Bronze Age Warfare: Manufacture and Use of Weaponry

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The participants of the workshop in the Natural History Museum, Vienna – November 1st, 2009

PREFACE

Marion Uckelmann, Marianne Mödlinger

This volume presents the outcome of two meetings: the international workshop on *Warfare in Bronze Age Europe: Manufacture and Use of Weaponry. An Interdisciplinary Research on Technology and Utilisation of Archaeological Finds*, held in Vienna at the Natural History Museum, from the 30th October to 1st November 2009 and the session *New Approaches on Studying Weaponry of the European Bronze Age* held at the 15th annual meeting of the European Association of Archaeologists (EAA) in Riva del Garda, Italy, on the 17th September 2009. The articles cover aspects relating to archaeometallurgy, functional analyses, experimental work and archaeology and are focussing on multidisciplinary approaches for studying archaeological artefacts.

From the very beginning of research on early antiquity, weapons have always been a source of fascination and have been studied and explored from various angles throughout this time. The reasons for the attraction of this subject are the universal interest in looking at how war and warfare affected human life, a topic still pertinent in this day and age, as well as the fine craftsmanship needed to 'create' these weapons. In most cases, the weapons being produced are the result of the application of the most advanced technologies of a culture. Therefore, they can be used as a good example of the scientific, technical and ethical advances of a culture or society.

Warfare and weapons are a prominent topic in Bronze Age research and 'heroes' of the period were depicted as warriors in contemporary images. These 'men of war' are traditionally characterised in scholarship by their weaponry, but despite this many fundamental aspects of weapon manufacture, use and functionality have not been comprehensively analysed. The consequence is that we are left with a still incomplete picture of this part of Bronze Age life. For instance, many weapons are believed to be of non-practical use in combat and are therefore regarded simply as weapons of display or weapons of a purely ceremonial character. How should the Bronze Age warrior be interpreted in such a narrative?

Over the last few years, several European countries (e.g. Ireland, Great Britain, Germany, Austria and Lithuania) have launched national research projects on Bronze Age weaponry. All these ongoing studies show the need for co-ordinated perspectives at European scale in order to find answers to the multitude of new questions that have arisen.

The original idea was to bring together scientists from different professional backgrounds, yet working on the same topic, to exchange research and develop new approaches. The focus was to discuss: the application of modern metallurgical methods and techniques used to investigate ancient weapons; experimentation relating to the manufacture and utilisation of the weapons; and the archaeological approaches to weapons, particularly, the use wear on objects.

This idea needed funding as it involved bringing specialists from across Europe together. We found this a much harder and longer road than we expected. However, we are both optimists by nature as well as very persistent and benefitted greatly from the support of many individuals who would later become participants. Thank you for bearing with us! We received funding two years after conceiving the idea and subsequently gathered in the beautiful Riva del Garda and later in the stunning Natural History Museum of Vienna.

Our utmost gratitude extends to the *Österreichische Forschungsgesellschaft* and the *Österreichisches Bundesministerium für Wissenschaft und Forschung* for making the workshop possible, and to the Natural History Museum in Vienna and its wonderful staff for providing the perfect location and catering, including the unforgettable wine tasting! Our thanks go out as well to the EAA committee for selecting our session for their programme. Furthermore, we would like to thank the Landesmuseum Kärnten for supporting the work on the publication.

Finally, we would like to thank all participants of the EAA session in Riva del Garda and the workshop in Vienna, who made both meetings so productive and inspiring and created such an open and collegiate atmosphere, and especially to those who contributed to this volume.

Marion Uckelmann and Marianne Mödlinger
London/Klagenfurt, March 2011

WARFARE IN BRONZE AGE EUROPE: MANUFACTURE AND USE OF WEAPONRY

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Marion Uckelmann

ABSTRACT

With the end of the Middle Bronze Age and the beginning of the Late Bronze Age shields made of a single piece of bronze sheet come into use. All over Europe about 86 of these metal shields are recorded, as well as two wooden and one leather shields and two wooden shield formers from Irish bogs. The main focus of distribution is in the British Isles, followed by a larger group in southern Scandinavia and more scattered finds from Germany, Poland, Czech Republic and the Carpathian basin. This paper will take a closer look at the possible function of the shields based on their technological characteristics, for example metal thickness, weight, strengthened rim and riveted on parts. New research on these features, together with metallographic and material analyses will be considered and compared with the visible signs of use wear on the shields, in order to evaluate a possible function as protective armour in combat. Old and newer experiments on the use of shields will be taken into account as well.

KEYWORDS

Shields – sheet metal work – combat – votive deposits

INTRODUCTION

Shields are an important part of the warrior panoply in the Bronze Age. The main part of the shields would have been made out of wood or leather, but due to their organic nature very few have come down to us. But widespread images of shields indicate that they were known in many parts of Europe and their use can be assumed from the late Middle Bronze Age and the Late Bronze Age (from the 13th century BC) onwards. Two wooden and one leather shield as well as two wooden shield-formers were found in Irish bogs. A C14 dating of one the organic shield-formers suggests the use of round shields in the British Isles already in Early/Middle Bronze Age times. The majority of the shields were found in 'wet' undatable contexts such as bogs and rivers and only very few finds from hoards in the Carpathian Basin and in one case from Denmark can be dated through their associations. With the end of the Middle Bronze Age and the beginning of the Late Bronze Age, organic shields were adapted to metal forms, made from one piece of bronze sheet. Today about 86 of those metal ones are known from Europe, some survived only in fragments and some are known only through literature (Uckelmann, in prep.)

DISTRIBUTION

An astonishingly high number of around 50 shields were found in the British Isles, comprising more than half of all known pieces. A third belong to the Nordic Bronze Age of Southern Scandinavia and Northern Germany, and smaller groups come from Southern Germany and the Carpathian Basin, as well as single shields from Poland and the Czech Republic (fig. 1).

