will evidently aid in the interpretation.

However, regardless of the implied general absence of domesticates within the chambers of the megaliths, with the possible exception of pig, deposits observed outside the entrances to monuments at Falbygden during recent excavations have been suggested to reflect a somewhat different picture. In contrast to the skeletal remains from the chambers, these deposits generally consist of burnt bones and can thus convincingly be attributed to human activities. There is further a general pattern of deposits of the Neolithic domesticates (pig, cattle and sheep/goat) rather than wild fauna, and the spatial distribution of the burnt bones seem to correspond with that of deposited megalithic pottery. Regarding these contexts, Sjögren (2003:136) has convincingly argued in favour of a Neolithic date coinciding with other activities of deposition and burial. Two radiocarbon dates on pig bones from such contexts at Jakobsberg and Nästegården, albeit associated with the problems inherent in the dating of burnt bones (Persson & Sjögren 2001:222; Sjögren 2003:136), seem to strengthen this hypothesis.
Neolithic diets and Neolithisation

People engaged in farming during the Early and Middle Neolithic of southern and central Sweden. This is an undisputed fact; if summing up the archaeological data there are numerous finds of domestic animal remains, seed impressions, charred cereal grains and pollen diagrams showing clearance of land and cultivation (see e.g. Florin 1938, 1958; Hulthén & Welinder 1981; Ahlfont & Welinder 1995; Welinder 1998; Segerberg 1999; Berglund et al. 2002; Hallgren 2008). However, what is less clear is the extent of these activities and their importance on the level of subsistence within different regions and periods. This is one of the main topics of debate in connection with the concept of Neolithisation, the different definitions and explanations of which will be discussed below, partly in light of stable isotope data. In the introduction, I suggested that food culture can be discussed in terms of an interplay between realities and representations, and that herein lies what I regard as one of the greatest potentials of stable isotopes as proxies for palaeodiet. When and where did agricultural products constitute any substantial part of the food cultural realities? Where can they be said to have been primarily important on the level of representation? As we have seen, the presented dietary data imply a diverse Neolithic resource utilisation, in several cases including more or less substantial contributions of marine, thus clearly wild, food sources. Other results, such as those from Alvastra, are less clear cut as regards the dietary reliance of agricultural products. This is also the case for previously published data from the Falbygden megaliths, which is why I will start out by discussing, in more detail, the dietary strategies at Alvastra and Falbygden.

Dietary patterns at Alvastra and Falbygden

Since isotope analysis cannot discriminate between domesticated and wild food sources from the terrestrial environment, it cannot be presumed a priori that implied land based diets equal a farming subsistence. People in inland regions naturally utilise predominantly terrestrial (or freshwater) resources, whether wild or domestic. Consequently, the isotope results from Alvastra (Paper V), or previous data from Falbygden (Linderholm et al. 2008; Hinders 2011), initially seem somewhat inconclusive regarding the impact of agricultural activities. However, what can be seen in the data is that freshwater fish has not formed any significant part of the diet in these regions, despite the prominent and diverse fishing opportunities at Alvastra. This becomes evident when comparing the Neolithic human data from Alvastra with Iron Age individuals from the dolmen as well as the nearby Smörkullen cemetery (Lindberg 2009). In these cases, values are much higher and indicative of consumption of substantial amounts of freshwater fish and/or suckling animals.

Further, the nitrogen isotope data from Alvastra seems to imply a strongly meat oriented diet. The values more or less correspond to data from the Falbygden site Frälsegården (Hinders 2011), whereas they are somewhat
higher than for the Rössberga material from the same region (Linderholm et al. 2008). It should be noted that the generally low protein content of vegetable products results in an under-representation of such food sources in the collagen isotope data. Of course, there has been a vegetable dietary component, although this has probably not constituted the main staple at Alvastra or Frälsegården. At Rössberga, the lower δ¹⁵N values in the human population are accompanied by lower values for the pigs compared to the Frälsegården material. One of the two analysed Rössberga pig samples has been radiocarbon dated to MN A (Linderholm et al. 2008), and the six Frälsegården samples represent phalanges assumed to be of Neolithic date (Sjögren 2008:57; Hinders 2011). Both human populations at Falbygden thus display values in line with a consumption of pigs from the respective site, suggesting that the human diets may not have been that different. However, there is nothing else to suggest that pigs were the main source of meat at Falbygden, so this is still a rather tentative suggestion. Further, we do not know whether the pigs from these tombs represent wild or domestic specimens, although the dietary data implies different feeding patterns. This could be the result of domestic animals being provided with different fodders, that one of the populations were wild and the other domestic, or that all animals were wild but had two different feeding patterns. With the data at hand, perhaps the first scenario is the most plausible one, although more isotope data on pigs, especially from Rössberga, is certainly desirable.

When it comes to the dietary importance of cereals, the frequency of caries can be applied as an indication of consumption of carbohydrates, especially sugar. At Alvastra, the caries frequency is low compared to analysed Falbygden materials from Hjelmars Rör and Rössberga which, in turn, display lower frequencies than the general pattern for Neolithic populations on the continent. This implies that the consumption of carbohydrates in the analysed Swedish megalithic populations was smaller than what is often assumed (Ahlström 2001; Wilhelmsson & Ahlström 2009). In conclusion, the Neolithic human diet among the megalith populations at Falbygden and Alvastra may have been based on meat from domestic animals, whereas the dietary contribution of cereals seems to have been more marginal. Thus, the meanings associated with cultivated plants within these communities would perhaps not have been tied predominantly to their nutritional importance, as food cultural realities, but to their significance as representations.

“Neolithised”? 
During the last decades, intense academic debates have flourished concerning the process of Neolithisation, with the impact of farming frequently at the heart of the disputes. However, not only are there advocates of different hypotheses of when, where and why people became “Neolithised”, there are also different ways of defining the very concept itself. This may lead to some confusion when trying to untangle the threads of this discourse, especially due to the occasional lack of clear definitions of what is actually meant
by Neolithisation (cf. Sjöstrand in press). Although touched upon briefly in a previous chapter, the understandings and implications of this concept will here be reviewed and discussed in some more detail, partly in light of the observed Neolithic dietary strategies.

Up until the seminal paper “Gatherer-hunter to farmer: a social perspective” by Barbara Bender (1978), which will be returned to below, the introduction of agriculture was more or less exclusively defined and explained in terms of nutritional needs and gains. Whether driven by demic diffusion, climatological crisis and/or population pressure, the introduction of food production was generally perceived as large scale, inevitable and irreversible wherever it gained foothold (e.g. Childe 1957; Binford 1968; Ammerman & Cavalli-Sforza 1971, 1973; Dolukhanov 1973; Cohen 1977). However, while during the early part of the 20th century, the Neolithic was defined on the basis of a series of traits, including horticulture and domestic animals, it was not until the second half of the century that the economic and technological development connected to agriculture became the sole basis of definition (see further Thomas 2007). Among the extremes of this approach we find the work of Ammerman and Cavalli-Sforza (1971) who, in search of the chronology of the spread of agriculture into Europe, took the presence of horticulture in Neolithic contexts for granted, even when such indications were absent (see further Thomas 1991:7pp, 2007). Although Zvelebil and Rowley-Conwy’s (1984) three phase model for the introduction of agriculture (i.e. availability, substitution and consolidation) represented a more sophisticated approach taking regional differences in the adoption of Neolithic traits into account, the focus was still fixed at the sphere of economy. Notions of the onset of the Neolithic as representing a sharp economic shift, in Scandinavia as well as other regions, are still being put forward, and the argumentation often draws on stable isotope data (e.g. Schulting & Richards 2002; Richards et al. 2003b; Rowley-Conwy 2004). However, the often suggested large scale economic transitions have frequently been questioned, in the context of stable isotopes e.g. in Lidén 1995, Eriksson 2003, Thomas 2003, Lidén et al. 2004, Milner et al. 2004, and Lightfoot et al. 2011.

