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Bone and antler combs: Towards a methodology for the understanding of trade and identity in Viking Age England and Scotland

Steven P. Ashby

This paper outlines the methodology of a doctoral research project at the University of York. The medium of study is the bone and antler hair comb, and the approach is one of integration. The project's aims are twofold: to elucidate the means of distribution of these artefacts, and to develop our understanding of identity in Viking Age England and Scotland.

The first phase of the project involves the review of methods of raw material analysis, whereby new and established identification criteria will be tested on a large sample of modern material. Should the results prove promising, the techniques will be employed in a study of combs from Viking Age contexts in northern England and Scotland. These zoologically-based methods will then be integrated with techniques taken from other areas of artefact analysis. Style and manufacture will be investigated through a variety of statistical and map-based techniques. These fine-grained analyses will develop our understanding of the way in which these objects were produced and exchanged. Building from these bases, a study of context and associations, together with a review of ethnohistoric evidence from the period, should help to elucidate the comb's role in the construction of identity.

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Introduction

This paper is based on ongoing PhD work at the University of York. As the research is in its early stages, no results can be presented, instead it will outline the project's aims and methodology. It is hoped that as such, this paper will highlight the potential of integrating multiple forms of analysis in the study of artefacts.

The medium to be studied is the hair comb. In particular, the project looks at the way in which the comb was produced, distributed and used, with emphasis on its role in the structuring and communication of identity. Single- and double-sided, simple and composite combs are included in the study, but long-handled "weaving" combs (e.g. Tuohy 1992) are excluded, given their possibly differing function. The field of interest is 8th–11th century (or Viking Age) settlement in England and Scotland. In England, combs from the northern Danelaw will be studied, including urban collections such as that from York (e.g. MacGregor *et al.* 1999). In Scotland, much of the material comes from rural sites in the Northern and Western Isles (e.g. Curle 1982; Buteux 1997). Hair combs are a common find in Saxon and Viking Age Britain (e.g. Dunlevy 1988; Riddler 1990; Batey & Cook 1994; MacGregor *et al.* 1999). Nonetheless, the care taken in the manufacture of these objects is considerable, and the fact that they are frequently found as grave goods (Ambrosiani 1981, 12–13; Alexander 1987) argues against their role as disposable objects. Furthermore, by the Viking Age their distribution extends across this continent and into European Russia, and they seem to show little variation in form or decoration across this vast area. The manner of their production and distribution remains contentious, however, as the archaeological remains of large, full-time workshops are elusive (Ulbricht 1978, 138; Ambrosiani 1981, 41).

It would be useful to have some understanding of the means by which these objects were distributed, how they related to the exchange of other prestige items and commodities, and

whether local production or import was most important. Such issues might be addressed through a careful and integrated study of combs and their early medieval context. Moreover, combs may be a reliable indicator of identity, possibly used to display status, age, gender, or ethnicity. As such, variations in raw material, form, decoration, method of manufacture, and context of deposition are all culturally significant.

The means of analysis of each of these criteria are discussed below. It should be noted that while the integration of multiple techniques is original, comparability with previous work is a fundamental concern. Thus, many of the measures used have been applied before, particularly in the work of Kristina Ambrosiani (1981) and Lyuba Smirnova (2001; 2002a; 2002b).

Raw material analysis

The first technique to be developed and exploited is that of raw material analysis. Although some hair combs were made of wood and horn (Petitjean 1995, 145; Smirnova 2002a), early medieval examples are comparatively rare (MacGregor 1989, 12; 1991, 364; 1998, 12–13). This research focuses on the analysis of combs constructed from skeletal materials.

Cetacean bone and morse ivory are likely to be encountered, but their identification is relatively well understood (Penniman 1952, 32; S. O'Connor 1987, 13–14; T. P. O'Connor 1987, 7; Espinoza & Mann 1992). The differentiation of bone and antler is somewhat more problematic, given that they are fundamentally the same material (S. O'Connor 1987, 9; T. P. O'Connor 1987, 7), but probable identifications can still be given in many situations. While judgements based upon colour, texture, grain and degree of polish can be made, macrostructure and histology are often rendered distinct by breakage and staining, allowing more reliable identification (S. O'Connor 1987; Deschler-Erb 1998).

