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COLLAPSING COMMODITIES OR LAVISH OFFERINGS?

UNDERSTANDING MASSIVE METALWORK DEPOSITION AT LANGTON MATRAVERS, DORSET DURING THE BRONZE AGE-IRON AGE TRANSITION

Summary. The discovery of 373 intact and broken tin-bronze socketed axes accompanied by 404 fragments in four pits at Langton Matravers collectively represents one of the largest hoards found to date in prehistoric Britain and Ireland. They were very probably never meant to be used as axes as they contain very high levels of tin. Many were poorly finished with the majority still containing their casting cores. The axes are typologically dated to the Llyn Fawr metalwork phase (c. 800-600 BC) and span the Bronze Age/Iron Age transition, when the production, circulation and deposition of bronze appears to have been substantially reduced throughout north-west Europe. By placing the Langton Matravers hoard(s) in a broader metallurgical, material and archaeological context, existing theories for this phenomenon, such as the preference for iron, a collapse in bronze supply, or the sharp devaluation of a social or ritual 'bronze standard' are evaluated. It is proposed that the Langton Matravers axes belong to a short phase in the centuries-long processes underlying the changing roles of bronze and iron.

INTRODUCTION

One of the largest bronze hoards from prehistoric Britain and Ireland was found at Langton Matravers on the Isle of Purbeck just above Swanage Bay, Dorset. A total of 373 intact and broken socketed axes and 404 fragments, placed in four pits, were discovered in 2007 (Fig. 1). The axes can all be dated to the Llyn Fawr metalwork phase (c. 800-600 BC) (O'Connor 2007), broadly labelled as the Earliest Iron Age (Cunliffe 2005; Needham 2007), which represents the Bronze Age/Iron Age transition. In the two centuries following the Langton Matravers hoard(s) (c. 600-400 BC), evidence for bronze production or deposition in southern England is substantially reduced; the few objects such as bronze-hilted iron daggers (Jope 1961; see Garrow *et al.* 2010 for dating), Swan's neck pins (Dunning 1934; Becker 2008) and bronze brooches (e.g. Hull and Hawkes 1987; Adams 2013) are rare. In contrast, the two centuries preceding the Langton Matravers hoard(s), the Ewart Park metalwork phase (c. 1000-800 BC), represent the peak of bronze deposition throughout Britain (Needham 2007).

DISCOVERY, EXCAVATION AND CLASSIFICATION

The hoard (or hoards) was discovered in October 2007 by metal-detectorists who initially found one complete and one fragmentary socketed axe at Putlake Adventure Farm, south of Langton Matravers (SZ 00175 78515 and 400182E, 078516N) (Fig. 2). The site was under pasture at the time of discovery and had been for some years. On returning to the site later that month, the detectorists identified three adjacent hotspots c. 30 m to the north-west of the initial finds, which yielded 303 socketed axes, broken axes and fragments in total (Bruns *et al.* 2008a). In early November, they found a further 197 axes and fragments in a fourth pit located c. 19 m to the south. The finds were reported to the Portable Antiquities Scheme (PAS) as potential Treasure and, at the request of the British Museum and the PAS, Wessex Archaeology undertook an excavation.

The fieldwork, which was funded by Wessex Archaeology was undertaken in December (by MD and AF). Two trenches were excavated over the findspots, confirming that the hoard(s) had been placed in four small pits (pits 4, 6, 8 and 10). Only the bases of the pits survived, their sides having been destroyed in the first investigation. Another 297 axe fragments were recovered, primarily from the backfill of the original investigations as well as an intact axe which had been retained by the farmer. The only other features were two postholes (12 and 14) (Fig. 2). The pits were prominently sited on a high spur (c. 85 m AOD) running north from the limestone hills of south Purbeck, with views to Ballard Down ridge above Swanage Bay, and across the channel to the Isle of Wight (Wessex Archaeology 2008).

From the finders' accounts (Spencer 2008) and an interview (conducted by AF), the axes appear to have been tightly packed in each pit in no particular arrangement (Fig. 3), suggesting that they could have been in bags when placed in the pits. Unfortunately, axes from different pits were mixed by the metal detectorists, but 28 and 30 complete socketed axes came from the two smaller pits 4 and 8 respectively. The remaining 176 intact and broken socketed axes came from the central larger pit 6, presumably with the majority of the 57 fragments recovered from pits 4,6 and 8. The axes in pit 6 were placed above and below a stone slab. In pit 10 to the south, 135 intact and broken axes and 50 fragments were found, together with a fragment of stone.

