Objects of Bone, Antler and Horn from The Circular Fortress of Oost-Souburg, The Netherlands (A.D. 900–975)

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DURING THE EXCAVATION of the circular fortress of Oost-Souburg, the Netherlands, objects of bone and antler and sawn horn-cores indicating the use of horn were found. The finds, mainly combs, needles, spindle whorls, tridents, bone skates and points of prickers, are dated between A.D. 900 and 975. The variability in form and ornamentation, the choice of the raw material and the use of this well dated material is described and discussed. The partially manufactured artefacts and waste products suggest that some of the objects were made or repaired within the settlement, possibly by peripatetic craftsmen. The objects of antler, and antler as a raw material must have been imported from elsewhere. In combination with the other animal remains, these objects provide information about the economy and activities of the inhabitants of the fortress.

From 1969–71 the State Service for Archaeological Investigations of the Netherlands (ROB) conducted an excavation in the western part of the circular fortress of Oost-Souburg on the former island of Walcheren in the province of Zeeland.[1] The fortress was built by the local inhabitants in the last quarter of the 9th century as a refuge against the threat of Viking invasions. In the 10th century, a civilian settlement developed inside the earthworks. In addition to objects of pottery, metal, and glass, the people who lived there also had things made of bone and antler. In combination with the unworked bone, these objects provide insight in the nature of the livestock, the importance of hunting, the consumption of meat, and the production of animal products such as wool.[2] In this article, these objects will be treated as implements. The description of the rich variety of forms of combs, spindle whorls, runners, and the like found at Oost-Souburg is in itself of importance because the material is so well dated. It gives us an example of the forms and decoration which occur in the 10th century. Furthermore, we shall attempt to find an answer to the question of the function served by these implements and why they were made of bone or antler. We shall also see what information these implements give us about the inhabitants of Oost-Souburg. The

FIG. 1
Map of the Netherlands, showing the location of Oost-Souburg

objects have already been discussed in a Dutch article.[3] The skates and points of prickers have been dealt with in detail elsewhere.[4]

THE CIRCULAR FORTRESS AND ITS INHABITANTS

The circular fortress of Oost-Souburg belongs to a group of five, possibly six circular timber-earth fortifications on the Scheldt estuary (Fig. 1). The ramparts vary in breadth from 4 to 12 m and are constructed of clay sods and sand. They were originally 3 to 4 m high and had a timber palisade on top. On the outer side there was a wide, shallow ditch. The fortification at Oost-Souburg with its diameter of 144 m is the smallest, and the circular fortress of Domburg the largest, with a diameter of 265 m. The circular fortress of Oost-Souburg was reconstructed in 1994 (Pl. IV, A); Middelburg and Burgh are still worth a visit in their present state.

In the early Middle Ages, which preceded the fortress-building period, the area which is now the province of Zeeland was flooded by the sea. Only along the coast did a narrow strip of beach barrier and dunes remain dry. It was here that the wealthy trade settlement of *Walichrum* near Domburg was situated. This *emporium*, comparable to Dorestad in the Central Netherlands river area, was destroyed during a raid by Danish Vikings in 837.

In the 9th century the land behind the dunes stood clear of the water and an enormous salt marsh area emerged. Archaeological and historical evidence indicates that the attraction of this new land lay in sheepbreeding and salt extraction. As yet, no fixed settlements are known.

On the basis of a large number of radiocarbon datings it is now certain that the circular fortresses of Zeeland were built by the local population in the third or last quarter of the 9th century as a defence against the plundering Vikings when they again raided the Scheldt region between 850 and 892. The administrative and political situation in the Zeeland delta area in the latter years of the Frankish empire has been closely studied in the context of fortress investigation.[5] The defences belong to the oldest archaeologically confirmed traces of human occupation in the salt marshes. The circular fortresses served as refuges for the shepherds and their flocks.

When the great Viking expeditions were over, shortly after 900, the sites were used as settlements. The fortress of Middelburg developed into the administrative and ecclesiastic centre of the region. This trade settlement probably already had a harbour in the 10th century.

With the building of house platforms along two paths which intersected at right angles in the centre, the site of the fortress of Oost-Souburg was systematically raised. The reason for this must have been its position which was relatively low and unprotected from the sea. Because only half the fortress site has been excavated and because it is difficult to determine the number of houses in use at the same time, it is not easy to establish the size of the settlement. Agriculture was possible on the higher-lying natural levees which soon carried fresh water. There is evidence of barley, wheat, and linseed cultivation.[6] Imports of pottery and millstones from the German Rhineland and the Meuse region, grindstones from Scandinavia,[7] iron,[8] and the antler objects discussed below illustrate the relative wealth of the settlement as well as good trade contacts.

We may consider the fortress settlement to be one of the first nuclei of a hitherto scattered settlement, but its part had already been played out by the end of the 10th century. The rise of local *ambachtsheren* (lords of the *ambacht*) and the sharply increasing division of *ambachten* (districts) and parishes favoured a completely different type of settlement, the circular village. The village church stood in the middle and the lord's private defence-work, the motte and bailey castle, was in the immediate vicinity. In the case of Oost-Souburg, this new village settlement developed 1 km away at present-day (West-)Souburg. In the 11th and possibly 12th century, there was still the odd large farm to be found on the site of the old fortress settlement, but after that the site was used as arable land until recent times.

MATERIAL AND METHOD

All the finds from the ROB excavations of 1969–71 which indicate the processing of animal material into objects will be discussed below. These finds may be divided into four categories of archaeozoological material. First, the implements themselves, for example the spindle whorls, needles, and runners found in Oost-Souburg. Second, the semimanufactures in the form of antler plates for making combs. The third category is waste; small fragments of sawn bone or antler which must be considered the remains left from manufacturing implements. The last category consists of the indicators for the processing of a different kind of material. These include the sawn horn-cores which do not refer to the processing of this piece of bone but to the sheath of the horn, now no longer present. We shall discuss the first category, that of the implements themselves; the finds from the other categories will be dealt with as far as possible in relation to the objects with which they may have been connected. For example, the plates of bone and remnants of production waste of antler will be discussed together with the combs because they are probably connected with the production of these implements.