This distribution map must be complimented by evidence of possible other shields, for example represented through nails, probably used as fittings on wooden shields. A smaller number of these are present in rich graves of the Middle Bronze Age Tumulus culture of Southern Germany (Stary 1980). But also other metal fittings that might have been used in some way for uncommon types of shield must be considered (Uckelmann, in prep.). It is important to add to this distribution of where shields were known and used to where images of shields are present. Many round shields are engraved on the so-called warrior steleas in Iberia, which show a very close resemblance to actual shields. The earliest encravings bear the shield as central symbol (Harrison 2004). Shields are also represented relatively frequently in many Scandinavian rock carvings, but there they are more roughly executed (Coles 2005). Some of the bronze statues from Sardinia known as bronzetti carry round shields, but in general they show no resemblance to the metal ones, and probably relate to organic forms (Thimme 1980). Many shield images and models are known from the Eastern Mediterranean, but almost no originals have survived. Different shapes are common in this region, such as the figure of eight or tower

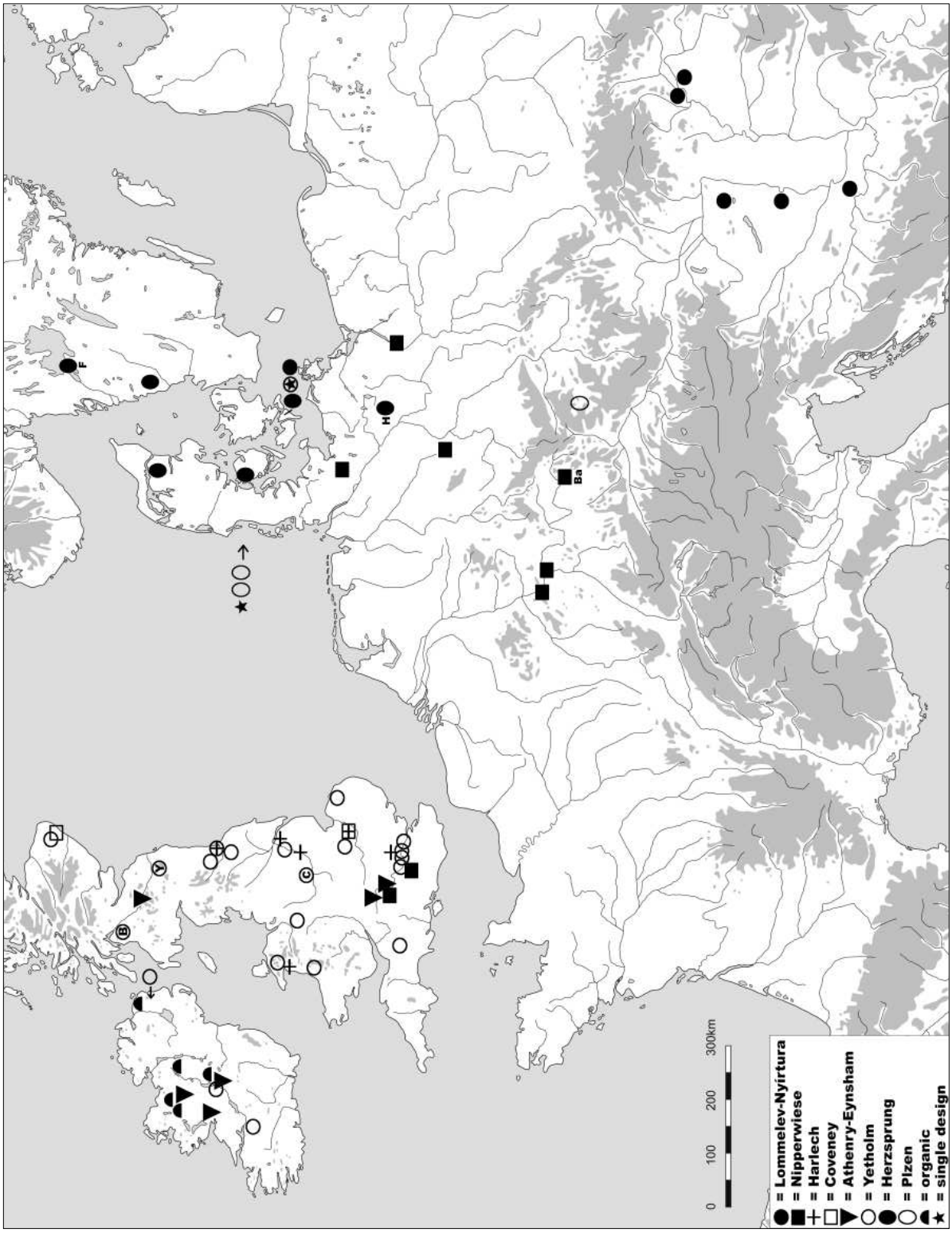

Figure 1: Distribution of the different types of Bronze Age shields. – Multiple finds of shields of the same type are indicated with a letter in or next to the symbol: B = Beith (5–6); Ba = Bamberg (2); C = Church Wilne (2); F = Fröslunda (16); H = Herzsprung (2); Y = Yetholm (3). – Multiple finds of shields of different types are indicated with symbols in or close to the other symbol. – Shields of unclear provenance are positioned with an arrow next to the country

Type	Number	Diameter	Thickness	Weight
Lommelev-Nyírtura	6	67 cm	0,9–1 mm	2,2 kg
Nipperwiese	8	38–44 cm	1–1,3 mm	1,5–2,2 kg
Harlech	6	50–68,9 cm	0,1–1 mm	1–2,75 kg
Coveney	2	45,7 / 52,5 cm	0,3–0,5 mm	0,9/1,2 kg
Athenry-Eynsham	6	23–35 cm	0,3–1,2 mm	0,9–1,2 kg
Yetholm	25	55–70 cm	0,4–0,7 mm	1,2–2 kg / 2,6 kg
Herzsprung	22	c. 71x67	0,4–0,5 mm	1,4–1,5 kg
Group Plzeň	3	c. 51x48 / 68x61 cm	1–1,3 mm	2,4–3,4 kg

Table 1: Table showing the number, diameter, sheet thickness and all over weight of the different types of bronze shields

shields. Round shields are rare and a rather late form (Snodgrass 1999).

MANUFACTURE

The shields were hammered out from a tin-bronze blank. No blanks or moulds for such a purpose have been detected yet, but it is assumed that the blank, probably cast as a round form in a ceramic mould which in experiments,[1] the cast discs would be as large as 19–20 cm. The metallographic structure of some shields suggests, due to the grain size in the cold-worked sheet, a starting diameter of the blank of about 15 cm (Goodway/ Chen 1996). Such a disc had to be flattened out into a sheet of, in most cases, 50–70 cm and an average weight of around 1.5 kg. Hammering to produce a thin bronze sheet involved a process which took many rounds of annealing in order to keep the metal from turning brittle. This was a rather time consuming process; in experiments a large disc could be expanded only 2 mm per hammering phase. To expand a blank disc of 20 cm to 60 cm would therefore take approximately 200 rounds of hammering and annealing. The technique of rolling or waltzing sheet metal can only be verified through the distinctive tools known only from the 15th century AD onwards (Born 1997).