Is it possible to go further than this, and identify objects to species? This project examines the feasibility of such identifications in antler. The species of interest here are red deer (*Cervus elaphus*), reindeer (*Rangifer tarandus*), and European elk (*Alces alces*). The identification of reindeer or elk antler in combs excavated from sites in England and Scotland is significant, in that it is likely to represent imported material (Clutton-Brock & MacGregor 1988; Weber 1992; 1993; 1994; Ballin Smith 1995).

A methodology for the identification of elk, red deer and reindeer antler will be defined. Previous attempts have been made (Weber 1992; 1993; 1994; Ballin Smith 1995; Smirnova 2002a), but prior to the production of this thesis none had been independently assessed, and it will be necessary to test these techniques before deciding whether to adopt, adapt or discard them. In order to demonstrate the effectiveness or otherwise of the techniques, practical investigations will be undertaken, followed by blind tests. Thus, this part of the study comprises an extensive literature review, analysis of modern bone and antler using low power magnification, and examination of artefacts using the same non-destructive techniques.

Surprisingly little has been published in the zoological literature that relates to the differentiation of cervid antler where gross morphology is not preserved. Rolf Lie (cited in Weber 1992; 1993; 1994; Ballin Smith 1995) has applied this approach to archaeological material, but a methodology is still to be published, and some workers are sceptical (e.g. Graham-Campbell & Batey 1998, 23; Smith 2000, 185).

Lyuba Smirnova has worked extensively on this problem in her analysis of materials from Novgorod. Dr. Smirnova was kind enough to demonstrate her approach, and this has informed my own investigations. Table 1 outlines the key criteria for species differentiation (these ideas are outlined in greater detail in Smirnova 2002a, and will be subjected to closer critique in this project).

Table 1. Criteria for the differentiation of antler fragments and objects (adapted from Smirnova 2002a).

Red Deer (<i>Cervus elaphus</i>)	Reindeer (<i>Rangifer tarandus</i>)	European Elk (<i>Alces alces</i>)
Rough, channelled surface texture	Generally smooth surface	Very large gulleys in surface
Compacta thickness varies, but rarely exceeds 10 mm for any length	Compacta thickness varies, but rarely exceeds 10 mm for any length	Great thicknesses of compact material
Regular, amorphous structure to compacta	Rough, poorly polishing texture to compacta	Vitreous texture to compacta
Large, round pores in core	Large, round pores in core	Core composed of fine, elongated pores
Boundary with compacta is discrete	Gentle gradation from core to compacta, forming a distinctive semi-porous zone	Boundary with compacta is diffuse, and often inconspicuous

These criteria have been shown to be useful in the study of antler waste and artefacts from Novgorod (Smirnova 2002a). Nonetheless, the criteria lie open to criticism, as internal structure may be affected not only by species, but by morphological, inter-individual, and inter-population variation (e.g. Penniman 1952, 35–36; Muir & Sykes 1988; Kierdorf *et al.* 2000; Webb 2000, 62; Azorit *et al.* 2002; Kruuk *et al.* 2002). It is not possible in the context of an archaeology research degree to definitively account for all of these factors, but the approach taken herein is twofold:

- Through like-for-like controlled comparisons, taking into account as many factors as possible.
- Through repeated blind identification tests on material representing a range of states on all variables.

Thus, it should be possible to demonstrate whether or not species distinctions are viable for antler material. The first stage is to section a large, diverse selection of modern antler. Thus it may be seen whether confounds such as age, sex and nutrition cause sufficient variation to throw doubt upon the possibility of using macrostructure to identify to species level. Preliminary investigations have shown potential.