The finds are not described separately in a catalogue and information is presented in categories whenever possible. The diversity of the material is reflected in the figures and in tables. The object numbers in the text, legend, and figures refer to the find numbers, unless otherwise stated. In the case of more than one object from a find number a serial number has been added in brackets, for example 254(2).

The overall picture of the horizontal as well as the vertical distribution of the objects over the excavation levels corresponds to that of the pottery.[9] From this we may conclude that objects of bone and antler have not been lost as a result of selective weathering. One can see from the objects themselves that they have been well preserved in the soil.

COMBS

All the combs found at Oost-Souburg are composite. This means that they were not made from a single piece of bone or antler but from several. A composite comb consists of a number of tooth segments 15 to 20 mm in width which were held together by two often-decorated connecting plates by means of iron rivets (Fig. 2). After the various sections had been riveted together, the teeth were sawn and the comb was finished off.[10] Apart from this type of comb, handled combs were also found at Oost-Souburg (Pl. IV, B). This type does not have two connecting plates but one antler point sawn open to about two-thirds of its length, into which the tooth segments were inserted. The uncut part served as a handle.

It is not always easy to establish whether the combs are made of bone or antler, but almost all the cases where this was clear proved to be antler. Only one comb is certainly made of bone; at least the connecting plate belonging to it is. The reason why bone was not usually chosen, although it is far more easily obtainable, is due to the fact that antler is much tougher than bone.[11] This is of vital importance in the case of the extremely fragile fine teeth of the combs and it is for the same

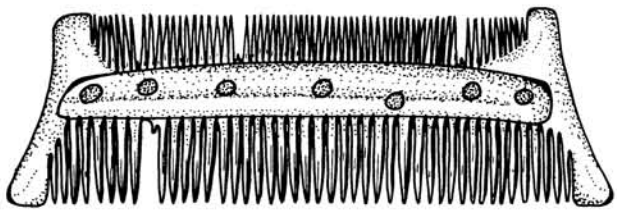


FIG. 2
Composite comb (16) made of six tooth-plates and two side-plates, joined by rivets. Scale 1:2

reason that the composite 'bone combs' from other findspots are usually made of antler.

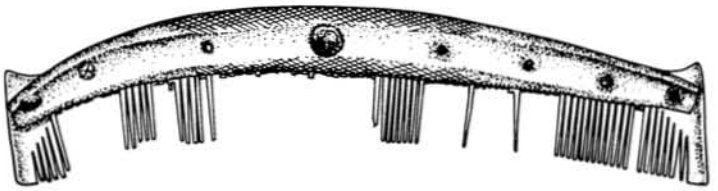
Combs are found in a great variety of forms.[12] The combs from Oost-Souburg can roughly be divided into four different types which, for convenience's sake, we shall refer to as A, B, C, and D (Fig. 3). The handle-less combs can be single-sided with uniform teeth (Fig. 3,A), single-sided with a coarse-fine segmentation (Fig. 3,B), and double-sided with a coarse-fine segmentation (Fig. 3,C). As far as can be observed, all these handle-less combs are symmetrical, apart from the size of the teeth. In addition, one type of handled comb was found, double-sided with a coarse-fine segmentation (Fig. 3,D). Table 1 is a survey of the various types. Since some comb fragments may also belong to other types, for example to a single-sided handled comb, an unknown type X has been added to the survey. Type B is most frequently found. Of the 24 combs and comb fragments found, six certainly and nine others possibly belong to this type. The specimens which are uncertain consist of small fragments which could also come from a different type of single-sided comb — Type A, for example, of which there is only a single clear specimen.

If the most decorated side of the comb is regarded as the front, the fine-toothed section is on the right in all cases. With the double-sided combs, both handle-less and handled, the fine teeth are uppermost.

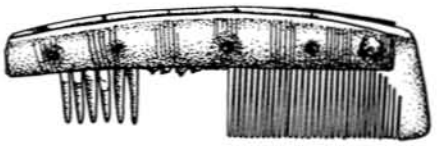
The exact size can only be determined for a few combs. Comb 408, type A, is 200 mm long. Comb 61 (type B) is *c.* 130 mm. Three other combs of this type, whose length can only be estimated, are 120–150 mm. Comb 16 (type C) is 140 mm long, and the two handled combs (type D) are 210 and 240 mm.

There is remarkable diversity in the finishing of the combs (Fig. 4). The fifteen handle-less combs, of which fragments of the connecting plates have been preserved, are almost all decorated differently. Only 337(1) and 680 may perhaps have had the same decoration. Most of the ornamentation consisted of lines made with a fine saw. Comb 163(2) also has thorn-shaped patterns applied with a knife-point or small chisel, and 680 has point-circles made by a drill. Of the combs of which both connecting plates have been preserved, one plate is usually more simply decorated than the other. Often the back plate is completely undecorated.

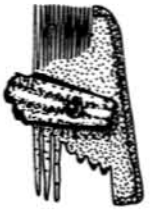
Two handle-less combs also have decorations elsewhere. With comb 595 the tooth segments have not been sawn off above the connecting plates, as is the case with the other combs, but continue for *c.* 7–9 mm. Point-circles have been applied to this projecting edge. The same kind of decoration can be seen on comb 582(2)



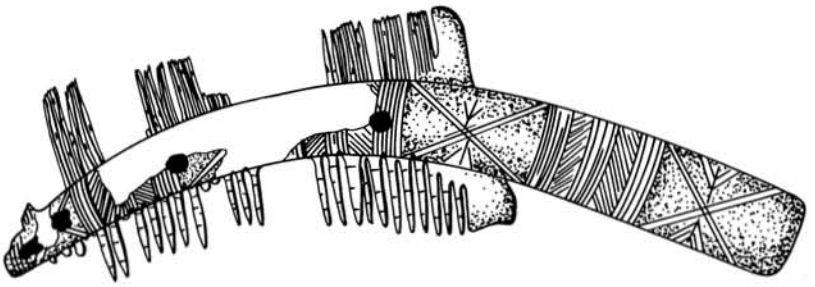
A



B



C



D

FIG. 3

The different types of combs. A handle-less, single-sided comb with uniform teeth (408); B handle-less, single-sided, coarse/fine toothed (61); C handle-less, double-sided (68); D handled, double-sided (000(1)). Scale 1:2

TABLE I

OOST-SOUBURG: NUMBERS OF COMBS AND FRAGMENTS OF COMBS THAT PROBABLY BELONG TO ONE OF THE TYPES SHOWN IN FIG. 3

type	*number*
A	1
A/B/X	8
N	6
B/X	1
C	3
C/D	2
D	2
D/X	1

though now somewhat irregularly on the uncut part of the end plate, the last tooth segment (Fig. 5).