On some of the shields the hammer-marks are still visible, but most of them were polished before the decoration was embossed. The back of some shields especially bears very clear punch marks of the hammering process where the hammer was worked radially over the surface and then crossing these radial marks to expand the bronze. On the front of certain shields, namely the Type Herzsprung of the Nordic Bronze Age, very fine and thin long marks are still visible. They reach from the centre along the whole width and were made before the decoration with ribs and bosses was punched in. Comparable marks are also common on other large sheet metal objects, such as cauldrons. It is still unclear what kind of a technique and/or tool produced such traces.

With the exception of the very small shields, all have a rolled over rim, which in some cases comprises a bronze wire for strengthening. Through this the rim becomes the strongest part of the shield being with the wire and rolled rim of sheet metal the thickest section of the shield and therefore the most suitable to withstand sword blows. When the body of the shield was finished, a grip of rolled sheet metal and thickened ends for the rivets or of either a massive bronze strap with flattened ends for the rivets were riveted onto the shield. In most cases loops or tabs were also attached to fasten a string to carry the shield over the shoulder. On a few shields, mainly the ones of Type Herzsprung, painted or incised lines and calliper points show how carefully and precise the ornamentation was planned (Thrane 1977; Uckelmann 2005).

Shield features

The shields have a round or slightly oval form, the diameter differs between 20 and 85 cm, but they measure mostly around 50 to 70 cm. The thickness of the sheet varies between 0.3 and 1.4 mm, and can vary quite a bit on one shield. But there is no evidence that the rim part represents a thinning out. Sometimes the area of the central boss is thinner. The weight of each shield lies mostly between 1 and 2 kg, but the heaviest one

[1] The experiments were carried out in the workshop of the bronze smith N. Burridge, Cornwall, United Kingdom. See: www.bronze-age-craft.com.

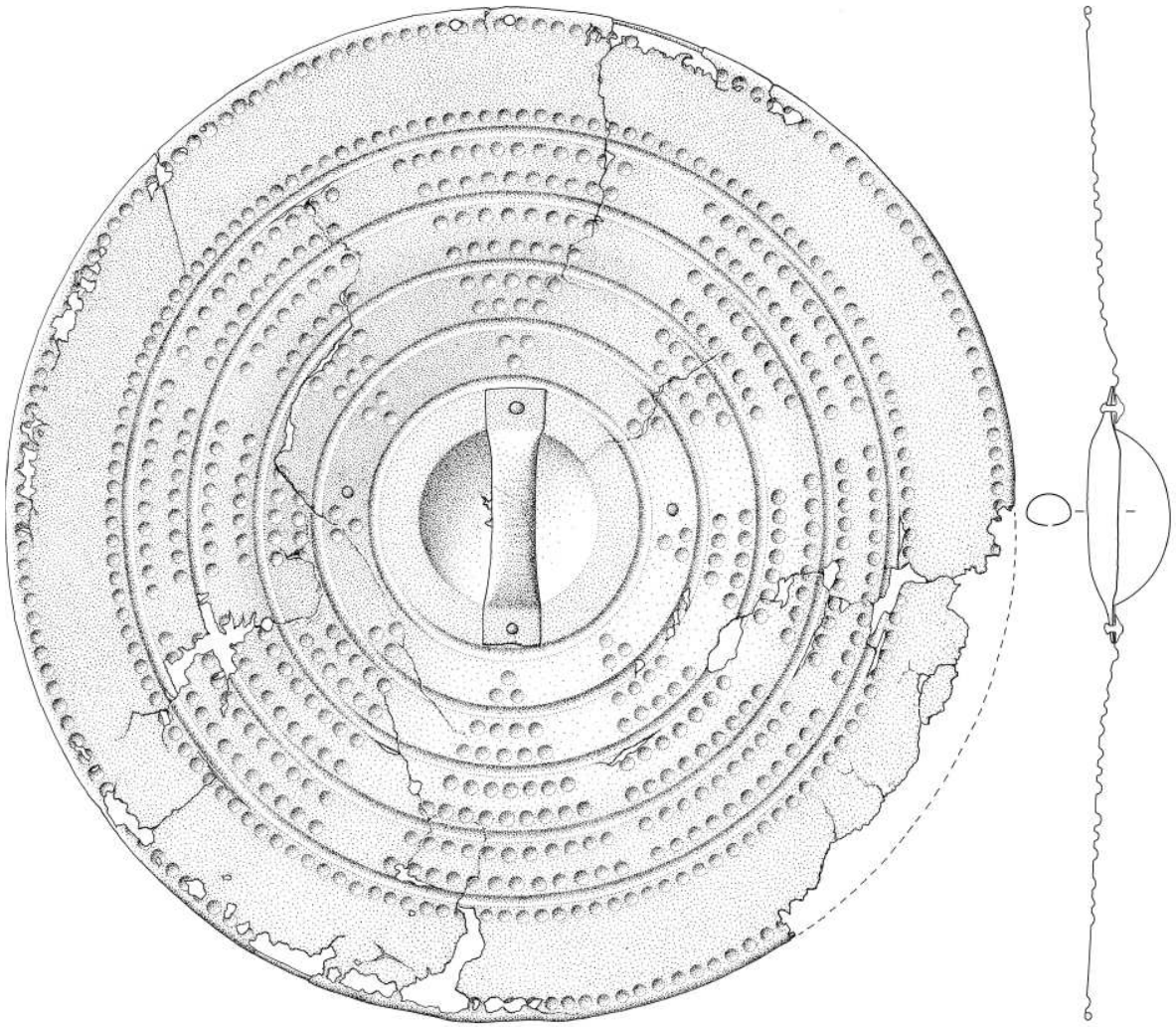

Figure 2: Bronze shield from Lommelev Mose, Falster, Denmark. Drawing from the back, and section on the side, Dm. 69 cm (Nationalmuseet København, M 9855; Uckelmann in prep., no. 3)

is 3.4 kg (tab. 1). Due to decorative and technical aspects, a number of types can be distinguished. Seven types and one group and two single shields can be differed.