Apart from the axe fragments found in the backfill, no further finds were found in the pits, but one pottery sherd in a sandy fabric from posthole 12 can be broadly dated to the early-mid first millennium BC as this fabric occurs in Early/Middle Iron Age assemblages at nearby Sutton Poyntz (Mephram 2007) and Rope Lake Hole (Davies 1987). The postholes also contained relatively rich charred plant remains from crop processing. The glumes were mainly of spelt wheat (*Triticum spelta*) with some emmer (*T. dicoccum*). A few grains of hulled wheats, emmer or spelt (*Triticum dicoccum/spelta*), were also present as well as a bean seed (*Vicia faba*) and a few grains of barley (*Hordeum vulgare l*). As spelt appears to largely replace emmer during the Late Bronze Age to Early Iron Age (cf. Carruthers 1992), this suggests that the postholes may be

contemporary with the pits. As the remains represent the processing stage prior to consumption, this indicates that there was a settlement nearby.

The whole hoard(s) was acquired as Treasure by purchase by The Dorset County Museum in 2009 (Woodward 2010) which also holds the complete project archive (Entry 6350, Accession 2009.88.1-6). The accession programme, including cleaning and stabilisation, refitting (84 refitting conjoins were achieved, reducing the initial estimate of the size of the hoard) and a comprehensive photographic catalogue, enabled a complete study of all the axes and fragments in the hoard(s) (Table 1, A-E; Fig. 4).

As a result there is relative confidence on the pit contents. In total there were 287 intact socketed axes, together with 86 broken socketed axes (30 with three quarters present and 56 with half present) and 404 smaller fragments (Table 1, A). The overwhelming majority of these axes are of Portland and Blandford types. Alternative estimates of the minimum number of individual socketed axes deposited can be proposed: a count of complete loops (with both body ends attached) gives a total of 382 (Table 1, B), while a count of the typologically assigned pieces totals 406 (Table 1, C). Individual axes are identified by their museum accession reference, e.g. Axe No. DORCM2009.88.1.1 (northern pits, axe 1).

The study of the whole assemblage (Fig. 4) enabled a clear view of the contrasts and variations between the collection units. Not recorded in Table 1 is the clear visual impression that there was a contrast in the colour and finish between the groups. Axes from the southern pit (10) were more robust, with a lighter green finish and proportionally more 'silvered' in appearance, while those from the northern pits (4, 6 and 8) were more broken and less robust, with many miscasts, a darker green surface with and more corrosion. This impression was not detected in the X-ray fluorescence analysis of a small sample of 13 axes (Table 2: eight from the northern pits (DORCM2009.88.1.119-297) and five from the southern pit (DORCM2009.88.2.12-69)).

The refitting indicated that considerable breakage had occurred just after the first discovery. Many of the axes were in a partial state and most of the refits were within the three collection units. A considerable number of broken-off loops were found in the excavations (Table 1, B), particularly in pits 4, 6 and 8, although when this breakage occurred is not certain (but perhaps at the time of pit deposition), suggesting that the axes were fragile castings, with many breaking either on deposition or first discovery. Also of note was the failure to refit approximately 30% of the axes in pits 4, 6 and 8 and approximately 11% in pit 10, suggesting that those proportions were possibly miscast parts of axes, very fragile axes indeed, which had been deliberately broken on deposition. The patina made ancient and modern breakages hard to contrast, and the finders reported frequent breakages upon retrieval.

The contrasting proportion of breakage and miscasting between the groups (Table 1, A-E) between pits 4, 6 and 8, and pit 10, suggest that they are from different production batches. Of particular note is the presence of a large number of lateral breaks across the waist of the axes, breaking the axes into two (neck-part and blade-part). Some intact axes also exhibited cracks across the waist suggesting that they had

fractured during manufacturing or through stress corrosion in the ground, perhaps as they were not initially carefully placed. There is also a clear contrast in the number of morphological variations (Table 1, E) between pits 4, 6 and 8 and pit 10 and this becomes more marked if one calculates the average number of variations per axe (calculated against the estimated minimum number [1] of axes in each group): 0.58 and 0.79 respectively. A marked contrast can also be seen in the relative presence of twisted ribs, stray pellets and variant axes.

The axes are made from copper alloy, are 85-100 mm in length, have a maximum width of 35-45 mm (at the blade), a maximum thickness of 23-30 mm (at the socket), a prominent casting seam and contain a casting core. The intact and broken axes were subdivided according to morphological variations, such as the number of ribs on the body, the presence of linear side facets, the orientation of the socket, the shape of the ribs, the position of pellets and whether differences in these existed on either side of each socketed axe (Table 1, D-E).

The classified axes were then assessed against a large corpus of socketed axes compiled by one of the authors (DB) and they compared well in form, casting, size, weight and decoration to other Dorset hoards, such as Portland (Pearce 1983, 479, pl. 55), Blandford Forum (ibid. 465, pl. 45-6), Eggardon (ibid. 462, pl 45), Thorney Down, Sixpenny Handley (O'Connor 2007, 75), near Weymouth (Pearce 1983, 487, pl. 60) and an unpublished hoard from Puddletown, Dorset containing 6 of an estimated 18 socketed axes (Dorset County Museum Accession 1990.64.1-6). The axes are also comparable to those from the 'Salisbury' hoard(s) from Netherhampton, Wiltshire (Stead 1998), but not to those from Batheaston, slightly further away in Somerset (Fig. 5). Two further Lyn Fawr hoards have recently been found in Wiltshire, at Tisbury and Hindon (Boughton 2013).