Once this stage is complete, blind tests will begin. A number of comb component pieces and offcuts will be produced. These will then be used in blind identification tests. Should the results of these tests demonstrate that the criteria are reliable, then each comb and fragment from the archaeological corpus will be analysed using these methods.

Style

The raw material analysis is just one component of the study, and is complemented by a style-based approach. This is not restricted to traditional typology, as much work has already been done in this field (e.g. Tempel 1969; Luik 1998). Furthermore, my analysis is based on the recognition of discrete attributes of combs, rather than entire objects.

The first stylistic aspect to be recorded for each comb is form. This is based on a range of attributes, relating to general size, proportions, profile and cross-sectional geometry. Decorative motifs will also be recorded. The manner of decoration (i.e. whether it is incised, punched, or openwork) will also be noted, as will inter-relationships, and degree of symmetry. Once recorded, the occurrences, relationships and associations of these variables will be investigated using histograms, scatterplots and correspondence analysis. This should allow common decorative schemes or layouts to be recognised, and correlations between the presence or absence of certain designs may be highlighted.

Method and quality of manufacture

To augment the stylistic survey, a number of variables will be taken as indicative of method and quality of manufacture. Differences in quality between combs excavated at rural and urban sites may help to clarify the issue of the level of itinerancy of the craftsmen (a problem discussed in Ambrosiani 1981). Furthermore, the identification of regional tendencies in design will impact upon our understanding of the objects' method of distribution and consumption.

Manufacturing techniques or traditions might be indicated by a number of patterns. For instance, variations in height, width and thickness of comb components could relate to individual choice, tradition, or the working parameters of different raw materials. Similarly, it is possible that a study of tooth shape and spacing will prove profitable. On double-sided combs, the level of differentiation in tooth-spacing between sides may prove to be a useful measurement. Variations in tooth gradation along a single comb edge may be equally interesting, and there may also be potential in the study of toolmarkings on the sides of teeth and edges of connecting plates.

Another potentially informative area of study is the analysis of riveting practice. A number of variables may be recorded in this respect, perhaps the most obvious being that of the materials used. In particular, it may be informative to study the arrangement of rivets. In a given comb, rivets may pass through billet centres, or through the edges between them, and centre- or end-plates may be secured differently to other billets (Fig. 1; see also Smirnova 2002a).

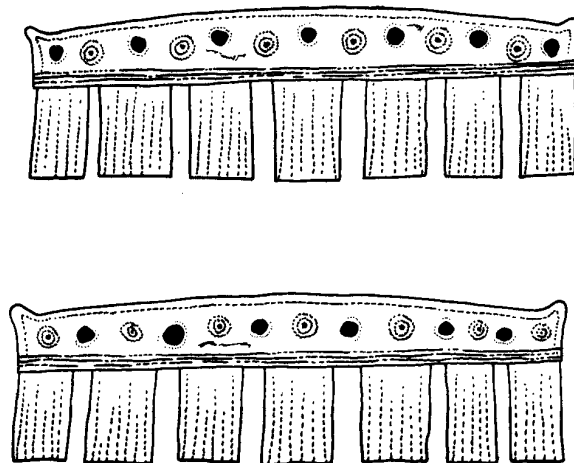


Fig. 1. Two possible variations in riveting practice. In the upper comb, each billet is riveted through its centre, while the lower comb is riveted at the junctions between billets (drawing by Sven Schroeder).

Quality of manufacture is another potentially informative facet of this study. Variation in quality of construction and ornament between rural sites and larger settlements may have implications for the organisation of the comb-making industry, and its means of distribution. But on what criteria may we judge the quality of comb manufacture? In practice, a somewhat subjective statement as to the overall degree of craftsmanship represented by the comb is likely to be of greatest utility. Nonetheless, it is worthwhile considering the variables that combine to form a “good quality” or “poor quality” comb. Symmetry and clarity of design in form, decoration and riveting are important, as are evenness of tooth thickness and spacing. In particular, it may be useful to compare how effectively rivets have been incorporated into the design of the comb, as it is possible to recognise when riveting is used as an active player in decoration (Clarke & Heald 2002). In contrast, some combs show a lack of forethought, in which rivets interfere with incised decoration.