Type Lommelev-Nyírtura

The Type Lommelev-Nyírtura includes only one complete shield from the eponymous find site of Lommelev Mose on Falster, Denmark (fig. 2) and fragments of shields from five hoards located in the Carpathian Basin. These finds have a central role in the dating of the shields, because they can be dated through their associated finds to the earlier Urnfield period (ältere Urnenfelderzeit, Bz D / Ha A1) or the 13th century BC, which makes them the oldest bronze shields so far in Europe. The shield from Lommelev has a round shape and a diameter of 68.7 cm. This size can also be estimated for the fragments. The ornamentation consists of concentric ribs and bosses. The bosses are arranged in double rows which are not continuous. The gaps become smaller at the outer rim of the shields and form triangular groups creating a star-like decoration. The decoration on the fragments cannot always be reconstructed in the same way, the beams of the star seem to have the same number of bosses and are not getting wider. On the reverse side of the Lommelev shield a grip has been riveted on, which is made of a tube of rolled bronze sheet. There were probably tabs attached as well, perhaps to hold a strap or wire to carry the shield over the shoulder, but only the rivets have survived.

Type Nipperwiese

This type was found in northern and central Germany, with two pieces in Britain.

Eight shields are known with a diameter between 38 and 44 cm and a thickness of the sheet body between 1 and 1.3 mm. These shields were the sturdiest since the sheet of most of the others are hammered thinner. The weight of the Nipperwiese shields ranges between 1.5 and 2.2 kg and all shields have a grip and tabs riveted on. The ornamentation of all eight shields consists of only two concentric ribs making this group very homogenous in appearance. However, they do differ slightly in the attachment of grip and tabs, and no two shields are fitted exactly in the same way.

Type Harlech

Only four shields and two more from the close variant Trent form this type and all are found in England and Wales. The diameters are between 50 and 68.5 cm. The metal thickness varies greatly, between 0.1 and 1 mm. Two of the shields weigh around 1 kg and the one from the river Leah 2.75 kg, two more are large fragments of around 0.5 kg and the last one could not be weighed. As on the Type Nipperwiese shields, the ornamentation consists of concentric ribs only, in the case of Type Harlech with more ribs, between six and ten, and on the variant Trent with 21 and 63 ribs. The reverse side of the shields are fitted with a grip of rolled bronze sheet, fastened on with rivets as well as tabs. These are triangular in shape, sometimes perforated, and typical for shields from the British Isles.

Type Coveney

The Type Coveney is formed by only two shields, but the extraordinary design justifies a type on its own. The diameters are 47.5 and 52.5 cm with a metal thickness of 0.3–0.5 mm and a weight of *c.* 1 kg. Both have two extra rivets next to the tabs, in one case with large conical heads. The function of these rivets is unknown. The unique ornamentation is formed by meandering ribs which wound around the shield face, but also following a general concentric line around the central shield boss. The ends of these ribs end in snakeheads, with punched-in eyes. If the ornamentation on both shields are compared closely it becomes obvious that they are very similar. Although the shield from Coveney is larger and has one rib more, the rib-width and the bows of the meander are almost exactly overlapping. Even though they were found far away from each other, one in Aberdeenshire and the other in Cambridgeshire, they must have been made either in the same place, or one was crafted using the other as a model.

Type Athenry-Eynsham

The shields of Type Athenry-Eynsham are the smallest sized shields and the six pieces were found only in the British Isles. The diameter varies between 23 and 35 cm, with a metal thickness of 0.3 and 1.2 mm and a weight of 0.9 and 1.2 kg. All show one concentric rib as decoration, and some show one or two rows of bosses. This type is less homogenous than other types. All shields have grip and tabs on the back. The grips can be made out of a massive bronze strip as well as of sheet tube, and the tabs are quite large, with big perforations. In contrast to the other shields, this type shows no rolled over rim (fig. 3).

Type Yetholm

This type is found only in the British Isles with the exception of one find from Denmark. With 26 known shields it is the most numerous type of shields. The diameter is quite large lying between 55 and 70 cm with a metal thickness of 0.4–0.7 mm. The Yetholm shields weigh around 1.2–2 kg, and in one case even 2.5 kg. The handle and tabs on these shields are all very similar and comparable to the ones on the other shields from the British Isles, while the tabs are generally of small size. The decoration is very regular and consists of alternating concentric rows of bosses and ribs. Most shields have 20 to 30 alternating ribs and small bosses, but a few shields have less rows, four to eleven, with larger bosses (fig. 4).

Type Herzsprung

The distribution of these shields is restricted to the Nordic Bronze Age, mainly southern Scandinavia. 16 of the 22 shields come from one find spot alone: a dried-up bay of Lake Vänern, Sweden near Fröslunda. The diameter of these

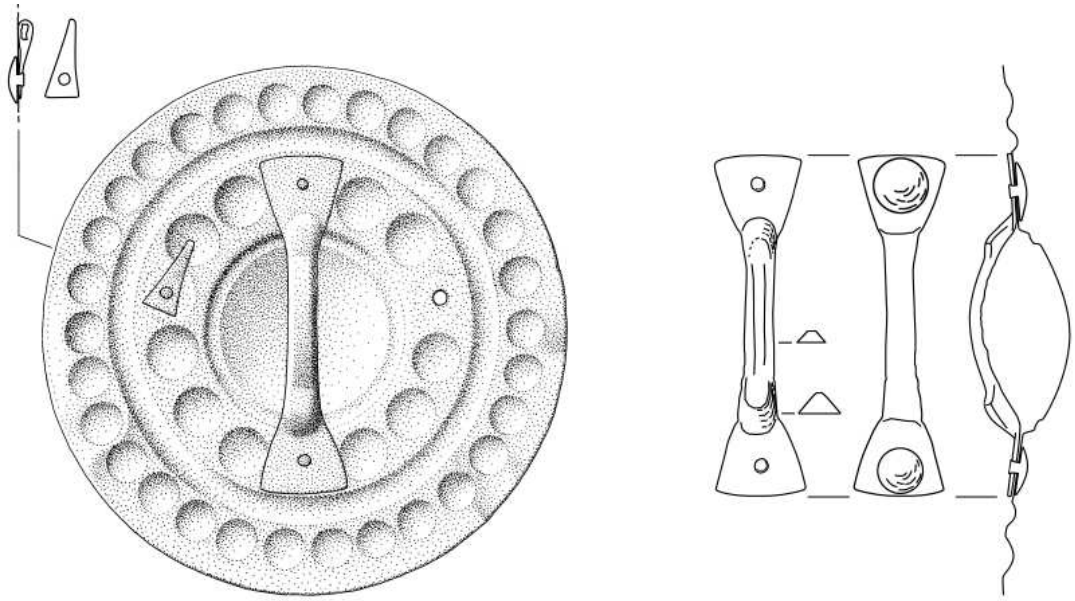

Figure 3: Bronze shield from Athenry, Ireland. Drawing from the back, and section on the side, Dm. 33.5 cm (British Museum, London, 1888.7-19,1; Uckelmann in prep., no. 24)