There only appears to be some measure of uniformity among the handled combs. Only the unworked handle of 9 has been preserved, but the two other more or less complete specimens are decorated all over. Both have an alternating pattern of crosses, herringbone and diagonal or oblique parallel lines (Pl. IV, B; Fig. 3, D) on the front. The back is simply decorated with the same diagonal sets of lines.

Comb 163(1) of the C type, has a small hole 3 mm in diameter bored in the end plate (Fig.5). Such perforations which are clearly not intended for rivets are often found in combs.[13] The hole probably serves to fasten the comb by means of a cord to the belt, for example.

Plates: semimanufactures

Five plates *c.* 60 mm long, 15–20 mm wide and 5 mm thick were found in Oost-Souburg (Pl. V). Plates like this were sawn lengthwise from the outermost non-porous part of the beam of the antlers. Many of these semimanufactures were found at Haithabu, but their length there is *c.* 40 mm.[14] Only single-sided combs are found though at Haithabu and this size fits them exactly.[15] The longer plates found at Oost-Souburg were probably intended for double-sided combs of the C or D type.

Not all the plates found are semimanufactures or sections of combs. The plates with diagonal lines and point-circles (Pl. V) lack the small notches so characteristic of connecting plates of combs which are made when the teeth are sawn. Moreover, both of them only have a single iron rivet in contrast to connecting plates of combs where there is usually less than 20 mm between the rivets. Both plates are of bone, whereas most combs are made of antler. What these objects were used for or what they were part of is unclear. The same applies to a plate fragment (102) and a flat piece of bone *c.* 45 mm wide and at least 65 mm long, made from the humerus of a cow or other large mammal (100). An iron rivet had also been driven through these two objects whose function is unknown.

Production and origin

Where do the Oost-Souburg combs come from? The material used for the combs is red deer antler, but since there are absolutely no skeletal remains of this

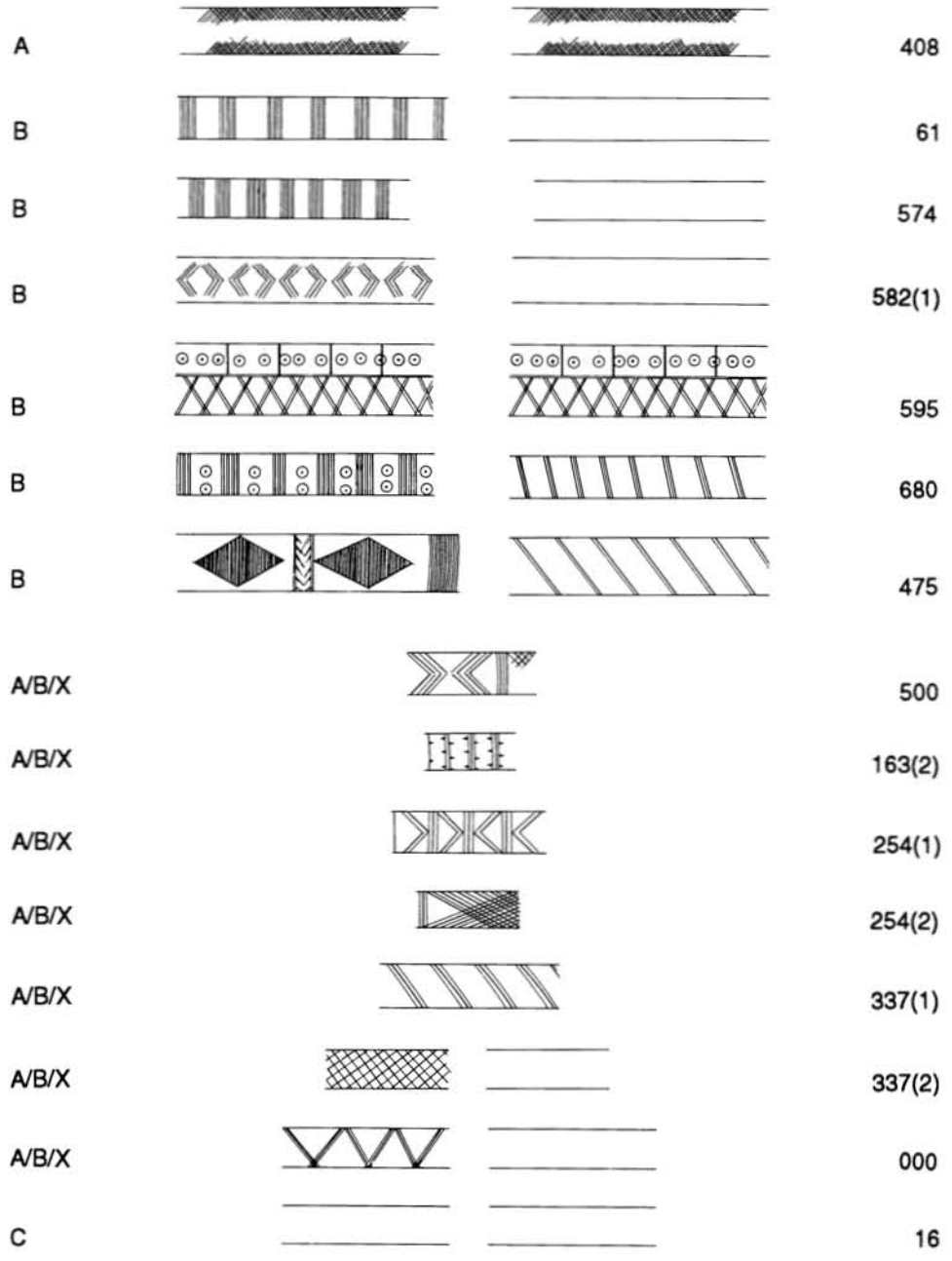


FIG. 4

Ornaments on the sideplates of the handle-less combs. For 595 the ornamented part of the tooth-plates is also shown