Given the wide range of data involved in the study of method and quality of manufacture, multivariate statistics will be employed, supported by histogram and scatter-plot based techniques. This facilitates the recognition of distinct groups, based on the co-occurrence of a range of discrete traits, which could then be interpreted as traditions or possible manufacturing schools.

Wear and repair

The level of use wear will also be recorded, based on damage and an assessment of the level of tooth wear and beading (Table 2). Such an analysis helps one to ascertain the way in which combs were used and consumed, and thus their place in the meaningful repertoire of material culture.

Table 2. *Scoring system for wear and repair.*

Wear Level	Criteria
0 (no wear)	No signs of wear. Probably never used. No evidence of repair.
1 (slight wear)	Tooth striations visible with hand lens. No primary surface damage. No evidence of repair.
2 (minor wear)	Tooth beading visible with hand lens. Little primary damage. No evidence of repair.
3 (medium wear)	Tooth beading visible with naked eye. Some surface damage. No evidence of repair.
4 (severe wear)	Severe beading, and related tooth loss. Surface damage considerable. May show evidence of repair.

As the table demonstrates, where repairs have clearly been made, they will be considered as part of the scheme used to derive the comb’s level of wear. Marked asymmetry may suggest conversion of form, while the adaptation or replacement of billets, connecting plates or rivets may also indicate repairs (Ambrosiani 1981, 13–14).

Use wear and repair will be analysed using basic statistical and map-based techniques. This allows the recognition of relationships between level of wear, geography, chronological period and specific context. This may prove useful in determining variations in the role of combs; for instance, are combs from burials as heavily used as those deposited in settlements?

Context and associations

The context of all finds will be recorded, and associations with sites of particular importance (such as brochs, prehistoric monuments or early medieval churches) will be noted. In addition, the finds associated with each comb will be recorded. However, absence of associations cannot always be assumed meaningful, particularly where context information is lacking. Thus, the assessment of artefact relations is limited to those combs found in burial contexts. This data will then be investigated using correspondence analysis, in an attempt to recognise common associations and separations. Thus, an insight into the meaning and perception of combs might be gained.

Synthesis

All of these criteria were carefully selected so that when analysed chronologically and geographically, they could help to answer particular questions. Thus, analysis of context and associations, together with a study of use wear and repair, and a review of contemporary literature and art, should lead to an understanding of the importance of combs, who they were made for, and how they were used and perceived. Analysis of variations in method and quality of manufacture should clarify whether European combs really are uniform in design, or whether this pattern is more apparent than real. In turn, this will increase one's understanding of the means of production and distribution of these objects. Raw material analysis will help to assign sources for these combs, and used together with a study of manufacturing waste, this technique may clarify the relationship between material provision and combmaking. Likewise, the relationship between raw material and style may help to elucidate distribution patterns.

Once the manner of distribution has been ascertained, one may speculate upon how combs were used in communication. The recognition of stylistic attributes, and an understanding of their geographical and temporal variation, may combine with a consideration of context and associations. This should further develop understanding of who was using particular combs, how they were using them, and for what purpose. This should help in the ascription of meaning to recognised associations, and may lead to considerations of identity and cultural signalling. Knowledge gained through close study of early medieval history, art and archaeology should foster an understanding of context that will help one to speculate as to the role of combs in forming and signalling identity.

Thus, combs may prove to be a reliable indicator of identity, given their social importance, providing that the several aspects of their construction are broken down and analysed individually. Such an analysis should inform our knowledge of ethnic relations in the Viking Age, and how the idea of identity was constructed and perpetuated. The research project will address the many questions raised in this paper, and in so doing will attempt to define the role of the comb and the comb-maker in the construction, manipulation and perpetuation of identity.