As evident from the observations of dietary strategies within this thesis, the Neolithic of southern and central Sweden cannot be defined or explained simply in terms of sharp economic transformation. Not only are there evidence of continued utilisation of wild resources alongside agricultural activities within different populations, the Swedish archaeological record further holds the remains of Neolithic groups, associated with the PWC, where wild resources were prevalent in the economy for a considerable time span. The underlying assumptions in the explanatory models reviewed above, that a societal structure resulting from economic transformation constituted the prerequisite for other Neolithic phenomena such as the amount of labour invested in the construction of megalithic monuments, thus fall short. There are other, potentially more fruitful, lines of reasoning to follow if we want to understand, and define, the process of Neolithisation, taking social relations into account.
As mentioned above, Barbara Bender (1978) was among the first to turn attention to the social structures when discussing the origins of agriculture. Rather than the commonly presupposed opposite situation, developing social relations could promote economic change. An emphasis on more social factors can be found in the works of e.g. Jennbert (1984) and Fischer (2002) concerning the onset of the Neolithic in southern Scandinavia. Here, the introduction and early meanings of agriculture is connected to the sphere of social competition, where cereals and live-stock are suggested to have signified prestigious luxury goods rather than nutritional necessities (cf. Hayden 1993, 2003). However, although the emphasis on subsistence is clearly toned down in these works, the Neolithisation is still closely tied to the very concept of agriculture or, more specifically, the products it yields. However, other researchers have drawn attention to cognitive structures not necessarily associated with food production, or other aspects of subsistence related to agriculture, when discussing the process of Neolithisation. These structures are often suggested to include an emphasis on the collective, delayed return and new ways of experiencing and manipulating the landscape including the investment in permanent material culture (e.g. Hodder 1990; Thomas 1991, 2007; Whittle 1996; Tilley 2007; Sjöstrand in press). The construction and use of monuments are often perceived as central, including the relating to the past and manifesting a presence in and control over the landscape. The megaliths are further regarded as acting as symbols for the collective and organisational aspects of society (see e.g. Shanks & Tilley 1982; Tilley 1994; Edmonds 1999). This cognitive structure by no means required either an agricultural economy or sedentism, nor can it be said to represent the prerequisite for the adoption and implementation of agriculture.

Since we have already defined the Neolithic as a bounded period in time, in Sweden extending from c. 4000 to 1800 BC, we always run the risk of getting caught in circular arguments on which are the most specific traits of the period in question. If agriculture cannot constitute the core of definition, which other phenomena can? Are there any common Neolithic traits that were of relevance to prehistoric people? I argue that, if anything, the suggested changes in cognitive structures can be perceived as constituting such traits, albeit probably encompassing a loosely knit web of gradual processes and diverse social structures, especially when leaving the regional level. This perspective perhaps becomes even more justified in light of the isotope results. For example, the megalithic monuments cannot generally be attributed to exclusively agricultural societies. Naturally, one may argue that since dietary data from the early part of EN are virtually non-existent in Sweden, there could still have been a significant dietary shift occurring in several regions in connection with the onset of the Neolithic. Further, there are regions where horticulture and animal husbandry may have been established on a larger scale during the Early as well as the Middle Neolithic. However, such potential economic transitions were evidently not all encompassing, alternatively not irreversible, given the data at hand. In central Sweden at least, such economic systems are also contradicted by the abundant evidence
of continued utilisation of marine resources alongside domesticated products within the context of the TRB (see further Segerberg 1999; Hallgren 2008). The transition to a farming economy seems to have been a regionally varied process sometimes continuing throughout the entire Middle Neolithic.

From this perspective, we may also discuss the eastern Pitted Ware Culture in the context of Neolithic cognitive structures. Here, the available dietary and faunal data imply that the farmer’s way of life has generally been discarded in favour of a predominantly maritime hunting economy (but see e.g. Segerberg 1999). This has resulted in perceptions of this culture as representing the surviving remains of, or degradation back to, a simpler, more Mesolithic lifestyle. However, since one cannot a priori presume that hunter-gatherer societies are less socially sophisticated or complex than agriculturists (cf. Bender 1978), and given the above discussions, such reductive perceptions fall short of a persuading explanation. Perhaps the establishment and long term use of the extensive coastal sites, including abundant deposited pottery, attributed to the PWC can also be perceived as connected to collective practices and regulations of the landscape including investment in a form of permanent material culture (cf. Sjöstrand in press regarding the Neolithic of northern Sweden). Although we cannot know whether investments of delayed return were central within the context of the PWC, the same may be said for other Neolithic communities where the extent and nutritional importance of agriculture seems to have been limited.

However, in the Neolithic of southern and central Scandinavia the introduction and subsequent establishment of agriculture, whether a slow or swift process, forms a central feature in the archaeological record, not least at a level of symbolic meanings. Where agricultural practices and products, whether associated with food or other, secondary products such as wool or transport (cf. Sherratt 1981 on the secondary products revolution), were manifested, they were indeed weaved into the cognitive structure. Apart from being more or less included in the diet, live stock and cereals were infused with symbolic meaning, probably in the context of social competition and/or group identity. Thus, whereas their importance as food cultural realities clearly varied, these products constituted central and deliberately displayed representations, although the connotations of these representations were naturally not universal. The exception is the PWC contexts. The consequences of this deviating pattern of the eastern Pitted Ware Culture will be elaborated in the following section.
Neolithic identities – a food cultural approach

The traditional tripartite division of the Early and Middle Neolithic of southern and central Sweden into different cultures lies at the heart of archaeological debates concerning the time span in question. As mentioned in chapter 1, I have chosen to adopt the traditional terminology in this thesis, partly for the case of simplicity, albeit aware of the inherent problems and connotations of such an approach. In the following, aspects of Neolithic identities in light of the isotope results, i.e., from a food cultural perspective, will be discussed. How can food culture elucidate aspects of identity in relation to other archaeological remains? The general premise here is that food culture, as well as perceptions of identity, constitute nodes, formed through shared experience and participation, in a complex web of social relations for which there are no universal modes of explanation. Although in part embarking from the disputed concept of pluralistic archaeological cultures, at least as regards the relationship between the TRB and the PWC, other themes and points of departure, recognising the diversity of Neolithic societies, will also be elaborated.

A basic assumption in this thesis is that food culture can act as a social binder, where the activities surrounding food production, acquirement and consumption can lead to perceptions of common identities. However, “identity” is a rather vague term, encompassing a wide array of different connotations. The multitude of identities within any given agent is situational, can operate on very different levels and scales of social life, and can be more or less conscious, negotiated and manifested (cf. Graves-Brown et al. (Eds.) 1996; Diaz-Andreu et al. 2005; Insoll (Ed.) 2007; Berggren & Brink 2010; Damm 2010). Further, equally as important as defining what is actually meant when discussing identity is a framework for the understanding of how such perceptions come to be. Here, I will embark from a very simple and obvious statement: food culture, as most aspects of social life, is practice.

Food culture as practice – the habitus

Within the field of archaeology, the concept of habitus, as it is applied and defined by the sociologist and anthropologist Pierre Bourdieu (1977, 1990), has been widely adopted during recent years. The appeal of this approach may to a large extent lie in the fact that it allows an understanding of social life in terms of practice, which can be more easily approached from the archaeological remains than thoughts and intentions. In short, habitus denotes the dispositions or principles that generate and structure human practice (Bourdieu 1977:72). Initially applied to understand the dynamics of class and dominance, the habitus, formed through the embodied practices and experiences of everyday life, structures the perceptions of the way things are, the way they should be. It thus reproduces the same practices and experiences which, in turn, reproduce power relations. Consequently, the shared practices and experiences of a group will result in a common way of looking at the world, a shared sense of the habitus. However, the habitus is neither static
nor independent of external factors; the structure is both reproduced and transformed over time by human practice, and external factors are mediated and transformed into the culture of a society. The concept of habitus thus allows the recognition of social structures and the practices of individuals as dialectic, where humans become structured as well as structuring social agents in the creation and elaboration of culture (Bourdieu 1977, 1990). As such, habitus is a product of history, of practice over time (cf. Ortner 1989), which may be another reason why the concept is so intriguing for archaeologists.

The concept of habitus can thus be applied as a means to understand cultural continuity and gradual or moderate processes of change, allowing humans to be perceived as structuring agents, albeit within the limits of the habitus (Bourdieu 2002). But what, then, brings about more overwhelming changes in society? Bourdieu to a large extent focused on class and means of economic power and domination, where the concept of habitus can explain the persistence of social and material inequality. The current structure, whether beneficial or oppressive for different individuals or groups, becomes reproduced and meaningful through human practice and experience (Bourdieu 1977:159pp, 1990:122pp). However, the arbitrariness of the structure can be exposed and made conscious in connection with, for example, economic or political crises or external influences such as “culture contact”. In such cases, the previously perceived natural state of things, the doxic knowledge and experience, can become challenged, potentially leading to more profound transformation of the structure (Bourdieu 1977:168p).