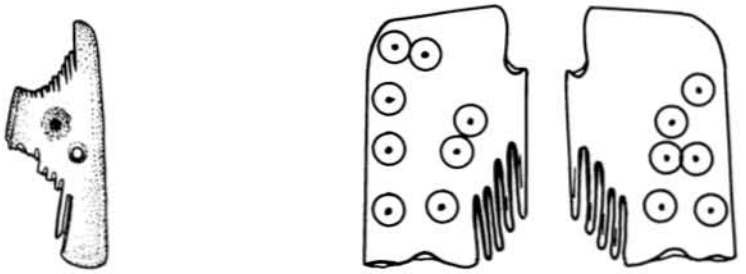


FIG. 5
Left: end-plate of double-sided comb 163(1) with a small hole. Scale 1:2
Right: end-plate of comb decorated with point-circles (582(2)). Scale 1:1.

animal to be found among the slaughter and kitchen refuse apart from the antlers, it can at any rate be established that the inhabitants of the fortress did not hunt red deer.[16] In fact, this animal was probably not found in the surroundings of Oost-Souburg in the 10th century, or only rarely, and the objects, either semimanufactures or raw material in the form of antlers, were imported from elsewhere.[17] Trade in combs was not unusual in this period.[18] Weber makes a reasonable case for reindeer antlers for comb production being exported from Norway to Orkney in the 7th, 8th and 9th centuries.[19] Where the material for the Oost-Souburg combs actually came from is unknown. Perhaps it was imported from the Rhineland by the same traders who imported implements of pottery and brick but it may also have come from less distant places in the present Netherlands and Belgium, since there is evidence of red deer hunting in various places outside Walcheren.[20]

The antler plates so typical of comb-making which were found in the settlement indicate that combs were made, or at any rate repaired, on the spot. That antler was worked at Oost-Souburg is also shown by two irregular pieces of antler with sawn surfaces which are clearly waste from antler-working (Pl. v, d, e). A 100-mm-long sawn off antler point is probably waste, although a point like this may also have been used as a simple marlinspike for rope-making.

The absence of postcranial skeletal parts together with the presence of semimanufactures and antler waste leads to the conclusion that antler was imported as a raw material for the manufacture or repair of combs. This does not exclude the possibility that ready-made combs may also have been imported from other places. It is unlikely that there were craftsmen in the settlement who specialized in making combs, because one would then expect to find a degree of uniformity which is contradicted by the great diversity of handle-less combs. This diversity may be the result of the combs being made, as a sort of home-industry, from antlers bought elsewhere. However, the level of specialized skill required to produce these objects makes home production rather unlikely. The variability of form and ornamentation is more probably due to the wider choice available through the market, where wares from larger centres were offered for sale. This type of trade may have been conducted via the nearby harbour of Middelburg which developed in the course of the 10th century. The combination of a wide variety, semimanufactures, and waste material from antler-working can also be explained if we assume that the combs

were produced by different travelling craftsmen who each stayed for a while in Oost-Souburg, made their products there, sold them, and moved on. The one model does not of course exclude the other; a combination of combs obtained via the market and combs made on the spot by travelling craftsmen is quite possible.

Handled combs are regarded by MacGregor as a product which was originally distributed and traded by Frisian seafaring tradesmen.[21] Because of the relatively large numbers of finds of this type discovered at Anglo-Saxon sites in recent years, Riddler sees England as the country of origin of these combs, at any rate up to the Viking period.[22] For example, the find of two handled combs at Haithabu is regarded as evidence of trade relations between England and southern Scandinavia. This may perhaps apply on the basis of similarities in decoration to the two combs from Haithabu which were discussed by Riddler, but there are no strong arguments for assuming the existence of such a trade in handled combs in general. There is no reason, therefore, to make any more specific statements about the provenance of the three handled combs from Oost-Souburg than have been mentioned above.

NEEDLES AND NEEDLE-SHAPED OBJECTS

Needles are rarely made from antler,[23] and the thirteen needles or needle-shaped objects from Oost-Souburg are no exception (Pl. VI, A). They are all made from the bones of large mammals; several specimens are clearly made from the fibula of a pig, which is already needle-shaped, and the largest needle was probably made from the metapodial of a cow.

Only five needles are more or less complete. Within this group, three different types may be distinguished. The first group consists of two needles with eyes similar to Schwarz-Mackensen's 'Type 10' needles (Pl. VI, A, a, b).[24] These needles are 88 and 102 mm long respectively, 6.7 and 9.9 mm wide at the most, and have an eye at least 2.9 and 4.7 mm in diameter. They are totally unsuitable for fine sewing. They may, though, have been used for tacking very coarse fabrics, making beehives or repairing nets.

The other two types have in common the fact that they are broader and have no eye, so that they cannot have been used as sewing or tacking needles. The needles c and d from Pl. VI, A are 117 and 108 mm long and 12.0 and 12.6 mm wide, have a sharp point, and are bluntly finished at the other end. They may perhaps have served as hairpins. Another possibility, if we do not exclude literacy, is that they were used as a *stylus*, a pen used for writing on a wax tablet. They may also have been used as pins in weaving or as an awl for widening a small cut made by a knife in leather.

The largest specimen is clearly quite different (Pl. VI, A, e). The needle is 149 mm long and 14.7 mm at its widest part. The main difference with regard to the previous group is the point. This is not pointed but rounded and flat. The specimen found is decorated on one side with groups of three stripes, diagonal, zig-zag, and crosswise. The function of this needle is uncertain but perhaps was a hairpin or had some needlework function.