The traditional classification of these socketed axes follows Butler (1963) and O'Connor (1980, 231-3) in placing the Langton Matravers axes in a broad Linear Faceted axe group dating to the Lyn Fawr phase (c. 800-600 BC) (O'Connor 1980, 231-4; Needham *et al.* 1997; O'Connor 2007). However, a recent reassessment of the Lyn Fawr phase axes has demonstrated the existence of two distinct groupings – one in east England and the other in south-central England (Boughton in prep). The former is represented in hoards from East Rudham, Watton, Syderstone and Cringleford (all in Norfolk) and contain a slightly larger socketed axe, known as Type East Rudham. The latter comprises Langton Matravers and other hoards from Dorset and Wiltshire which contain a slightly smaller socketed axe, known as Type Portland. This type is defined by a 'back to front' socket, a single mouth moulding beneath a protruding loop, a slender upper body, leading to a sharply trapezoidal lower body and a straight, broad edged blade. The type typically exhibits defined side facets and three or more vertical ribs ending in a round pellet. In addition, there is another distinctive and slightly larger socketed axe, which is decorated with one or two curving side ribs and no pellets, known as Type Blandford after the Blandford Forum hoard. In the Langton Matravers hoard(s), over 90% of the intact and broken socketed axes (339) are Type Portland (Fig. 6, a). Less than 1% of the

intact and broken socketed axes (3) were classified as Type Blandford (Fig. 6, b). A further 7% of socketed axes (27) exhibit a single central rib and pellet and flanked by two curving side ribs creating an apparent hybrid form (Fig. 6, c). Further distinctions are described in Table 1 (Table 1, C, E).

What makes the Langton Matravers hoard(s) exceptional is their sheer quantity, which is unprecedented in Britain (O'Connor 2007, 64-8), and challenges traditional interpretations of the collapse of bronze production and use. The majority of the other 34 hoards dated to this period have been found in southern Britain and are comprised entirely of axes, frequently in large numbers, which can be divided into three broad Types; Armorican, Sompting and the former Linear Faceted axe group, now divided into three subtypes; Portland/Blandford/East Rudham (O'Connor 1980, 230-7; 2007, app. 1). The next largest contemporary hoards are the 68 Armorican socketed axes from the Fawley area, Hampshire (O'Connor 2007, 75) and over 40 Armorican socketed axes found at Gwinear, Cornwall (Pearce 1983, 408, pl. 5). Though the Netherhampton hoard contained at least 93 Type Portland axes, it was likely deposited during the 1st century BC, despite the presence of earlier objects.

The Portland/Blandford/East Rudham axes were deposited separately from the Armorican and Sompting axes, with a Blandford axe being found once with a Sompting axe at King's Weston Down, Bristol (Bristol Museum and Art Gallery 31/1982/1-28). In contrast, several East Rudham axes were included in the Sompting hoard, Sussex (Burgess 1970). Neither Portland nor East Rudham axes have been found with any other type of object except small, thin, silvery high-tin bronze socketed gouges. It is therefore not possible to construct finer typological or chronological resolution and absolute dating remains poor due to the radiocarbon plateau (Lanting and van der Plicht 2001/2). The latest continental radiocarbon and typological dating schemes, place a single Linear Faceted axe, albeit of a different form to those in Langton Matravers, in a grave at Court-Saint-Etienne, Belgium in the Hallstatt D phase (Warmenbol 1993, 104-5; Lanting and van der Plicht 2001/2, 173; O'Connor 2007, 71-3). This evidence could place the Langton Matravers hoard(s) towards the end of the Llyn Fawr phase, in the late seventh century BC.

ANALYSING PRODUCTION METHODS

The initial recording of visible production evidence (PW and BR) revealed differences in the clarity of definition in form and decoration with a minority of axes having especially high (40) or low (39) definition. This implies diversity in the moulds used as also indicated by the micro-variations encountered when classifying decoration (Table 1, E). Casting cores were present in virtually all socketed axes (323) that could have retained them. The failure to remove casting cores suggests that there was no intention to haft the axes. However, partial finishing had occurred in the majority of axes as they had had their casting flashes removed (along with any casting sprues) leaving only a minority with casting flashes still attached (44).