Habitus is thus about social relations. These social relations are formed and transformed through the practices of everyday life, as well as by participation in more special activities, such as burials, feasts or other forms of ritualised practices. From this, I argue, arise the perceptions of shared identities. Since, within Neolithic societies, food acquirement (and, of course, eating) made up some of the most principal practices within any given group of people, the food culture would have been correspondingly central to these notions of identity. This is a dual relationship. As the practices surrounding acquiring/producing, preparing and consuming foods can lead to a shared sense of belonging, attitudes towards the same aspects can constitute central parts of the identity and thus reproduce the food cultural components, e.g. in terms of what, and what not, to eat or how and when certain foods are to be consumed. As such, food culture is a central aspect of the habitus of a group. However, as noted above, identity is a rather vague term with several potential connotations, which can further operate at different scales within a society. Here, the concept of communities of practice as elaborated by Etienne Wenger (1998) may be adopted to discuss the role of food cultural practices in social relations. The main source of inspiration here is the recent application of this concept to the northern TRB by Fredrik Hallgren (2008). As will be elaborated below, this approach can elucidate how, additionally, the food cultural representations, i.e. components of less nutritional than symbolic values and thus not as extensively engaged in within the practices of everyday life, can create and manifest a sense of shared identity.
Food culture as practice – communities of practice

In essence, the theory of communities of practice is a theory of learning, originally elaborated and applied within the contexts of contemporary apprenticeship and corporate organisation (Wenger 1998). However, it further places learning within the context of social participation, with a focus on practice, experience and identity formation (Wenger 1998:3pp). As such, the theory can be applied in practice oriented research within a number of academic fields, archaeology included. Wenger perceives learning as equaling the social practices of participation, constituting an integral part of everyday life (cf. Turner 2001). It is further historically and culturally situated, and will reproduce as well as transform the social structure (Wenger 1998:8pp). This perspective thus falls well in line with Bourdieu’s theory of practice, where a similar dialectic between human practice and structure is pronounced. Indeed, according to Wenger “Practices evolve as shared histories of learning” (Wenger 1998:87), showing that the two concepts are intrinsically interwoven.

Communities of practice denote the communal active participation and engagement in specific practices. These communities thus exist only insofar as the practices are upheld, and since membership is defined by participation the concept can transcend formal social categories such as age, gender, family etc. Further, every individual can be participating in a number of different communities of practice simultaneously. Communities of practice are always situated within the wider cultural context, and as such they are not to be perceived as operating in isolation from other practices. Further, as noted above in connection to learning, they both reproduce and transform the social structure. Communities of practice can be relatively short-lived, but since members can come and go, they can also persist for considerable time spans. This further adds relevance to this theory when dealing with prehistoric societies (Wenger 1998, see further Hallgren 2008:30p).

Apart from dimensions of mutual engagement and joint enterprise, a further characteristic of communities of practice is the shared repertoire, including routines, words, tools, gestures, symbols, concepts and all other aspects that the particular community has adopted as part of its practice. The repertoire thus reflects a history of mutual engagement. It further includes both participative and reificative aspects (Wenger 1998:73, 82pp). With reification, Wenger (1998:58p) refers to the concretising of our experiences in objects, thus congealing the experience into “thingness” (cf. objectification).

On a larger scale, Wenger uses the word constellation to define wider social contexts of interconnected practices. Constellations can be associated with an array of different forms of relations between the different communities of practice, such as shared historical roots, related enterprises, common members or artefacts, geographical proximity and so forth. For example, a constellation can comprise a factory or a school (Wenger 1998:127). Suggested examples of communities of practice and constellations of more relevance for prehistory and, more notably, the Neolithic, can be found in
Hallgren (2008:31pp). Here, the artefacts associated with the Funnel Beaker Culture (e.g. funnel shaped beakers, clay discs and polygonal battle axes) are perceived as the products of craft traditions reproduced in different communities of practice within local groups. The members of these groups further participated in a number of other communities of practice associated with e.g. other forms of craft, communal chores and meals within the contexts of the household, hunting expeditions, herding, ritual practices such as burials, and so on. Some of these may have included specific age or gender categories, whereas other communities, such as those associated with burials at a specific site, were based on geographic proximity. In a wider sense the similarities in the material culture of TRB contexts in different regions can, according to Hallgren, be regarded as representing a wider constellation including several local communities of practice. However, this does not necessarily imply that the elements of these communities of practice always had the same meaning; meaning is reproduced within the social context of each community and may thus differ within the constellation (Hallgren 2008:31pp, cf. Wenger 1998:129p).

Identity constitutes another central concept within Wenger’s practice theoretical framework. Communities of practice are not the same thing as identities, which are constructed through broader processes of identification: “We define who we are by negotiating local ways of belonging to broader constellations and of manifesting broader styles and discourses” (Wenger 1998:149). However, as identity is formed through participation in social practices, it emanates from communities of practice. It thus constitutes lived experience in a social context: “Building an identity consists of negotiating the meanings of our experience of membership in social communities” (Wenger 1998:145). Naturally, not only the practices in themselves but also the associated repertoire, i.e. including material culture, are central in identity formation and negotiation. Further, Wengel emphasises how identities are both temporal and multifaceted.

Identity is not only culturally but also historically anchored, it implies and builds on a sense of shared history of practice. The material culture, as well as other parts of the repertoire, of a practice plays a central part in the emergence and manifestation of this historicity (Wenger 1998:153). Further, ritualised practices have an inherent high potential for identity formation in this respect, since they convey a sense of relating to the practices of others and thus connect past, present and future: “Rituals connect local practices and identities to other locations across space and time” (Wenger 1998:183, cf. Berggren 2010; Nilsson-Stutz 2010). Ritualisation can, if following the practice oriented theories of Catherine Bell (1992:89pp, 2007), be understood in terms of the distinguishing of certain practices from others. Ritualised acts are thus made privileged, and often powerful, and constitute central arenas for establishing relations between people, places and things. Further, ritualised practices are, in line with the concept of the habitus, perceived as creating rather than symbolising meanings.
If returning to the perspective of Neolithic food culture, a number of different communities of practice would have surrounded processes connected to food and eating. These would have included cultivation, harvesting, herding, hunting, fishing, preparation of foods, consumption, feasts etc., including different levels ranging from the household to more regional communities (cf. Hallgren 2008). Further, communities of practice associated with production of tools and utensils connected to food culture, in the preserved archaeological record perhaps most prominently represented by pottery craft, should also be included here. Through the engagement in these different communities of practice, perceptions of shared identities have emerged.

In the multi-dimensional sphere of identities, some would have operated on a regional level within what Wenger (1998) refers to as constellations, whereas others were highly local. Further, since identities are generally situational, different notions of identity were made conscious and articulated depending on the context of social interaction. Probably, some regionally common activities, food cultural or other, were rarely associated with a regional sense of identity, but could become manifested in the interaction with similar communities of practice from other groups within a constellation. Other practices, especially within ritualised contexts, were inherently referential to other communities across both space and time. In both cases, the material culture constituting parts of the repertoires of different practices played an important part in the communication of identity both within and between communities. I thus argue that the similarities discerned in some categories of material culture, which have formed the basis for the different traditional archaeological cultures, have in part been of conceptual relevance in prehistory as well (cf. Hallgren 2008 and Sjögren 2010 regarding the TRB). However, we should not perceive these regional identities as the only, or necessarily the most prominent, form of social identification. Consequently, we cannot regard the material assemblages, the communities of practice or the archaeological cultures as bounded entities.

**Food cultural realities and representations in identity formation**

In the following section, I will draw attention to some of the more regional and interregional identities, and communication of commonality, from a food cultural point of view. We know from isotope and other archaeological data that the food culture of the Middle Neolithic in several regions and cultural contexts included communities of practice surrounding maritime hunting and fishing. However, it is on the eastern PWC sites that marine food sources are most prominently represented in the dietary record. These elements are further elaborately manifested in ritualised practices and materiality, such as the suggested “seal altar” at Ajvide, Gotland (Österholm 1989) and the presumed seal-human figurine from Jettböle on the Åland islands (Storå 2001) (Fig. 13). Such an emphasis can further be seen in the extensive PWC sites which both geographically and conceptually relate to the coast. Together with the prominence of marine resources in the diet this
implies that the identity as seal hunters, emerged through the communities of practice and deeply rooted in the habitus, was central within these communities. In other words, the most important food cultural reality reflected a central representation. I propose that the maritime associated communities of practice did not constitute any central basis for identity formation in the other discussed contexts from Öland and Scania, where we have to look elsewhere to find such practices. Here, maritime hunting and fishing constituted a part of the food cultural realities that was not elaborately manifested on the level of representation. It should be noted, though, that Hallgren (2008:128) suggests that the northern Funnel Beaker Culture communities identified themselves, and were identified by others, as seal hunters in the interaction with southern, more agriculturally oriented TRB groups, an assumption I find no reason to dispute.