SPINDLE WHORLS

On the fortress site of Oost-Souburg ten spindle whorls were found (Fig. 6); all made of antler. This is not surprising in view of the size of these implements in general: discs of 30–50 mm diameter and 10–20 mm thick cannot be cut from the bones of cattle and horses. Only the beam of an antler from a large mammal is suitable. This is probably why, in other places, whorls are found which are made of two, three or four pieces of bone riveted together.[25] If antler is not available and one needs to make a spindle whorl of the correct size, one will have to join together various pieces of bone, which is much thinner. The weight and diameter of the whorl determine whether it functions correctly. For example, a wide whorl produces a longer but slower rotation than one with a smaller diameter.[26] Even more important for the rotational speed is the weight. A light whorl achieves far more rotations per second with the same power than a heavy one.[27] There is then a clear relation between the choice of the weight and size of the spindle whorl on the one hand, and the material used and the thickness of the thread one wants to spin on the other hand. A fine thin thread will have been made with a light, fast spinning whorl and spindle, and a thick strong thread with a heavier combination.

The variability of these objects is great. The most deviant is semi-spherical in form (Fig. 6: j).[28] This specimen is also the heaviest and has the greatest thickness and diameter (Table 2). It is decorated on the round base with twelve radial clusters of three or four lines between which there are three or four point-circles. The weight of the other whorls varies from 12.7 to 26.7 grams, and the most important functional measure, the diameter, varies from 32 to 42 mm. The degree of decoration and workmanship varies considerably. The most soberly finished whorls are only decorated on one side with several clusters of lines or with point-circles (Fig. 6: a–b and e); two specimens have these simple clusters on two sides (Fig. 6: c–d). The other specimens are also decorated on two sides, though more lavishly. They have point-circles in different sizes or a combination of line clusters and point-circles. Two of the whorls are also decorated on the side (Fig. 6: g–h).

As in the case of the combs, the raw material for spindle whorl production must have been imported. The travelling craftsman is a possibility; in view of the great variability in size and decoration it seems unlikely that a specialized craftsman would have had a fixed workshop at Oost-Souburg.

TRIDENTS

Tridents, ten of which were found, are mysterious objects (Pl. VI, B, a; Fig. 8). Although they are regularly found in complete or almost complete form, their use is uncertain. A general discussion of the tridents from the Netherlands and surrounding areas has been published by Van Klaveren.[29]

Table 3 shows several characteristics of the tridents from Oost-Souburg. One trident was made from a radius, and all the others from metacarpi and metatarsi, see Fig. 7. Only one was made from the bone of a horse, in all other cases cattle

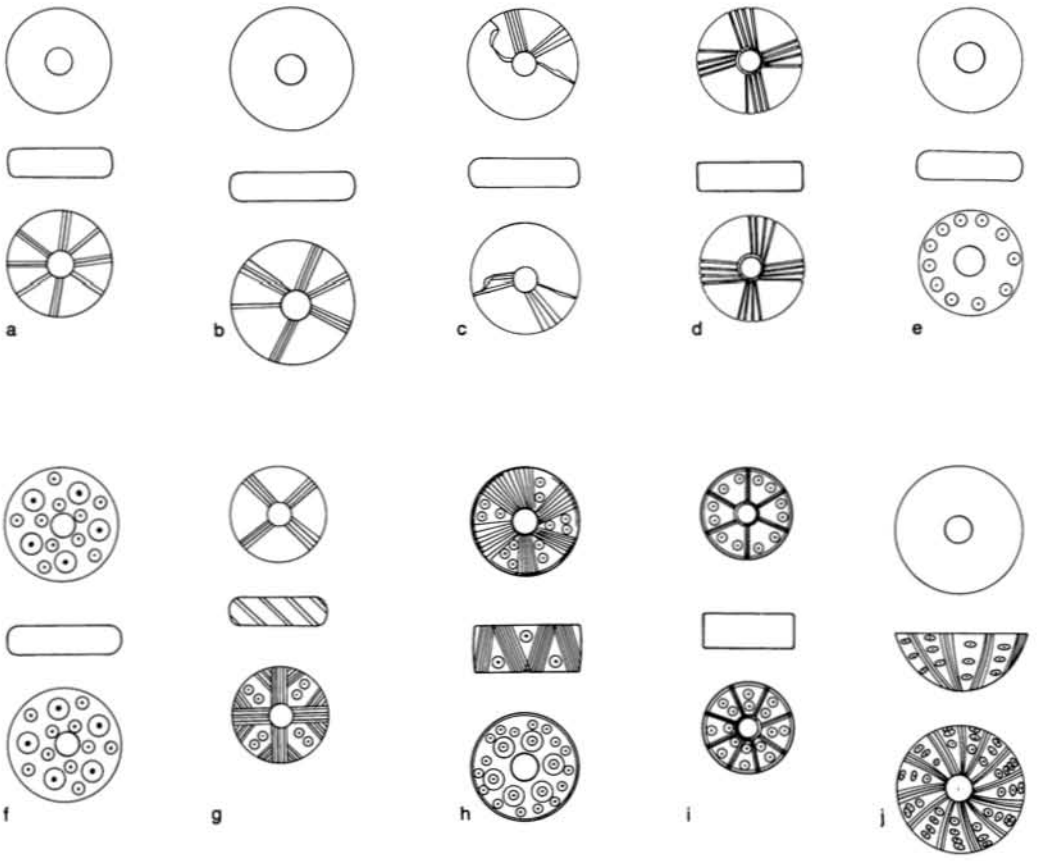


FIG. 6
Spindle whorls. View from above, side, and below. Find numbers, measurements, and weights are mentioned in Table 2. Not to scale

TABLE 2
OOST-SOUBURG: MEASUREMENTS AND WEIGHT OF THE SPINDLE WHORLS (a–j) SHOWN IN FIG. 6. SPINDLE WHORL j IS A DEVIANT, SEMI-SPHERICAL TYPE

Fig. 6	*Find no.*	*Diameter (mm)*	*Height (mm)*	*Weight (g)*
a	25	42	9	18,8
b	45	36	12	15,0
c	00	—	13	—
d	163	38	10	15,5
e	71	37	12	22,2
f	77	39	10	20,7
g	101	33	10	12,7
h	495	37	16	26,7
i	703	32	12	15,6
j	527	43	18	27,5