slightly oval shields is around 71 x 67 cm, with a metal thickness of 0.4–0.5 mm and a weight of 1.4–1.5 kg. The special ornamentation in the centre of these shields is the main feature for the type description: three wide and plain ribs running around the oval shield boss, the inner one has a gap and the two outer ones bear a U-shaped notch. The outer zone on the shield body is decorated differently with alternating ribs and rows of bosses. The handle on these shields is formed differently to other shields. Here a rolled tube of bronze sheet is riveted on the body with three rivets over a smaller rectangular piece of sheet, only the middle rivet connects the shield, handle and sheet, the two outer ones secure the handle from being ripped. The central boss is much shallower than on other shields, but the handle is heavily bent, and gives enough room for the hand of the bearer.

The five shields and formers of organic material, are due to their decoration, close to Type Herzsprung (Uckelmann 2008; in prep.).

Group Plzeñ

This is not an actual type but due to similar decorative motifs the three shields form a group. One was found in the Czech Republic and the other two come probably from Denmark, but are unprovenanced. The shields are of oval form, and through decoration are related to the Type Herzsprung. The diameters are between 51 x 48 cm and 68 x 61 cm. The metal thickness is 1–1.3 mm which explains the relatively heavy weight of 2.4–3.4 kg for the shields. The integrating element in the decoration is the circular notch in the central shield boss, the rest of the shield body is rather plain, and adorned only with ribs or boss rows. The handle and tabs are all fitted in different ways. The shield from Plzeñ-Jíkalka shows at least in this aspect some resemblance to the Type Nipperwiese shields.

CHRONOLOGY

The dating of the shields is still problematic, since most of them are single finds or associated only with other shields. The fragments of shields found in the Carpathian hoards are well dated through their associations and belong to the 13th century (Bz D / Ha A1/2; Patay 1968). A hoard in Skydebjerg, Denmark dating to Period V (*c*. 925–800 BC) includes a fragment of a Type Herzsprung shield and gives a *terminus ante quem* for this type (Albrectsen 1957). The close resemblance with some of the shield images on the Iberian stelae and the early dating of the organic shields (see below) make it possible that the Type Herzsprung origins are as early as the late 13th century BC (Uckelmann 2008). The C14 result of the shield former from Kilmahamogue shows an Early to Middle Bronze Age date and that of the wooden shield from Cloonlara a Middle to Late Bronze Age

date.[2] Three more organic shields were recently C14 dated and a 13/12th century BC date can be securely stated. In addition, a further metal shield is being AMS-dated through small pieces from remaining wood in the bronze sheet grip. Therefore, the long discussion about the date of the shield from Plzeň-Jíkalka can finally be ended: it belongs to the 13th century BC.[3] For the British types, the recent find of a Type Yetholm shield at South Cadbury suggests a date based on the find circumstances and the stratigraphical situation, as well as the metal alloy, of the Penard metalwork phase (c. 1300/1250–1125 BC) and at the latest the Wilburton metalwork phase (c. 1125–975BC) (Coles *et al.* 1999; Needham *et al.*, in prep.). The Types Harlech and Coveney are seen to be contemporary, since they are associated with Yetholm shields. Type Athenry-Ensham and Nipperwiese are extremely difficult, since they are all single finds, but the latter can be seen as contemporary with the shield from Plzeň-Jíkalka, whilst the former is similar to the larger British Types in form and technical features. The available dates for all shields suggest that the round shields were an invention that occurred in Britain and Ireland.

FUNCTION OF THE SHIELDS

Whether the metal shields of the Bronze Age were actually used and if so what for remain ongoing debates. What answers can be gleaned rely on the technical attributes and traces of use wear on the shields as well as on the find circumstances and experimental approaches.

Technical attributes

The size of the shields is the same as that of used shields in contemporary and later times. Even the very small shields cannot be labelled as miniatures because the grip is a normal size. It is known from more recent times that they are quite useful in combat.[4] The metal thickness of the shields is rather thin (0.3–1.4 mm), but when held in the hand they appear as quite sturdy objects, which are specially reinforced through the rolled rim and the fluting of the shield body through ribs and boss rows. The grip and tabs are well connected to the shield and fully functional. The alloy and hardness of the surface has been analysed in some cases. The examined shields show a percentage of copper between 85 and 90 % and tin between 9 and 13.4 %. This makes a rather hard bronze, comparable to a modern cast alloy. It is surprising that this alloy was used – and deliberately chosen – to make bronze sheet, since from a modern point of view it seems too hard and too brittle for hammering. The reason for such a high tin proportion could be the lower melting point, or the special colour. It is also possible that this alloy was chosen to make shields because of its heightened hardness and tensile strength. The measured hardness varies between shields as well as on a shield itself. This is due to the manufacture process as areas which have been worked on after the final annealing are far harder. From the few analyses it becomes obvious that even shields from the same types have varying hardness levels (Needham *et al.*, in prep.). More testing has to be done to understand the differing results of these hardness tests on the shields surfaces.

Traces of use wear

Traces of wear or abrasion are seldom found on the shields, which is mostly due to corrosion and patina. Repairs can be counted as traces of use; they appear on some shields, but are not common. Some shields have little sheet-straps riveted over small fractures and in one case a fracture is sewn together with a bronze wire (Klockhoff 1995). The smoothed over rim of a sharp-edged hole is probably also an ancient repair, the hole is likely to have been inflicted by a spearhead. Two more signs of damage can be found on the same shield, which was found in the river Thames near Long Wittenham.[5] There is

[2] Kilmahamogue (Uckelmann, in prep., no. 84), dating after Hedges *et al.* 1991, 128 f. OxA-2429: BP 3445 ± 70 (c. 1950–1600 cal BC). Cloonlara (Uckelmann, in prep., no. 83), dating after Hedges *et al.* 1993, 316, Oxa-3228: BP 3150 ± 90 (c. 1630–1190 cal BC).