In the previous section on Neolithisation, I discussed how, although the concept in itself does not require the presence of agricultural activities, the practices and products of cultivation and keeping of livestock seem to have been central in the conceptual world of different communities in the Neolithic of southern and central Sweden. The exception is the PWC communities by the Baltic Sea. The isotope data from Alvastra and Falbygden, altogether implying a land based protein intake, suggests that domestic animals and, to a lesser extent, cultivated plants constituted central parts of the diet, possibly together with wild game and vegetabilia. At Resmo, terrestrial resources, i.e. most probably including domestic species, have been consumed to varied extents throughout the Middle Neolithic, during MN B in some cases altogether dominating the dietary strategies. A similar pattern, although with a higher reliance of terrestrial foods, is evident from the Scanian BAC burials. Other archaeological indices of livestock and cultivation, such as faunal remains, charred seeds and impressions in pottery, are present to varied extents throughout the TRB and BAC contexts and areas of distribution (e.g. Malmer 1962, 2002; Hulthén & Welinder 1981; Welinder 1998; Segerberg 1999; Hallgren 2008). However, if inferences on the dietary reliance of agricultural products based on isotope studies are somewhat problematic, they will be even more tentative in the absence of such data. Here, it will suffice to say that communities of practice related to

Figure 13. Clay figurine from Jettbøle, Åland, possibly representing a merge of anthropomorphic and seal characteristics. Picture not to scale (Burenhult 1999:330).
livestock and horticulture have probably been present in more or less all communities that we associate with the TRB and BAC. However, the extent of these practices has varied, and the yielded products have consequently not always been the most fundamental for the subsistence. On the other hand, there are several indications of such products being consumed and displayed in specific contexts which can often be interpreted as representing ritualised practices. These include e.g. deposits of burnt domesticate bones outside megalithic monuments (Sjögren 2003), sheep/goat bones recovered from BAC burials (Malmer 1962, 2002), and the presence of deposited domesticate bones and carbonised seeds in Danish and Scanian palisade enclosures (Andersen 1997; Brink 2009). Here, it is also worth mentioning the recently discovered deposits of large quantities of charred cereal grains at the Early Neolithic TRB site Stensborg in Södermanland, eastern central Sweden (Larsson & Broström 2010). Hence, we can plausibly include ritualised activities among the different communities of practice associated with agriculture, and the associated products have formed prominent food cultural representations. Especially within the TRB, agriculture seems to have comprised a phenomenon around which notions of shared identity emerged even among groups where the nutritional importance of domesticates were no more substantial than, and sometimes probably inferior to, marine or other wild resources. Some of the foremost practices through which these identities formed, I argue, were of ritualised character.

As noted above, ritualised practices can be prominent promoters of identity formation. Naturally, food culture did not constitute a central aspect of all Neolithic ritualised activities, nor all communities of practice or identities. However, I suggest that it does play some part in many different processes of identity formation, and it further represents an aspect that can often be reached in the archaeological record. I have already discussed identity in relation to the overall dietary patterns implied in the isotope data, as well as the importance of agricultural practices and products in ritualised contexts. However, some other food cultural practices on the level of representation are worth mentioning, one of which can be directly elucidated by stable isotope data: the meanings associated with wild boar in PWC contexts.

Pig bones have been recovered in large quantities on several PWC sites, including Korsnäs (Aaris-Sørensen 1978) where it constitutes the second most common species, after seal. Further, pig mandibles, tusks and tooth beads are common in PWC burials at Gotland (Ekman 1974; Janzon 1974) (Fig. 14), and beads and pendants of tusks and teeth from the animal have been identified at Korsnäs, albeit not in burial contexts (Sjöling 2000). In Paper I it is argued that the pig bones at Korsnäs are likely to represent wild (or possibly feral) animals on the basis of their diet, as discernible in the isotope data. Pig bones from Köpingsvik (Paper II) as well as Västerbiers, Gotland (Eriksson 2004) display a similar pattern. Further, the prominence of wild boar indicated in the archaeological record has no apparent connection to any nutritional importance, since the analysed humans from Korsnäs,
Köpingsvik and Västerbjerks all have subsided on predominantly marine resources (Papers I and II; Eriksson 2004). It is therefore suggested that wild boar may have been hunted in order to be consumed and/or sacrificed in connection with feasts. Communities of practice associated with wild boar hunting and consumption thus seem to belong within the sphere of ritualised activities. I propose that a common identity as wild boar hunters is thus implied in several PWC contexts, and the food cultural importance and manifestation of this animal is to be found on the level of representation.

Among the Neolithic food cultural practices in ritualised contexts, it is further worth mentioning the crushed pottery and burnt domesticate bones found by the entrances of megalithic tombs (e.g. Persson & Sjögren 2001; Sjögren 2003; Janzon 2009). The pottery is likely to represent vessels originally including some kind of foods or liquids. One may wonder whether feasts were held outside the tombs, where perhaps some of the contents of these vessels and the flesh of domestic animals were intended for the deceased members of the community. Regardless, the widespread distribution of these depositions implies that they both led to, and referred to, a common sense of identity on a regional level. The BAC ceramic vessels, which further adhere to strict stylistic conventions, can similarly be regarded as reflecting a regional identity, partly rooted in ritualised practice. Åsa M. Larsson (2009:247 pp) argues that the small BAC beakers were mainly intended for holding beverages, although she admits that this is a somewhat tentative
interpretation given the data at hand. Regardless, the beakers are likely to have included some kind of food, whether solid or liquid. Since the beakers are most commonly found in funerary contexts (e.g. Malmer 1962), these foods would probably have been consumed and/or deposited in connection with the burial ritual, the remarkable uniformity of which is indicated e.g. in the grave construction and inventory. Again, a regional sense of shared identity seems to have been evoked through the participation in ritualised practices with highly standardised repertoires, although the potential role of food culture in this process is rather elusive. Finally, perhaps the large assemblages of pottery on several PWC sites can be understood in terms of food cultural ritualised practices leading to identity formation. If so, this identity also seems to be of a more regional character, referring to similar communities of practice within a geographically dispersed constellation by the Baltic Sea.

Dietary continuity and change

The inherent potential of Bourdieu’s theory to approach aspects of both continuity and change through the concept of habitus can be employed within the context of the Early and Middle Neolithic economies of southern and central Sweden. The fact that marine resources were continuously utilised alongside agricultural products in some regions for what seems to be considerable periods of time may be understood in terms of the rootedness of practices associated with hunting and fishing in the habitus of the societies in question. The new, agricultural, practices became incorporated into the habitus without any need to exclude the previous ways of life, anchored in the social memory. People may have identified themselves as farmers, but that did not necessitate the abandonment of marine resources as food cultural realities. Subsistence practices apparently comprised highly durable elements of the social structure. The tenacity of dietary traditions is further evident in intra-individual isotope data from several sites, where pronounced, or even moderate, dietary changes during the course of life are rare (see e.g. Papers II, V and VI). Indeed, where they do occur, in Middle Neolithic Resmo, they are almost exclusively associated with residential change (Paper III). However, it should be noted that the MN B phase in Resmo is characterised by a turbulence in dietary patterns between individuals as well, preceding the “settling” into a homogenous, terrestrial food intake during the Late Neolithic. By this time, something had clearly happened within the habitus, where marine, and perhaps all kinds of wild, resources were no longer regarded suitable for extensive utilisation.

The cultural change that marks the emergence of the Pitted Ware Culture in the coastal regions of eastern central Sweden may also be approached from the perspective of the habitus. As noted above, wild resources seem to have been central within the economy of the TRB in this region, and the abundance of e.g. seal bones on TRB sites imply that maritime hunting may have constituted one of the foremost food cultural practices on the level of
subsistence. Further, as Hallgren (2008) has suggested, an identity as seal hunters may have been articulated in the interaction with southern communities, and the northern TRB constitutes a regionally specific tradition within the larger constellation of the Funnel Beaker Culture. The identity as farmers, to a somewhat limited extent incorporated into the food cultural realities, and the materiality and traditions adhering to the Neolithic “package” of communities in the south, were not easily incorporated into the habitus of these northern societies: the world of ideas and the practices of everyday lives did not harmonise (cf. Stenbäck 2003). Although upheld for a number of centuries, this discrepancy eventually came to the fore, and the doxic knowledge became challenged. Here, the resulting change in the structure was a renewed emphasis on the wild, whereas agricultural ideals and practices were more or less abandoned. On the subsistence level, many of the practices remained the same since maritime resources were continuously utilised, although the identity as seal hunters became increasingly manifested. Further, other aspects of the structure such as settlement pattern, pottery traditions, burial practices, and the emphasis on the level of food cultural representations, were transformed. In this perspective, the maritime food culture of the PWC can thus be perceived as sprung from a process of internal innovation rather than a regression imposed by external factors.

Up until this point, references to the different Neolithic cultures have focused on the singular, where the TRB, PWC and BAC have been treated separately as constellations of some, but far from exclusive, relevance for the formation and manifestation of situational identities. Further, the discussions on identity have concerned perceptions of commonality. However, the relation between the different cultures, where they appear simultaneously, has not yet been addressed. The following section will approach this issue, again from a food cultural perspective. The starting point reflects the recognition that identity formation is not only a process of manifesting affinity; it also includes the perceptions and articulations of difference.