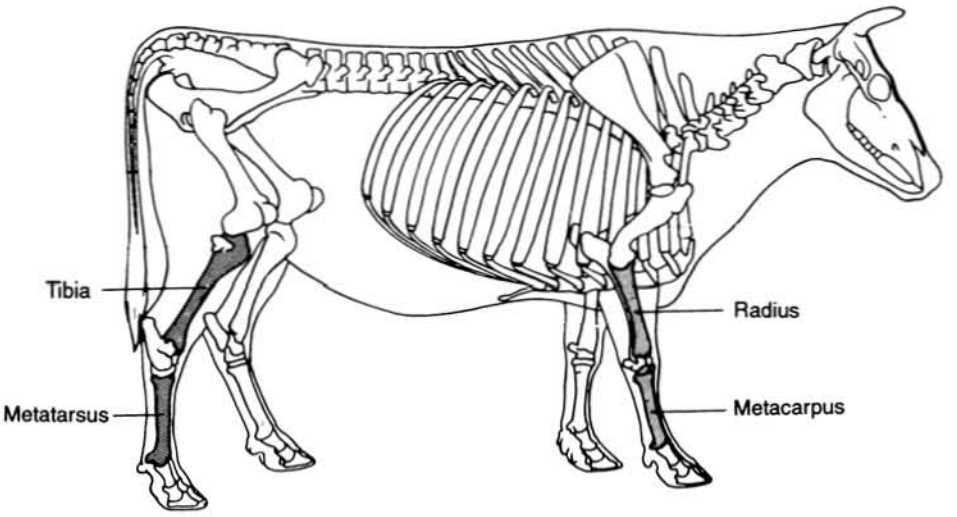


FIG. 7
Skeleton of a cow with an indication of the bones that are often used for boneworking. Metacarpus and metatarsus together are called metapodials

bones were used. The piece of manufacturing waste (Pl. VI, B, b) is part of the metatarsus of a cow. Two tridents were probably sawn from this bone, one to the left and one to the right of the piece of waste material. That metapodials or possibly a piece of radius were chosen as material is apparently connected with the features which one wished to give the objects. By selecting these particular bones, and after trimming and scouring them, these hollow objects acquire a rounded front and an almost flat back. It is striking that in nine of the ten specimens the rounded front is decorated, whereas the flat back is undecorated in all cases. This leads one to suspect that the almost flat back must have been used for something. All specimens had three teeth, but three of them had still been clearly used after a tooth had been broken because the fracture surface was polished; the absence of one of the teeth did not make the object useless. The length of the complete teeth varies from 8 to 17 mm. The function suggested by Van Vilsteren that the object was the bridge of a stringed instrument is not probable because of the considerable length of the teeth and also because the teeth have rather sharp points,[30] which are more likely to indicate that they were used for pricking something. According to Van Gaans, the objects are very suitable for pricking rows of holes in leather.[31] An argument against their use as a pricker is that the objects are polished between the teeth as well. Polishing of this kind would appear to be more appropriate if the objects were used as a kind of comb.

Another noticeable feature of these objects is that although they are hollow by nature, they have been hollowed out further. In various specimens it can be observed that the spongiosa or spongy bone material which was still present in the bone cavity has been removed in order to make the opening larger or smoother. Apparently the cavity was functional too, perhaps for inserting a thin finger or for

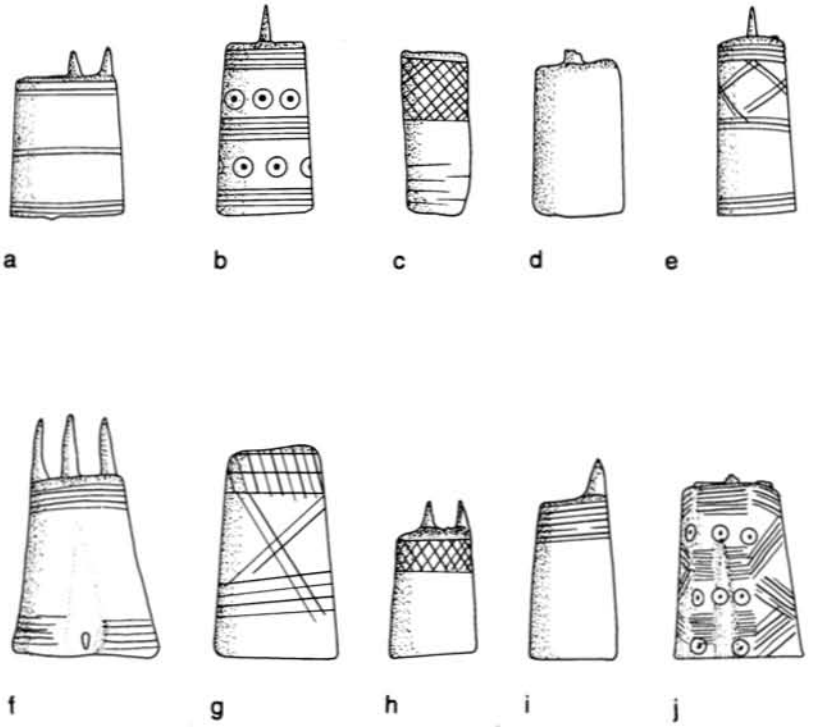


FIG. 8
Tridents. Find numbers and further descriptions are mentioned in Table 3.
(Scale 1:2)

fastening it to a handle. It is not likely that a thread was passed between the teeth and then through the hole, because then the bone at the edge of the hole, between the teeth, would also have been polished, which is not the case. In short, the function of these tridents is obscure. Since the inhabitants of Oost-Souburg were partly dependent on wool production, these comb-like objects may have had something to do with the processing, but this, too, is pure speculation.

The decoration of the rounded side of the tridents is extremely varied and was applied in various patterns by means of lines and point-circles (Fig. 8). In contrast to antler, the cattle and horse bone, used for making tridents was available within the settlement. This, together with the manufacturing waste found, makes it very probable that the tridents were made in the settlement itself, though not by a resident specialized boneworker as the diversity of ornamentation and the variability of size and weight is too great (Table 3). However, the travelling craftsman model is again a good possibility. Another is that the tridents were manufactured in the home, and that the decoration was a matter of personal taste. The possibility that tridents were not only made on the spot but were acquired through trade is less likely but cannot be excluded.