[3] The dating for these shields, the leather shield from Cloonbrin (National Museum Dublin, 1908:156), the wooden shield from Annadale (National Museum Dublin, 1863:1754), the wooden shield-former from Churchfield (National Museum Dublin, 1942:1844) and the wooden fragments from the bronze shield from Plzeň-Jíkalka (Západočeské muzeum Plzeň, 8432) was undertaken in the laboratory of Groningen University by J. Lanting and will be fully published in Uckelmann, in prep., no. 85. 81. 82. 86.

[4] A 13th century AD fencing book describes the use of a buckler. The so-called *Walpurgis-Codex* or *Tower Fechtbuch,* Royal Armouries, MS I. 33; Forgeng 2003.

[5] Ashmolean Museum, Oxford, 1980:212; Uckelmann, in prep. no. 9.

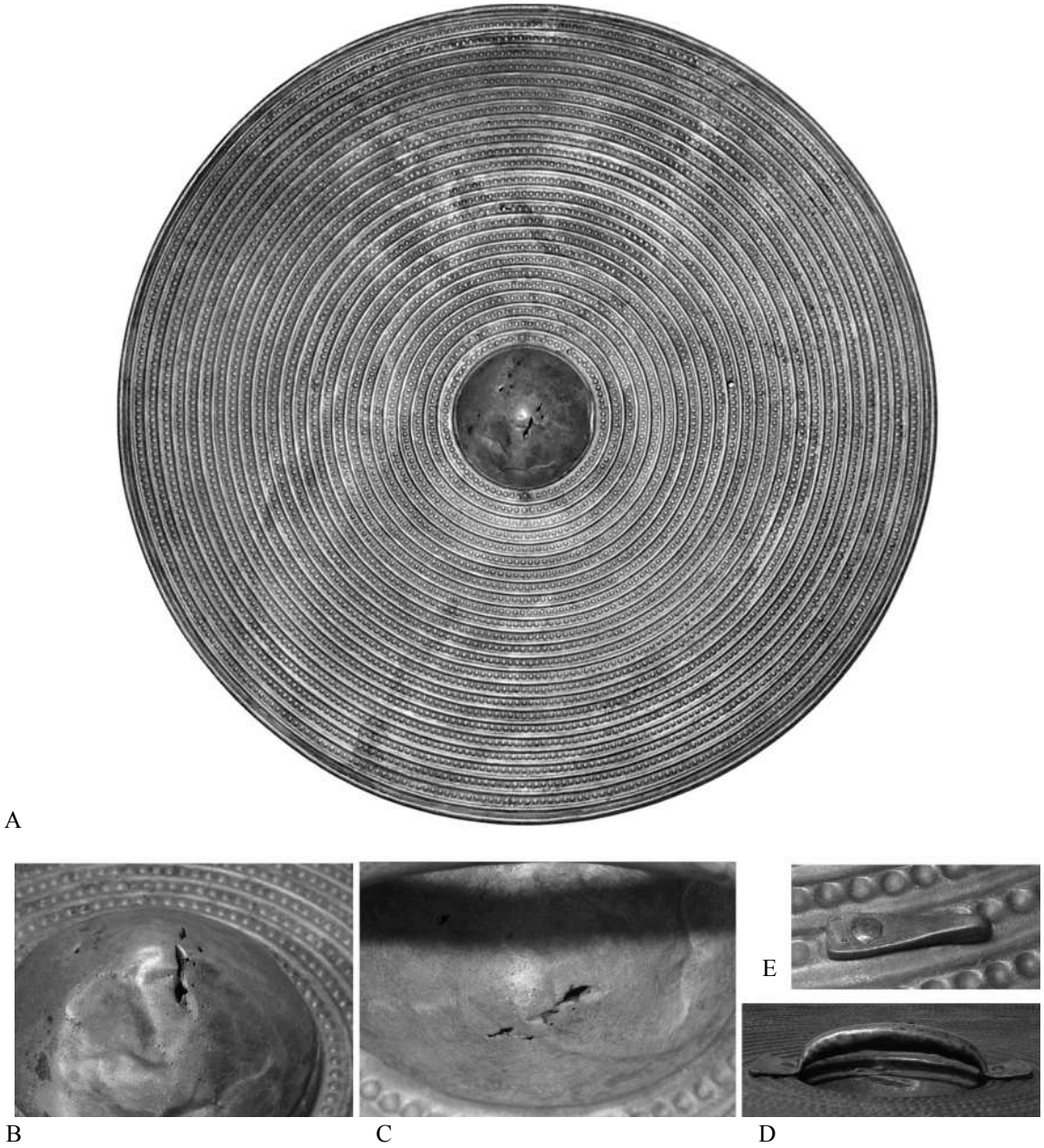

Figure 4: Bronze shield from Yetholm (National Museums of Scotland, Edinburgh, X. DN1; Uckelmann in prep., no. 49). – A: Photograph of the front, Dm. 60.2 cm. – B: Detail of damage on the front of the shield boss. – C: Detail of damage on the back of the shield boss. – D: Detail of shield tab, length: 2.4 cm (scale *c.* 1:1). – E: Detail of handle, side view, length: 14.8 cm

one larger hole of trapezoidal shape which could also have been derived from a spearhead, and smaller round one perforation. Another shield also from the Thames near London[6] bears a cut in the upper half, maybe from a sword tip, and a trapezoid hole, probably from a spearhead. One of the three shields from Yetholm, Scotland, also shows as well some damage: the central boss is pierced by a sharp pointed object, most likely a sword (fig. 4 A–C). Other shields show weapons marks, but they are not common and not bound to one type of shields.