Identity as difference

Discussions concerning the Neolithic cultures have predominantly focused on their chronological relationships in any given region, and on whether or not they represent different groups of people. The assumed “groups of people” have been perceived in different ways throughout the history of archaeology, e.g. in terms of immigration (e.g. Almgren 1906, 1914; Rydbeck 1930; Forssander 1933; Oldeberg 1952; Stenberger 1964; in a Danish context, see Kristiansen 1989), genetics (Linderholm 2008; Malmström et al. 2009, 2010), different economies (e.g. Welinder 1998; Malmer 1962, 2002; Lidén & Eriksson 2007), mobile versus sedentary lifestyles (Knutsson 1995), and social status (e.g. Edenmo 2008). Since the TRB and PWC are generally considered as successive (e.g. Browall 1991), discussions on cultural duality have predominantly, but not exclusively, concerned the relations between the PWC and the BAC. Further, a number of authors have questioned the validi-
ty and appropriateness of associating the Neolithic archaeological record, and our constructed cultures, with different groups of people of any form (e.g. Carlsson 1998; Strinnholm 2001; Werbart 2002; Gill 2003, Svensson 2006; von Hackwitz 2009, 2010). From the perspective of social relations, which is the main focus here, the theme of ethnic identity as approached from a practice oriented perspective has been applied in recent approaches to the topic at hand (e.g. Larsson 2006; Hallgren 2008; Larsson 2009). Such discussions constitute the path taken in the following, primarily in relation to the Neolithic of Öland.

As already pointed out, I argue that these Neolithic cultures can in some respect be regarded as constellations, the practices within which have given rise to a sense of shared identity, of situationally perceived commonality. However, identity is also about defining what one is not. Ethnicity is one of the aspects of identity that most prominently embarks from the manifestation of difference (e.g. Barth 1969; Jones 1997). Further, although sometimes constituting a marginal aspect of self-conceptualisation, ethnic affiliation can become one of the most articulated parts of the identity. Here, I define ethnic identity following the rather broad definition of Siân Jones as “that aspect of a person’s self-conceptualization which results from identification with a broader group in opposition to others on the basis of perceived cultural differentiation and/or common descent” (Jones 1997:xiii). As such, ethnic identity can be understood as the foundation of a person’s most basic, general identity (Barth 1969:15), thus often perceived as primordial, although it may be just as situationally made conscious and articulated as other aspects of identity. From this understanding of ethnic identity follows that an ethnic group can be defined as “any group of people who set themselves apart and/or are set apart by others with whom they interact or co-exist on the basis of their perceptions of cultural differentiation and/or common descent” (Jones 1997:xiii).

The social anthropologist Fredrik Barth was among the first to, in the introduction to the edited volume Ethnic Groups and Boundaries (1969), suggest an understanding of ethnicity that went beyond the primordial, or essentialist, perceptions of ethnic groups as bounded entities which could be studied more or less in isolation. According to Barth, ethnic affiliation emerges through the interaction with other groups and is thus characterised by the perception and articulation of self-ascription as well as difference. Ethnic groups thus constitute a form of social organisation rather than cultural units and include no fixed boundaries. Further, although ethnicity forms the basic identity, it can be of varied importance and prominence in different cultural contexts. Ethnic categories “may be given varying amounts and forms of content in different socio-cultural systems. They may be of great relevance to behaviour, but they need not be; they may pervade all social life, or they may be relevant only in limited sectors of activity” (Barth 1969:14).

The theories of Barth had profound consequences for studies of ethnicity, not only on the conceptual level of what ethnic groups entail, but also regarding how to identify ethnic groups through material culture. Firstly, according to Barth, increased cultural specificity does not equal isolation, but
can rather imply increased interaction between ethnic groups. Secondly, since only parts of the material culture are actively used in the communication of ethnic identity, and since the symbols of ethnic affiliation can further vary and be more or less important to manifest in different social contexts, one would expect similarities in parts of the material culture transcending ethnic groups. Since ethnic identity forms in the process of contact and interaction, there can be a flow of material objects as well as people between groups of different ethnic affiliation, and the ethnic groups will still persist (Barth 1969).

But how do these perceptions of ethnic affiliation emerge? What constitutes this perceived “otherness” from others, and where is the sense of commonality within ethnic groups created? Barth (1969:19p) takes on an ecological perspective, discussing how ethnic groups may, for example, occupy different niches in the natural environment of the same area, or monopolise separate neighbouring territories, where ethnicity thus can transcend economic differences. These differences lead to varied forms and scales of interdependence and thus also to different ways of, and forums for, articulations of ethnic ascription. This perspective of Barth’s is a natural consequence of his primary focus on ethnic boundaries rather than cultural content. Barth’s instrumentalist approach to ethnicity has, however, been criticised for neglecting the role of culture and giving too much room for individual choice (e.g. Bentley 1987; Jenkins 1997; Jones 1997). According to Barth (1969:11), the sharing of a common culture should be regarded as a result of, rather than a prerequisite for, ethnic group organisation. However, Barth himself reconciles the precedence given to ethnic boundary over cultural content in Ethnic Groups and Boundaries in a later work, clarifying that ethnicity indeed constitutes the social organisation of culture difference (Barth 1994).

In order to understand what this culture difference constitutes, we can again return to the concept of habitus, and approach the works of Siân Jones (e.g. 1996, 1997, cf. Jenkins 1997). According to Jones, ethnicity, as all forms of social identity, is rooted in the practices of everyday life, and thus in the habitus. Hence, although constituting social constructions, ethnic groups are built upon real, historically situated cultural practices, and the manifestations of ethnic ascription will be derived from these habitual practices and experiences. However, in line with the theories of Barth, Jones perceives ethnicity as dependent on the interaction with other groups; in the encounter with other cultural traditions, the existing common practices within the group, and the doxic knowledge they entail, become recognised and transferred to a reflexive mode of perception. Where this leads to the systematic communication of cultural difference, ethnic categories emerge (Jones 1997:95). Further, the situational and dynamic nature of the articulation and communication of ethnic identity, as well as the flow of people and material objects across ethnic boundaries, are acknowledged and emphasised by Jones (cf. Hylland Eriksen 1993; Jenkins 1997; Dietler & Herbich 1998). Richard Jenkins (1997) takes a similar stand to that of Jones regarding the role
of culture in ethnic identity, arguing that the formation of ethnicity, as an ongoing, everyday process, is rooted in the primary socialisation of an individual, i.e. in childhood.

If following the line of reasoning of e.g. Barth and Jones, there are apparent problems associated with attempts to identify ethnic groups in the archaeological record by means of differences in the material culture. Further, due to the situational and communicative nature of ethnicity, the concept cannot be applied as a universal category of explanation of the different Neolithic cultures. We can, I argue, identify a commonality in some of the communities of practice within each culture and thus discuss them in terms of constellations. These commonalities may have given rise to perceptions of shared identity, made conscious and articulated in specific contexts of practice and interaction, but this cannot be directly translated to notions of ethnic groups. Ethnicity would probably not have formed a central part of self-conceptualisation in all Neolithic societies in question. Further, if discussing the relation between the Neolithic cultures, ethnicity can only constitute a possible category of definition where two cultures are present at the same time and place. Naturally, there may be other groups of people vis-a-vis ethnic affiliation was communicated that we cannot discern in the fragmentary bits and pieces of prehistoric societies that we as archaeologists have access to, just as well as several ethnic groups may be present within, or transcend, one Neolithic culture. Does this mean that it is futile to even attempt to discuss Neolithic, or indeed any prehistoric, societies in terms of ethnicity using the definition and understanding of the concept outlined above? I propose that it may not be, and that, where the contexts of such studies are well defined and not too generalising, it may further be a highly relevant enterprise. Although archaeologists through time have had a tendency to over-emphasise difference and created bounded entities instead of dynamic societies, this does not automatically mean that prehistoric people have not communicated, or perceived themselves in terms of, differences towards others at the level of self-conceptualisation. The key, as I see it, to the study of ethnicity in prehistory lies in the rootedness of ethnic ascription in the habitual practices of everyday life.

If ethnicity cannot be reached solely by searching for patterns in the material culture, I suggest that we may focus not only on these materials but also on the very practices behind them, which give rise to perceptions of ethnic identities. A practice oriented approach to ethnicity in a Neolithic context has previously been applied in the interpretation of the TRB in central Sweden as articulating ethnic group identity in relation to groups traditionally associated with the northern Swedish “Slate Culture” (Hallgren 2008, cf. Graner & Karlenby 2007). The relation between the central Swedish Battle Axe Culture and Pitted Ware Culture has also been described in terms of ethnic groups on the basis of different practices and conceptualisations surrounding pottery craft and dealing with the dead (Larsson 2009). Since the main focus here is food culture, I will start out from the perspective of subsistence and dietary patterns, as reached through isotope analysis. A
number of everyday practices concern food culture, granting it a central role in the habitus. As such, it can give rise to articulation of commonality and difference on a fundamental level of self-conceptualisation. However, as stated by Barth, ethnic groups may or may not be centred around economy, so it is problematic to base inferences on ethnic affiliations solely on observed dietary difference. Apart from observed variations in everyday dietary practices, we also need to be able to identify manifestations of difference in the material culture, and preferably in other social practices as well. Material culture communicating ethnic ascription will constitute parts of the repertoires of the practices through which ethnic identities are emerged and articulated. Further, there are two fundamental criteria which need to be fulfilled before starting to discuss ethnicity; in order for interaction promoting construction of ethnic group identity to take place, the studied “groups” must be contemporary, and they must be represented in the same, or geographically reasonably close, regions.