TABLE 3

OOST-SOUBURG: DETERMINATION, MEASUREMENTS AND WEIGHT OF THE TRIDENTS SHOWN IN FIG. 8

Fig. 8	*Find no.*	*Species*	*Skeletal element*	*Length (mm)*	*Weight (g)*
a	19	cattle	metacarpus	36	26
b	79	cattle	metacarpus	46	19
c	358	—	—	43*	—
d	422	horse	metatarsus	41	22
e	544	cattle	metatarsus	47	20
f	545	cattle	metatarsus	47	33
g	601	cattle	radius	58	40
h	637	cattle	metacarpus	33	13
i	653	cattle	metacarpus	43	—
j	683	cattle	metacarpus	45	29

* Calcinated and possibly shrunk in the fire.

SKATES AND PRICKERS

Bone runners, all used as a kind of skate, form the largest group of objects made of bone. Together with the prickers they are discussed in more detail elsewhere.[32] The skates are roughly made from the metacarpi, metatarsi and radii of horses as well as cattle (Fig. 9). The diversity in construction of the runners is considerable. Certain types were used without bindings and one must just have stood on this skate while pushing forward with the help of a pricker. Others were either clearly fastened on at the heel and toe, or were possibly tied only at the heel. Another possibility concerning the latter types is that one stood completely freely on the runners, and that the perforation at the heel simply served to tie the skates together so that they could be carried more easily to the ice.

The points that were found are also roughly made and without any finish. They are made from the tibia and metatarsus of a cow, one from the tibia of a horse and one from a piece of red deer antler (Fig. 10). The joints of the long bones have been knocked off and the medulla hollowed out in a circular fashion. The latter was also the case with the antler point. A stick *c.* 20 mm in diameter would fit into these holes. The fact that these points are found in considerable numbers, as are the runners which are also designated as disposable articles, would suggest a link between the two. The points were possibly fixed to a shaft and used as prickers for skating.

OBJECTS MADE OF HORN

No objects were found of horn, which is much more perishable than bone or antler. However, several sawn off horn-cores of cattle and sheep are evidence for the use of the horn which encircled the core. Before the core was put to soak so that the horn could be removed after some time, the horn was probably cut to the right size by sawing it off, core and all. Two horn-cores of a cow and one of a sheep were sawn off at the base as well as the top (Pl. VII). The horn from several horn-cores which were hacked off below the base may also have been used.

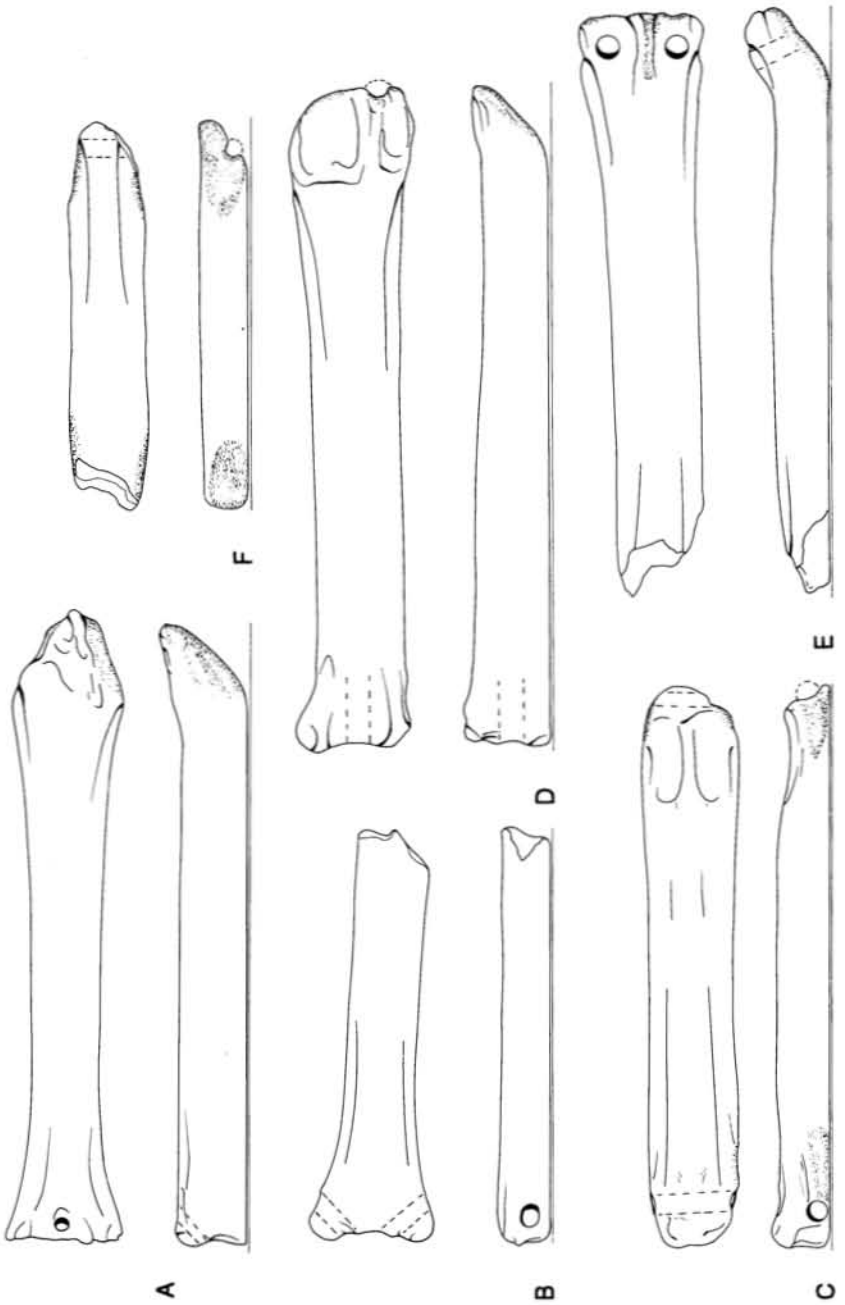


FIG. 9

View from above and side-view of different types of skates made of horse metapodials. Front of skate / distal end of bone on the right side. A, B, D, F metatarsus (565; 413; 104; 561); C, E metacarpus (86; 233). Scale 1:3