DEFENSE

Some shields show weapon marks and the technical characteristics that suggest that some of

[6] British Museum, London, 1856,7-1,1350; Uckelmann, in prep. no. 42.

them could have been used in combat. J. M. Coles undertook an important study on shields in the 1960s and conducted the first experiments on the usage of shields in combat. Unfortunately, he took a rather thin shield as a model and used, due to availability, only 0.3 mm thin copper, rather than copper-alloy, sheet to reproduce a shield. In an adventurous testing with one individual holding a shield against repeated sword blows, the shield could not withstand any sword blows and was cut through to the rolled rim (Coles 1962). Newer experimental approaches carried out by B. Molloy showed that some metal shields, especially the thicker ones, are quite capable of protecting an individual in combat. He used copper sheet as well, but of 0.9 mm thickness, to reproduce three shields of different sizes, two of them with a rolled over rim. These shields were tested with swords and spears thrown at them: they survived the test without being damaged to the extent that they were unusable, with only minor dents visible (Molloy 2009).

Coles produced very valuable research on shields, but due to his experiments came to the conclusion that metal shields could have been only used for display and were non-functional in combat. This opinion was adopted by most later researchers. Yet, the closer examination of the shields revealed more evidence for weapon damage, and newer experiments with copper-sheet shields show that the interpretation of the function of metal shields has to be changed, although clearly not for all of them. To prove this, further testing, with a replica that is much closer to the original, ideally hammered out sheet from a blank of tin-bronze, has to be carried out. A project of such nature is currently being undertaken, including metal analyses of the shields kept in the British Museum and practical work carried out together with the bronze smith N. Burridge. The project is funded by the British Museum.

The surviving shields of organic material certainly could have been used in battle. Coles also reproduced and tested a hardened and waxed leather shield which was found quite suitable fending off sword blows (Coles 1962). In the experiments by Molloy a leather shield replica was also tested and was quite effective in warding off sword blows and spear throws, but dented and buckled after about 40 blows. However, the shield withstood all testing of cuts and thrusts of bronze swords. The marks of the attacking weapons were comparable to those on the original shield from Cloonbrin (Molloy 2009). Traces or damages had been noted before, but could not be related to weapon marks until testing and comparative analysis.

It has often been suggested, that the thin sheet metal shields were strengthened with a layer of leather on the back, but no archaeological evidence on the actual shields can be found to support this. Since many shields come from bogs, remnants of organic material for the backing would have been recorded in some cases.

DISPLAY

For Bronze Age people these shields were precious objects, this becomes obvious through their limited numbers, the high amount of material used, and the time intensive and high skilled production as well as their final use as votive offerings (see below). Some of the shields bear an extensive ornamentation, for example, the shield from Beith with over 9000 singly punched bosses.[7] The shields could have been used to mark a social position or as a badge of rank. Since they are never found in graves, they seem not to represent a personal item, but rather a communal property, where the shield was at certain times assigned to a person according to their position (that could be a chieftain or a leader in battle). In their own time the shields glistening golden glare in the hands of their bearer must have bestowed an impressive vision in the eye of the beholder and maybe an enemy in battle or a participant in a ceremonial rite.

On the shield from Sørup on Falster,[8] Denmark, four rings are riveted on to the rim. The rings show abrasion and the shield was probably hung up. Where it was placed is of course speculative, but it is easy to envision the shield hanging in a community hall or in the house of the leading man, or as well in a ritual building, the latter one is found with shields in temples in antiquity.

DEDICATION

There is some evidence for a ritual function of the shields. The few shields with figurative décor are bearers of ideological and/or religious content: one shield of Type Herzsprung shows a row of water-birds formed from punched in bosses and points; another shield of unique character bears a rare design of the common bird-sun-boat

[7] Society of Antiquaries London, LDSAL 80; Uckelmann, in prep. no. 34.

[8] Nationalmuseet København, B. 10988b; Uckelmann, in prep. no. 90.