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References

- Alexander, M. L. 1987.** A Viking-Age grave from Cambois, Bedlington, Northumberland. – *Medieval Archaeology*, 31, 101–105.
- Ambrosiani, K. 1981.** Viking Age Combs, Comb Making and Comb Makers in the Light of Finds from Birka and Ribe. *Stockholm Studies in Archaeology*, 2. Stockholm.
- Azorit, C., Analla, M., Carrasco, R. & Munoz-Cobo, J. 2002.** Influence of age and environment on antler traits in Spanish red deer (*Cervus elaphus hispanicus*). – *Zeitschrift für Jagdwissenschaft*, 48, 137–144.
- Ballin Smith, B. 1995.** Reindeer antler combs at Howe: contact between Late Iron Age Orkney and Norway. – *Universitetets Oldsaksamlings Årbok*, 1993/1994, 207–211.
- Batey, C. E. & Cook, A. 1994.** The bone comb. – T. W. Potter & R. D. Andrews (eds.). *Excavation and Survey at St Patrick's Chapel and St Peter's Church, Heysham, Lancashire, 1977–78*. *The Antiquaries Journal*, 85, 122–124.
- Buteux, S. 1997.** Settlements at Skaill, Deerness, Orkney. Excavations by Peter Gelling of the Prehistoric, Pictish, Viking and Later Periods, 1963–1981. *British Archaeological Reports, British Series 260*. Oxford.
- Clarke, D. & Heald, A. 2002.** Beyond typology: combs, economics, symbolism and regional identity in late Norse Scotland. – *Norwegian Archaeological Review*, 35, 81–93.
- Clutton-Brock, J. & MacGregor, A. 1988.** An end to medieval reindeer in Scotland. – *Proceedings of the Society of Antiquaries of Scotland*, 118, 23–35.
- Curle, C. L. 1982.** Pictish and Norse Finds from the Brough of Birsay 1934–74. *Society of Antiquaries of Scotland Monograph Series*, 1. Edinburgh.
- Deschler-Erb, S. 1998.** Römische Beinartefakte aus Augusta Raurica. *Rohmaterial, Technologie, Typologie und Chronologie. Forschungen in Augst*, 27: 1. Augst.
- Dunlevy, M. M. 1988.** A classification of Early Irish combs. – *Proceedings of the Royal Irish Academy*, 88, 341–422.
- Espinoza, E. O. & Mann, M.-J. 1992.** *Identification Guide for Ivory and Ivory Substitutes*. Baltimore.
- Graham-Campbell, J. & Batey, C. E. 1998.** *Vikings in Scotland: An Archaeological Survey*. Edinburgh.
- Kierdorf, U., Kierdorf, H. & Boyde, A. 2000.** Structure and mineralisation density of antler and pedicle bone in red deer (*Cervus elaphus* l.) exposed to different levels of environmental fluoride: a quantitative backscattered electron imaging study. – *Journal of Anatomy*, 196, 71–83.
- Kruuk, L. E. B., Slate, J., Pemberton, J. M., Brotherstone, S., Guinness, F. & Clutton-Brock, T. 2002.** Antler size in red deer: heritability and selection but no evolution. – *Evolution*, 56, 1683–1695.
- Luik, H. 1998.** Muinas- ja keskaegsed luukammid Eestis. *Muinasaja teadus*, 6. Tallinn.
- MacGregor, A. 1989.** Bone, antler and horn industries in the urban context. – D. Serjeantson & T. Waldron (eds.). *Diet and Crafts in Towns: The Evidence of Animal Remains from the Roman to the Post-medieval Periods*. *British Archaeological Reports, British Series 199*. Oxford, 107–128.
- MacGregor, A. 1991.** Antler, bone and horn. – J. Blair & N. Ramsay (eds.). *English Medieval Industries: Craftsmen, Techniques, Products*. London, 355–378.