In the materials so far analysed with regard to stable isotopes, these stipulated demands are only met on Middle Neolithic Öland (Paper II). Here, individuals from the PWC site Köpingsvik and the Resmo passage grave yielded approximately contemporary radiocarbon dates spanning more or less the entire Middle Neolithic period (although some dates from both sites stretch into the late Early Neolithic as well, they will in this section, for the sake of simplicity, be referred to as belonging to the MN A phase). The two sites are further situated in relatively close proximity to one another, so we should assume that confrontation and interaction took place. The rather modest size and natural delimitations of Öland makes it a convenient area to study in this respect, although its character have by no means promoted insularity, just as the Neolithic cultures present have never constituted isolated “cultural islands” (cf. Hylland Eriksen 1993). The sulphur and strontium isotope data from Resmo (Papers III and IV) indicate that the majority of the MN A individuals were of local origin, together with a number of individuals from MN B, although there is a high representation of people spending at least the early parts of their lives outside Öland during the later period. The data from Köpingsvik is inconclusive as regards geographic origin due to the marine diet of the individuals, but the rather homogeneous values displayed may indicate an absence of exploitation of marine resources from outside the confines of the Baltic Sea. This is, however, a somewhat tentative hypothesis. The MN A individuals from Resmo chronologically correspond with the general megalithic tradition of the Funnel Beaker Culture. Considering the MN B individuals, we should not attempt to put a “cultural label” on the interments from this period. It is worth mentioning that a few BAC associated artefacts have been recovered from the chamber (Papmehl-Dufay 2006), and such a presence is attested in a possible stone cist at Köpingsvik as well (Schulze 2004; Papmehl-Dufay 2006). Further, the MN B dates from Köpingsvik in all but one case represent disarticulated remains retrieved from the cultural layers, and the only included burial from this period (Grave 4 or 5, see further Schulze 2004; Papmehl-Dufay
lacks burial gifts. Although we can still distinguish two different traditions of dealing with the dead at MN B Resmo and Köpingsvik, there are evidently some need for caution to bear in mind when discussing cultural or ethnic affiliations among these individuals.

Although the isotope data reveals that marine resources have been exploited among the individuals from both sites, there is no overlap in the values from Köpingsvik versus Resmo since it is only at the second site that a mixture of marine and terrestrial protein intake is indicated in the values. There is thus an evident difference in the dietary practices between the sites, accompanied by different practices concerning dealing with the dead and associated material culture. This is most evident during MN A, where the dietary patterns at Resmo are rather homogenous and practices surrounding the megalith have included not only burials but also depositions of fragmented pottery at the entrance to the tomb (Alexandersson 2005). In conclusion, I suggest that the combination of differences in the practices of everyday life (diet), ritualised practices (burials) and the material culture (predominantly burial forms and pottery) between the sites can be interpreted in terms of two groups of people experiencing themselves as, and manifesting, different ethnic groups. During MN A, where these differences are most apparent and further reflect practices and material culture paralleled in other regions, these groups of people can be discussed in relation to our cultural constructions of Funnel Beaker Culture versus Pitted Ware Culture. Although none of these categories can be argued to represent large scale ethnic groups, it is quite possible that in the confrontation and interaction with each other, the people at Öland drew on, and emphasised, the notions of shared identities as megalith building farmers versus coastal seal and boar hunters from within the two suggested constellations of TRB and PWC. As the discrepancies between the habitus of the two groups became recognised, and the doxic knowledge came to be reflected upon, the common practices within the respective group were more or less consciously perceived in terms of shared cultural affiliation as well as differences from the other group and its practices. As the ethnic ascriptions thus emerged, the manifestations of difference were accompanied by an increased emphasis on affinity with groups in other regions engaging in similar practices and associated material culture. The loosely knit shared identities within the constellations we categorise as TRB and PWC were thus, on Öland and perhaps in other, but far from all, contexts, transferred to a more basic level of identity – that of ethnicity, or with the words of Jones (1997), of “perceptions of cultural differentiation and/or common descent”. This does not mean that interaction between the two groups did not take place; interaction constitutes a prerequisite for the emergence and persistence of ethnic groups, but burial practices as well as some of the most basic practices of everyday life remained different. However, among the potential communities of practice transcending this ethnic boundary, we may find joint enterprises connected to seal hunting. Indeed, the dietary data suggests that the food cultural differences were perhaps most prominently experienced in terms of the absence or presence
of agricultural related practices. Seal hunting seems to have taken place within both groups, although at Resmo the identity as seal hunters was secondary to the farming identity.

As regards the MN B period, there may be similar processes of ethnic group ascriptions at work between the communities using the Köpingsvik and the Resmo site, although we can naturally not discuss the Resmo individuals from this period in relation to the constellation of the TRB. Further, the picture is less clear during this phase in several respects. Firstly, we do not have any other similar megalithic contexts to compare with, since this intense MN B burial activity is as of yet not attested anywhere else. A second call for caution concerns the diversity in dietary practices among the MN B Resmo individuals, suggesting that even though there is no overlap with the Köpingsvik individuals from the same time, there is neither any commonality in the practices surrounding the food cultural realities comparable to that of the MN A phase. Thirdly, a number of the Resmo individuals have moved into Öland during a late stage in life, so in several cases we cannot reconstruct the dietary pattern, i.e. the habitual practices of everyday life, of these individuals during the time spent on the island. The MN B Köpingsvik individuals, on the other hand, with one exception display homogenous isotope values in line with a predominantly marine diet similar to that of the MN A phase. However, the fact that these individuals predominantly represent disarticulated remains recovered from the cultural layers should be kept in mind. To sum up, there are apparent differences in dietary as well as burial practices between MN B Resmo and Köpingsvik which could reflect the presence of different ethnic groups, although this interpretation is clearly more tentative than that for the MN A period.

If critically evaluating the suggested ethnic identities on Öland during the Middle Neolithic, there are some problematic issues that need to be highlighted and discussed. Apart from the critique surrounding the relevance of the concept in relation to the Neolithic cultures, it has been argued that ethnic identity is a modern invention, and as such hardly applicable to prehistoric societies (e.g. Werbart 2002; Hillerdal 2009). Emberling (1997) places the emergence of ethnic groups in the context of early state formation, since they are perceived to exist in relation to a larger sociopolitical system. However, if moving away from the instrumentalist notion of ethnic identity as connected to some form of interest groups (e.g. Barth 1969) and instead applying the broad, practice oriented definition of Jones, I argue that the concept of ethnicity can indeed be approached in relation to Neolithic societies. All analytical classifications have their flaws, including both ethnic groups and cultures, and the best way to circumvent this problem is to clearly account for one’s definitions and to recognize these classifications as the academic constructs that they are.

Inherent in the perception of ethnicity as formulated by e.g. Jones is a presumed high degree of dynamism and fluidity in the adherence to, and communication of, ethnic identity. This is by no means an erroneous presumption; such dynamism is attested in both anthropological and archaeo-
logical studies (e.g. Barth 1969; Hodder 1982; Jones 1997). People may change their ethnic affiliation during the course of life, and the materiality through which these affiliations are manifested can vary between different contexts of social interaction. In this respect, the Öland material seems remarkably, and suspiciously, rigid. Could it really be that specific ethnic identities on Öland have prevailed for hundreds of years? And if so, is it really possible that the communication of these ethnic affiliations has taken the same form throughout all this time? Here, it is worth reiterating some of the above mentioned archaeological facts: there are differences in the burial practices and associated material culture between Resmo and Köpingsvik during the Middle Neolithic. The individuals buried at the two sites have had different dietary practices; there is, with only one exception from late MN B Köpingsvik, no overlap at all between MN Resmo and Köpingsvik in the carbon and nitrogen isotope data, and these differences are evident throughout all age categories represented in the analysed samples. The two sites are contemporary during an interval of several hundred years; this is evident from the substantial set of radiocarbon dates. Further, the sites are located in such close proximity that the people using them must have known about, and most probably interacted with, each other.