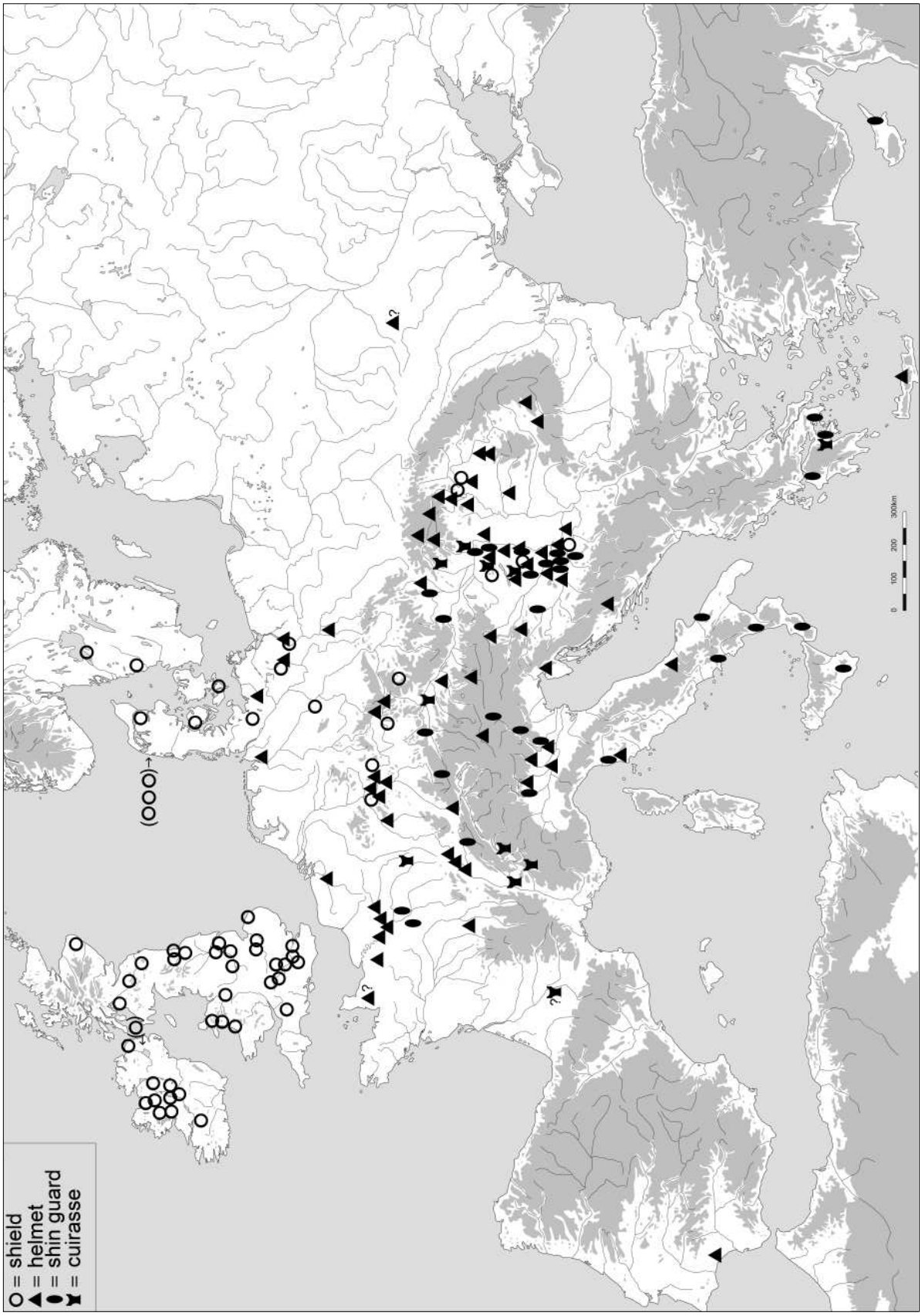

Figure 5: Distribution of Bronze Age sheet metal armour

motif; and the two shields of Type Coveney are decorated with winding snakes. The symbol with U-notches on the Type Herzsprung shields might also have a religious meaning (Uckelmann 2008; in print).

It is the find context of the shields that especially suggests a ritual interpretation, at least at the time of their deposition after their time of use. 75 of the 90 shields come from a wet context, rivers, bogs and lakes. The few finds in a landscape context come mainly from hoards in the Carpathian Basin. Almost half of the shields come from multiple depositions, but with only shields as further associations: on seven sites two shields were discovered together; and on one site each three, five to six and 16 shields. These multiple finds of shields are potentially comparable to the well known ritual of dances with arms in antiquity (Hagberg 1989, 41 f.; Uckelmann in prep.). Many of the shields received special treatment prior to the deposition. Some are recorded to have been placed standing on edge, the five or six from Beith even in a circle. A few shields show damage, and less frequently white sand as bedding or burnt remains were observed (Uckelmann, in prep.).

Detailed studies on regions with water finds, such as the river valleys of the Thames in England and the Shannon in Ireland, as well as the Fenlands in East Anglia and the southern German area have revealed that the shields fit in the general deposition patterns, with the exception that they are rather rare objects.[9] In these studies most of the finds from watery contexts are interpreted as votive gifts, due to special choice and treatment of the objects, as well as the fact that most them could not be retrieved again. All these aspects suggest that the shields were votive gifts. The motivations behind these offerings remain unclear, but one can imagine them, for example, as offerings for a victorious battle. Alternatively, rivers can be interpreted as borders as well as transport routes, and the offerings could have wished for a safe crossing or to strengthen the borders. For the Fen sites maybe the offerings were placed to wish for the waters to stop rising (Evans 2002).

OTHER DEFENSIVE ARMOUR

Compared with the distribution of the other metal defensive weapons such as helmets, cuirasses and shin guards, a clear distinction becomes obvious (fig. 5). Only in the Carpathian area are all types found, but these have survived mainly in fragments. A complete set of defensive armour – although in fragments – is known from only one site: Nadap, Hungary in a huge hoard of metal objects (Petres 1982). In the British Isles shields are the only form of metal armour. Shields and cuirasses are never found in the same area; helmets and shields are known in small numbers in Germany and Denmark and appear together on the Iberian stelae and in Nordic Rock Art, but on the later not on the body. In France and the south Alps region helmets and shin-guards are common and in the west Alps region cuirasses appear as well, but there are no metal shields in the rest of Western Europe. The numbers of the other objects of armour show that they are as rare as the shields: ca. 90 helmets; 51 shin guards and 30 cuirasses (cf. Uckelmann in prep.).

The meaning behind this distribution is not yet clear. The images of the shields show that their use was probably widespread over Europe, but in organic material. Helmets, shin-guards and cuirasses are, like the shields, manufactured from thin bronze sheet and had to be skilfully hammered out and formed into shape. They also have riveted on parts as well. The decorative elements bear the same punched in bosses, points and ribs, and very few have bird motifs. Some of the pieces show traces of use wear and repairs, indicating evidence for longer use-time. Unlike the shields, helmets, cuirasses and shin-guards were worn over some kind of bedding, most likely leather. In some cases the edges of helmets and cuirasses show punched in holes and the shin-guards have wire loops, where the bedding could be sewn on. The other armour also shows a similar deposition pattern as the shields: the majority of finds in Western Europe were deposited in wet contexts whereas in the Carpathian Basin the finds are mainly in hoards. Only the shin-guards seem to have a different meaning, since they appear very often in graves, a context where almost none of the other pieces of defensive armour are found.

CONCLUSION

Organic shields made of leather or wood were almost certainly the main material for shields throughout much of Europe in the Bronze Age, even though they rarely survive in the archaeological records. Shields were used in combat and their development and spread should probably be seen in relation to the use of swords. Different sized shields probably indicate different

[9] York 2002; Bourke 2001; Evans 2002; Falkenstein 2005.

combat styles (Molloy 2009). The form of the round shield appears, according to the recent dating of organic examples first, in the British Isles, where most of the metal ones were produced in the following centuries. This manufacture of shields of bronze sheet, as well as the other sheet armour, that occurs at the end of the Middle Bronze Age and the beginning of the Late Bronze Age in Central, Western and Northern Europe shows a pan-European desire to elevate the meaning of these objects and maybe their bearers. This can be related to broader changes in Bronze Age societies, and especially the role of the warrior. In different regions, different parts of armour were preferred, but treated in the same way when deposited. Together with the images of warriors and weapons this provides evidence that the metal defensive armour was possibly used to mark exceptional warriors or leaders.

The bronze shields were valuable and elaborately worked objects and had their own meaning in the martial environment of the Bronze Age people. They were clearly used but not simply for a single purpose. During the 'lifetime' of the shield it went through different stages in its meaning and function. At the beginning as the precious product of a well skilled and trained craftsman. In its time of active use, some of the metal shields very probably protected their bearer in combat and were also used as markers of a social position and/or as a device in ritual ceremonies. After their time of active use, their function changed and they were transferred – most likely by the community – to another sphere.

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