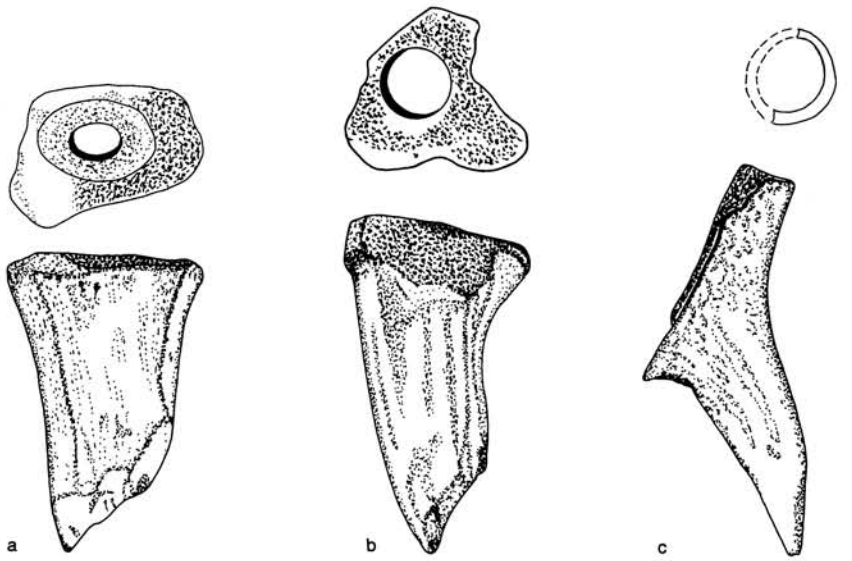


FIG. 10
View from above and side-view of points, probably of prickers. a proximal part of a tibia of a horse (488); b distal part of a tibia of a cow (144); c a piece of antler of a red deer (485). Scale 1:2

Most of the horn-cores, however, were hacked very roughly from the skull, usually right through the lowest part of the core. Often there are traces of cutting at the centre of the core. With these horn-cores the horn around the core must have been damaged and unsuitable for further processing. Apparently the horn was not always used, and was therefore of little importance as a material for manufacturing objects at Oost-Souburg.

MISCELLANEA

One piece of red deer antler, almost 90 mm long and 35 mm in diameter, possibly served as a handle. A drilling of 20 mm diameter over the whole length of the object shows that it encircled a sizeable handle. The size and form indicate a rather heavy object whose handle was grasped by the fist.

It is striking that, with the exception of a very small section, the compact, tough outer surface of the antler has been sawn or cut away. As a result, the spongy bone tissue is visible over almost the entire surface area. Perhaps the originally tough outer surface was sawn away in plates for further processing, and that this is in fact waste from antler-working which has been given a second use.

A bead and a brooch or *fibula* are made of bone (Fig. 11, a, b). The bone bead is 11.5 mm in diameter and 6.8 mm thick. The brooch is *c.* 20 mm in diameter. It has an unusual decoration of four half point-circles. There were probably two eyes at the back through which a pin fitted. One of these eyes with a diameter of 2.9 mm has been preserved intact.

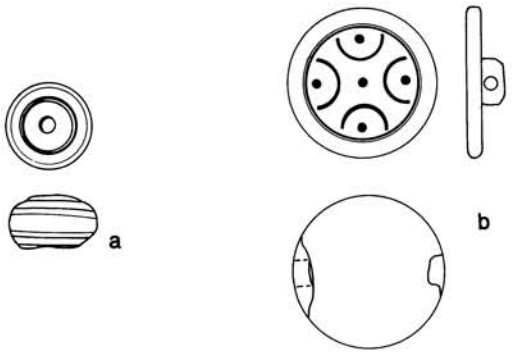


FIG. 11
a bead of bone (161); b brooch or fibula of bone (691). Scale 1:1

Finally a tibia of a sheep was found with a 5 mm hole *c.* 30 mm from the distal end (313). The proximal end of the bone has been broken off. Its function is uncertain. It is not a flute like those known from the terps and from Haithabu, for example; if it had been meant to produce sounds the distal end would have been sawn off to make an open end.[33]

THE OBJECTS AND THE INHABITANTS

These implements do not only provide a catalogue of artefacts which were used in Oost-Souburg in the 10th century, but also information about the inhabitants of the fortress. The presence of spindle whorls shows that Oost-Souburgers processed wool from their sheep into thread. Loomweights, however, were not discovered. We may exclude the possibility of knitting. Although this technique was already known in Syria and Egypt in the third century A.D., it was not used in Northern Europe until the 13th or 14th century.[34] Because of the absence of loomweights, it would appear that the inhabitants of Oost-Souburg traded their wool in the form of spun thread, possibly alongside wool in fleeces. That there was trade is evident from the antler finds: the combs and spindle whorls. If these objects themselves were not imported, the raw material in the form of antlers certainly was, and in return wool and horses may have been sold.[35]

In addition to the objects which were bought or exchanged, some objects were also made in the home. This certainly applies to the runners and points for prickers. It may also apply to the tridents and spindles, although in the latter case the raw material was certainly imported. It is, however, clear that Oost-Souburg did not have a specialized boneworker among its inhabitants. There were possibly travelling craftsmen who visited the fortress once in a while in order to make and sell combs, and perhaps also to repair them.

It can be concluded from the worked and unworked bone material that the inhabitants of the fortress were cattle-farmers and shepherds,[36] who do not require a fixed dwelling-place. It is possible that the farmers of Oost-Souburg spent part of the year with their herds elsewhere but the considerable quantity of runners and points of prickers probably belonging to them indicate that the fortress was, at any

rate, inhabited in the winter. From the slaughter refuse of pigs one may conclude that it was also inhabited in the autumn. Since spinning is traditionally women's work,[37] the spindle whorls indicate that the cattle-farmers and shepherds lived in the fortress with their families. Whether the inhabitants of Oost-Souburg were present or absent in the spring and summer is not evident from the bone material, but the presence of families makes it likely that habitation was permanent.

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