Are there better ways of understanding these observations outside the context of ethnicity? One could argue that we rather have before us the remains and manifestations of different social groups within one and the same community. However, if the suggested homogenous, long term perception and communication of ethnicity seems too rigid an explanation, this is arguably even more so the case for such explanatory models. These social roles, or statuses, would generally have remained unchanged throughout life, as the intra-individual isotope data, at least from MN A, displays no signs of individuals changing their general dietary practices from that of one group to the other. The pronounced intra-individual dietary changes observed among the Resmo individuals from MN B seem, in all but one case, to correspond with residential change rather than taking place within the confines of Öland. As implied in data from deciduous teeth, these social roles would have been inherited from birth, as teeth formed during breastfeeding indicate the diet of the mother. Further, although the sex of the analysed individuals from Resmo and Köpingsvik has not been determined, one may assume that both men and women are represented in the material. In my opinion, explanations in terms of social roles fall short in this respect. Another problem concerns how to draw the line as to where these social groups start to perceive themselves as ethnically different, especially where these differences are deeply rooted in the central practices of everyday life that food culture constitutes. One way of getting around this dilemma may be to discuss these social groups in terms of status and hierarchies, but that does not resolve more easily the outlined problems of rigidity and longevity of dietary difference than other social group explanations. Further, with such an explanation we again run the risk of reducing the PWC associated individuals to some place in the social margin, not able or allowed to make
use of the land or keep their own live stock. I doubt that anyone would turn the roles around and suggest that the partly farming individuals adhering to the burial practices and materiality of the TRB were of lower status than the more or less full time seal hunters buried at Köpingsvik. Ethnic identity, on the other hand, generally transcends age and gender categories as well as social status, although there is no universal formula for what constitutes an ethnic group (cf. Damm 2010). As such, not only does this perspective seem more in line with the data at hand, it also includes the recognition that an ethnic affiliation with what we call the Pitted Ware Culture does not need to be socially or economically inferior to other ethnic groups (cf. Papmehl-Dufay 2006). Of course, the interplay between different ethnic groups may be characterised by control over resources, and ethnicity can be the result of an external categorisation by other groups aiming at maximising their own benefits. It has thus been argued that the dynamics between hunter-gatherers and coeval farmers cannot a priori be understood solely in terms of people refusing to adopt agricultural practices. This process can also be about exclusion and stigmatisation where some groups are not allowed, or able to, engage in these practices (Damm 2010:21). However, I detect nothing that supports this idea of social and economic stigma in the PWC contexts at Öland, nor in other regions. Indeed, the maritime hunting economy rather seems to be emphasised in the materiality and site localisation in PWC contexts, and it is quite possible that this hunting identity constituted a positive force in the self-conceptualisation rather than an externally imposed restraint.

Within the field of practice theory as applied in archaeology, there is a tendency to focus on change, in practices as well as associated material culture. However, as argued above, the concept of habitus and the embodied practices it connotes also presents possibilities to approach aspects of long term continuities and traditions (cf. Bradley 2002:11p regarding continuity in material culture). This potential has been emphasised and applied by e.g. Åsa Berggren (2010) in her study on the long continuity of Neolithic ritualised practices surrounding the Hindby fen in Scania. According to Berggren, the inertia built into embodied practices may explain how they can be maintained for considerable time spans. The social memory built into the habitus of the same practices can further promote their persistence, although the meanings they give rise to may change. This perspective can shed light on, for example, the continuous use of the Alvastra dolmen for several hundred years. Berggren predominantly focuses on ritualised activities, but I argue that the embodied practices of everyday life can be understood in the same way. The tenacity of Neolithic dietary practices has already been discussed, and if the suggested ethnic ascriptions on Öland are, at least in part, sprung from differences in the food cultural practices, this may explain why they are so persistent. Similarly, the apparent longevity in the ritualised traditions of dealing with the dead may be understood in terms of the inertia of embodied practice and social memory. Within this social mem-
ory, the perceptions of ethnic ascription may have further added to the reproduction of the same food cultural and ritualised practices.

During the later part of the Early Neolithic to MN A on Öland, apparently some people chose to embrace the materiality and practices associated with the Pitted Ware Culture, whereas others preferred to adhere to the megalithic traditions and farming identity of the TRB. In other regions, the main traits associated with the TRB disappears from the archaeological record with the appearance of the PWC (cf. Browall 1991), implying that the transition from the TRB to the PWC entailed a more all-encompassing abandonment of megalithic traditions, parts of the material culture and, at least in some contexts, agricultural practices.

Here, it is worth commenting on the Alvastra Pile Dwelling and its relation to the nearby dolmen. The Alvastra Pile Dwelling constitutes a wooden construction of remarkable preservation, situated in the Broby mire less than 2 km northeast of the dolmen analysed in Paper V. Finds of TRB character as well as abundant PWC pottery, predominantly of Fagervik III character, have been recovered from the site, together with some 700 kg of animal bones and the remains of at least 45 human individuals. The unique nature of the Pile Dwelling, in an archaeological and probably also prehistoric sense, is further attested in the presence of about 40 pre-forms of double-edged battle axes, an artefact type that appears in both TRB and PWC contexts, as well as by the traces of no less than one hundred identified hearths. The animal bones include numerous fragments of domesticated species, and thousands of seeds from cultivated plants have been identified (Browall 1986, 2003, 2011; During 1986; Göransson 1995; Malmer 2002). The site has been interpreted as representing the transition between the Funnel Beaker Culture and the Pitted Ware Culture in the area (Browall 1991; Carlsson 1998). This transition is supposed to have constituted a rather swift event, as the dendrochronological dating of logs from the site implies a 42 year construction phase, with an emphasis on the first 18 years of this sequence (Malmer & Bartholin 1983; Browall 1986). The longevity of this construction, or of the supposed transitional event, is, however not entirely clear, and Browall (2011:390p) mentions that radiocarbon dates, yet to be published, from 29 human individuals imply a longer period of activity at the mire.

In Paper V, it is suggested that the Alvastra dolmen and the Pile Dwelling are connected on a conceptual level in the respect that they occupy the same ritualised space, where people using the dolmen also included the mire in their ritualised practices before, and perhaps simultaneous to, the construction of the Pile Dwelling. The importance of the Alvastra region as a central place, at least in connection to ritualised activities, during the time period leading up to the construction and use of the Pile Dwelling, is attested in the varied sulphur isotope values from the dolmen, implying dispersed geographical origins among the interred. Further, the radiocarbon dates suggest that the dolmen was still in use for burials when the Pile Dwelling was built. The Pile Dwelling can thus be perceived as complementing rather than substituting the dolmen in the ritualised space and practices. These aspects may
strengthen the hypothesis that the Alvastra Pile Dwelling marks an internal transition from the TRB to the PWC, although it is unclear how swift this transition was. With this follows, that it is still an open question whether there was any period of duality between the practices and materialities associated with the two cultures similar to, albeit more possibly momentaneous than, the conditions on Öland. From a food cultural perspective, the introduction of the PWC at Alvastra does not, as far as we know, seem to correspond to any significant economic change; the Pile Dwelling presents a multitude of evidence for agricultural practices, implying that domesticated resources were prominent on the level of representation. As regards dietary practices, the only published data from the Pile Dwelling constitutes a few stable carbon isotope values indicative of a terrestrial protein intake (Sælebakke & Welinder 1988). However, according to Browall (2011:413p), the 29 unpublished radiocarbon dated individuals all display values indicative of a land-based subsistence. This is not surprising given the inland location, deviating from the overall pattern of larger coastal sites within the PWC. As there are no published nitrogen isotope data from the Pile Dwelling, we do not know whether the terrestrial diet, i.e. the food cultural realities, was similar to that of the dolmen individuals. With the data at hand, we thus cannot know whether the new practices and material culture associated with the PWC at Alvastra were accompanied by an economy or identity as (terrestrial) hunters. Following the exposure to, and inspiration from, what Bourdieu (1977:168) denotes “culture contact”, ritualised activities and associated repertoires were modified, whereas the habitual practices of everyday life may have remained more or less the same. The Pitted Ware Culture at Alvastra thus seems to represent something different from the coastal PWC sites. Further, the unique nature of the Pile Dwelling makes the feature difficult to discuss in terms of relations between the TRB and PWC, and we cannot, with the data at hand, draw any conclusions regarding whether the dolmen and the Pile Dwelling were simultaneously used by the same community. To here approach these sites from the perspective of ethnicity would therefore be neither a fruitful nor appropriate endeavour.