- MacGregor, A. 1998.** Hides, horns and bones: Animals and independent industries in the early urban context. – E. Cameron (ed.). *Leather and Fur: Aspects of Early Medieval Trade and Technology*. London, 11–26.
- MacGregor, A., Mainman, A. J. & Rogers, N. S. H. 1999.** Craft, Industry and Everyday Life: Bone, Antler, Ivory and Horn from Anglo-Scandinavian and Medieval York. *The Archaeology of York. The Small Finds*, 17/12. York.
- Muir, P. D. & Sykes, A. R. 1988.** Effect of winter nutrition on antler development in red deer (*Cervus elaphus*) – a field study. – *New Zealand Journal of Agricultural Research*, 31, 145–150.
- O'Connor, S. 1987.** The identification of osseous and keratinaceous materials at York. – *Archaeological Bone, Antler and Ivory*. United Kingdom Institute for Conservation of Historic and Artistic Works Occasional Papers, 5. London, 9–21.
- O'Connor, T. P. 1987.** On the structure, chemistry and decay of bone, antler and ivory. – *Archaeological Bone, Antler and Ivory*. United Kingdom Institute for Conservation of Historic and Artistic Works Occasional Papers, 5. London, 6–8.
- Penniman, T. K. 1952.** Pictures of Ivory and Other Animal Teeth, Bone and Antler. *Occasional Papers on Technology*, 5. Oxford.
- Petitjean, M. 1995.** Les peignes en os à l'époque mérovingienne. Évolution depuis l'antiquité tardive. – *Antiquités Nationales*, 27, 145–191.
- Riddler, I. 1990.** Saxon handled combs from London. – *Transactions of the London and Middlesex Archaeological Society*, 41, 9–20.
- Smirnova, L. 2001.** The working of antler, bone and ivory in Novgorod: A study of a craft industry. – M. Brisbane & D. Gaimster (eds.). *Novgorod: the Archaeology of a Russian Medieval City and its Hinterland*. British Museum Occasional Papers, 141. London, 79–84.
- Smirnova, L. 2002a.** Comb-making in Medieval Novgorod (950–1450): An Industry in Transition. PhD thesis, University of Bournemouth.
- Smirnova, L. 2002b.** Social hierarchy of early Novgorod on the evidence of an analysis of the 10th–11th century single-sided composite combs. – G. Helmig, B. Scholkmann & M. Untermann (eds.). *Centre, Region, Periphery. Medieval Europe Basel 2002*, 1. Hertingen, 552–565.
- Smith, A. N. 2000.** Material culture and North Sea contacts in the fifth to seventh centuries AD. – J. C. Henderson (ed.). *The Prehistory and Early History of Atlantic Europe*. British Archaeological Reports, International Series 861. Oxford, 181–188.
- Tempel, W.-D. 1969.** Die Dreilagenkämme aus Haithabu. *Studien zu den Kämmen der Wikingerzeit im Nordseeküstengebiet und Skandinavien*. PhD thesis, University of Göttingen.
- Tuohy, C. 1992.** Long-handled 'weaving combs' in the Netherlands. – *Proceedings of the Prehistoric Society*, 58, 385–387.
- Ulbricht, I. 1978.** Die Geweihverarbeitung in Haithabu. *Die Ausgrabungen in Haithabu*, 7. Neumünster.
- Webb, S. D. 2000.** Evolutionary history of New World Cervidae. – E. S. Vrba & G. B. Schaller (eds.). *Antelopes, Deer, and Relatives: Fossil Record, Behavioural Ecology, Systematics, and Conservation*. New Haven; London, 38–64.
- Weber, B. 1992.** Norwegian exports in Orkney and Shetland during the Viking and Middle Ages. – R. A. Hall, R. Hodges & H. Clarke (eds.) *Exchange and Trade. Medieval Europe*, 5. York, 159–167.
- Weber, B. 1993.** Norwegian reindeer antler export to Orkney. – *Universitetets Oldsaksamlings Årbok*, 1991/1992, 161–174.
- Weber, B. 1994.** Iron age combs: Analyses of raw material. – B. Ambrosiani & H. Clarke (eds.). *The Twelfth Viking Congress: Developments around the Baltic and the North Sea in the Viking Age*. The Birka Project, 3. Stockholm, 190–193.