Levels of food cultural diversity in the Pitted Ware Culture

Before closing this chapter, some final remarks on the food culture in Pitted Ware Culture contexts by the Baltic Sea are motivated. From the discussions above, these food cultural contexts may appear remarkably homogenous, aligned and conservative. This is, however, not the case when broadening the scope from everyday dietary practices to specific food cultural events. Such events can be reached e.g. through the analysis of lipid residues absorbed into ceramic vessels, where the body of data during recent years has come to include a number of Pitted Ware Culture materials from different sites and regions. These sites include Trössla, Överåda, Sittesta and Kornsäls in Södermanland (Isaksson 2008; Ohlberger 2009; Dimc 2011), Högmossen, Brännpussen, Snåret and Postboda 1 and 2 in Uppland (Brorsson et al. 2007),
Köpingsvik and Ottenby on Öland (Papmehl-Dufay 2006), and Glaminders on the Åland islands (Papmehl-Dufay 2005a), representing different chronological periods and Fagervik types.

The results from these analyses reveal a diverse pottery use, where the proportions of vegetable, terrestrial animal and aquatic contents, as well as empty vessels, vary between the sites. Traces of vegetables, the low protein component of which results in an under-representation in bone collagen isotope values, dominate the analysed pottery assemblages on several sites. Further, terrestrial animal contents are present in a number of contexts, although aquatic animals (marine or lacustrine) are, as a general rule, more common (see further Isaksson 2009). These differences cannot solely be explained in terms of location or chronology. For example, the two more or less contemporary Postboda sites, both represented by Fagervik II pottery, display differences in vessel use in terms of aquatic versus vegetable contents (Brorsson et al. 2007; Isaksson 2009). At Öland, the Ottenby and Köpingsvik ceramics deviate not only in terms of a much higher representativity of aquatic animals at Köpingsvik, but also as regards technological and stylistic characteristics (Papmehl-Dufay 2006). Resulting from the aimed and deliberate sampling strategy and subsequent analysis of pottery from Korsnäs, an intra-site variation in vessel use has been identified, where lipid residues from aquatic products dominated in one area but were altogether absent in the analysed sherds from an adjacent part of the site (Dimc 2011). Whether this pattern at Korsnäs is the result of chronological variation and/or spatially different practices is not clear. However, it is worth mentioning that some morphological and stylistic variations in the pottery assemblages from the two parts of the site have been identified as well (Dimc & Fornander 2011).

To conclude, the reconstructions of pottery use in these PWC contexts by the Baltic Sea show that although the overall dietary pattern is remarkably homogenous throughout the sites analysed with regard to stable isotopes, the preparation and consumption of foods in ceramic vessels varied on a local, as well as a regional, level. The different communities of practice engaging in these activities seemingly did not adhere to any apparent common regional traditions or ideals within the constellation of the Pitted Ware Culture.
6. Synthesis

In essence, isotope analysis can be perceived as a method for extracting a specific form of source material. As all source materials, the isotope data is thus best understood and most useful when approached in light of the wider archaeological context, where other pieces of this interdependent puzzle are equally important. Herein lies the potential, rather than the limitation, of this methodology, and its relevance within the field of archaeology.

When adding this piece of the puzzle, a picture emerges of a Neolithic food cultural diversity, which can be traced, at least, throughout the Middle Neolithic. To a large part, this diversity cannot be explained in terms of chronological or regional differences, and the continuous inclusion of marine food sources in several contexts transcends not only the Neolithic transition but also the traditional cultural boundaries. The dynamics of food culture, however, seem to operate on different levels. The everyday diet of communities associated with the Funnel Beaker Culture seems to have been, in part, governed by the availability of marine food sources, although agricultural products and practices have probably been important to varied extents among all these people. The same can be said about the MN B individuals from Scania, although the reliance on marine food sources is somewhat lower here. Among the MN B individuals interred in the Resmo passage grave, the food cultural realities further seem to have varied to an extent bordering on the extreme. Although this can in part be explained by the diverse geographic origins among the interred, it still implies that there was far from any coherent dietary strategy during this period in time. In contrast to this diversity, the Pitted Ware Culture contexts, on the Baltic islands as well as in eastern central Sweden, display evidence of a highly durable and homogenous food culture in terms of dietary practices. However, when moving beyond the everyday subsistence pattern as implied in the isotope analyses and instead turning attention to the foods prepared in ceramic vessels, there is an evident food cultural variety which cannot be accounted for solely by regionality, availability or chronology. Neither can the dietary variations evident on Middle Neolithic Öland, from the Resmo passage grave compared to the Pitted Ware Culture site Köpingsvik, be explained in these terms.

Apart from this food cultural diversity, however, there is also an apparent tenacity in the dietary practices which can be understood in terms of the rootedness of these practices in the habitus of the Neolithic societies. From this perspective, we may be able to make sense not only of the continuous traditions surrounding maritime hunting and fishing throughout the Middle
Neolithic, but also of the scarcity of evidence of significant dietary changes taking place during the course of life. Further, from the habitual, social practices emerge perceptions of shared identities, where food cultural realities as well as representations play an important, albeit far from exclusive, part. In the eastern PWC contexts, we see a rootedness in the dietary realities in an emphasised identity as seal hunters, whereas the wild boar seems to have constituted a central focus for identity formation on the level of representation. The food cultural practices surrounding which communities associated with the Funnel Beaker Culture perceived and manifested group affiliations rather seem to have been associated with domesticated products, the nutritional importance of which has clearly varied. To some extent, the situational and multifaceted identities of Neolithic communities seem to have been related to shared practices and materialities within the larger constellations which can roughly be translated into our traditional culture classifications. This is not to say, however, that these cultures signify separate prehistoric groups of people, primordial or privileged identities, or any other forms of bounded entities on a larger scale. Further, as regards the Pitted Ware Culture, it is within the seal hunting communities by the Baltic Sea that this common identity seems to be manifested. On Middle Neolithic Öland, self-conceptualisation further seems to include distinct perceptions of difference vis-à-vis contemporary groups of people living on the island. At least during MN A, the differences in dietary as well as burial practices, and associated material culture, at Resmo compared to Köpingsvik imply the presence of adherence to separate, albeit interacting, ethnic groups, perceiving themselves as culturally different. Here, the affiliations with the wider constellations of megalith building farmers versus coastal seal hunters became central within this ethnic identity. Whether or not similar processes were at work in other geographical or cultural contexts cannot be elucidated on the basis of dietary strategies given the data at hand.

However, Neolithic social relations included much more than the interaction between people. The megalithic monuments, and most likely the large PWC coastal sites as well, formed important nodes in the relations to places and to the past. Often actively used for several generations, the megaliths constituted an arena for invoking and maintaining a genealogical history, a link to the ancestral members of the communities, through different ritualised practices. These places were further central in the mythical history, during the Neolithic and far beyond, although we must keep an open mind to the probability that the monuments in this respect were associated with varying meanings in different Neolithic contexts. At Falbygden, the sense of place evoked in the presence of a passage grave included a relating to a larger whole, represented by the density of monuments within this limited region. However, the people buried in these passage graves seem to represent geographically rather delimited communities, as indicated in sulphur isotope data from Rössberga and Frälsegården (Linderholm et al. 2008; Hinders 2011). Thus, local group identities within this larger whole have been manifested through these tombs. From a methodological perspective, the partly
different picture implied in strontium isotope results (Sjögren et al. 2009) from the Falbygden burials, where there is a somewhat wider range in values, points towards the potential of discussing micro- versus macro-variations in the residential patterns through combining data from these two elements.

When compared to Falbygden, Scania and the west coast of Sweden, both the Alvastra dolmen and the Resmo megaliths stand out as rather solitary occurrences of the megalithic phenomenon. In different ways, they also display some specific characteristics. The Alvastra dolmen is situated in, and constitutes, a ritualised space uniting people from a wider geographic region. The special character of the sense of place here is further evident in the topographical setting, the emergence of the Alvastra Pile Dwelling, and in the plausible inclusion of an ancestor from a mythical past into the chamber of the monument. At Resmo, the as of yet unparalleled extent of the inclusion of the investigated passage grave into the ritualised practices of MN B as well as the Bronze Age constitutes another form of implied specificity. A further distinguished trait of the analysed Resmo megalith is the high representation of mobile, non-local individuals from these later stages in the life history of the tomb. Conclusively, there seem to be different meanings associated with, for example, the densely occurring Falbygden megaliths compared to the more solitary monuments on some levels, although there is no clear link between the Alvastra dolmen and Resmo in this respect. In these diverse megalithic settings, different relations to people, place and past have been evoked.

In retrospect, I hope to have been able to motivate the statement that, at least to a large extent, a specific methodological field of research such as isotope analysis can indeed constitute a fruitful point of departure for the study of social relations. When putting our fragmentary pieces of the puzzle together in search for some understanding of the lives of prehistoric people, an integrated approach taking as many adjacent aspects as possible into account will evidently be of aid. In this case, the applied methodology in itself by no means governs the general premises on a theoretical level, nor does it render impossible a primary focus on social relations. Insights gained through this methodology can rather serve to deepen the understanding of such aspects. We can thus, I argue, both eat the cake, and have it.
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