The subsequent archaeometallurgical analysis (NM, AM and DH) involved samples from 13 socketed axes (c. 4% of the intact and broken axes) which were selected primarily on the basis of variations in condition and context. The purpose was to characterise their metallurgical structure and to investigate any variations in composition using metallography, scanning electron microscopy with energy dispersive X-ray analysis (SEM-EDX) and X-ray fluorescence (XRF). To avoid damaging the blades, the axes were sampled at the haft end using a diamond disc saw (aside from DORC 2009.88.2.15.1 whose haft and blade were both sampled to investigate any potential variation). All the samples were mounted in resin and polished down to one micron, providing cross-sections of the axes from the outer surface to the inside edge of the socket. The samples were first examined optically using a metallographic microscope and were subsequently carbon coated for examination and analysis by SEM-EDX. In the SEM, images of the microstructures of all the samples were recorded using backscattered electron imaging, first at low magnification (30x) to describe the overall microstructures and any macro inclusions and corrosion, and then at high magnification (1000x) to show any finer phase structures and details of the eutectoid microstructure and lead distribution. Some of the axes themselves, with both silvery and black surface colours, were also examined directly in the SEM to compare their surfaces with their cross-section structures (Figures 7-9). The samples were also analysed using XRF, especially to investigate the levels of both major and minor elements present (Table 2).¹ XRF is generally a more sensitive technique than SEM-EDX and thus better able to detect the minor elements.

The axes have a variety of surface colours, from silvery, green, grey and black, often with multiple colours on a single axe (Fig. 7-9). The silvery and black colours clearly visible on some of the axes draw attention to the fact that they differ in appearance from axes in many other hoards. The silvery colour is due to the dominant presence of the delta eutectoid intermetallic compound at the surface, which is clearly visible as a characteristic microstructure in the SEM (Figures 7c, d and 8c, d) (Meeks 1993a; 1993b). This is also a reflection of the internal microstructure seen in cross-section. However, it is also possible that the surface may have been further enriched in eutectoid during casting by the ‘tin-sweat’ phenomenon. Despite the commonly used name, during ‘tin-sweat’, the surface does not become enriched in metallic tin. Rather, as the alloy solidifies, the remaining molten metal enriches in tin up to the eutectoid composition of 27%, as shown in the phase diagram (Fig. 11b). During solidification and cooling, the axe shrinks in the mould and it can force this remaining tin-rich liquid metal to the surface through fine inter-dendritic pathways, where it solidifies as a continuous eutectoid microstructure. Simultaneously during the cooling phase, lead globules will form due to their insolubility in the solidifying copper-tin alloy, and shrinkage can also force lead to the surface. At the surface of the axes, the copper-rich alpha phase corrodes first, leaving the corrosion-resistant intermetallic compound network with its silvery surface. However, in certain cases, this intermetallic

¹ The archaeometallurgical studies were undertaken in the Department of Conservation and Scientific Research of the British Museum. The SEM was a *Hitachi S-3700N Variable Pressure SEM*, set with an acceleration voltage of 20 kV and under high vacuum for analysis with *Oxford Instruments INCA analyser and SDD detector*. The XRF instrument was a *Bruker Artax spectrometer* operating at a 50 kV voltage and 500 μ A current, with 0.2, 0.65 and 1 mm collimators. The microscope for metallography was a *Zeiss Axiovert 100A* metallographic microscope combined with a *Leica DFC500 digital camera*.

compound also corrodes forming dense black-coloured tin oxides that remain on the surface as pseudomorphic ghost structures. Therefore, the original physical surface remains, but is now black in colour. Some axes have both silvery and black areas due to varying local corrosion conditions (Meeks 1986).

The socketed axes examined were either unfinished or only partially finished as-cast high-tin bronzes and would have originally been a distinctive silvery colour due to the presence of the delta intermetallic compound throughout the structure being the dominant compound especially at the surface. They have not have been ‘tinned’ by the deliberate application of metallic tin to their surface to produce this colour. Although the axes are all high-tin bronzes, with tin contents varying between c. 16 and 23 wt% (Table 2, Fig. 10, 11a-b), the concentrations of both major and minor elements are variable, suggest that a highly-controlled, specific recipe was not employed and that different batches of bronze were used. The amount of tin in the copper is the most important factor, as it determines mechanical properties and the colour of the alloys. The continuous network of the intermetallic compound that occurs in these high-tin alloys makes them hard and brittle. This precludes any of the cold hammering that would normally have been needed to finish the axes with sharp cutting edges; they therefore appear not to be intended as working tools. The axes also contain c. 2-18 wt% of lead (Table 2) as finely distributed, small globules in the axes that contain low levels of lead, but in the form of large globules, distributed heterogeneously, in those with high lead contents. The lead does not improve the mechanical properties of the alloys, causing weakness, but can improve the castability of bronzes. Although the lead contents do vary considerably in the selection of axes analysed, they appear to display a Gaussian distribution, which is unlike Late Bronze Age cast bronzes in general where the lead content has a much more dispersed, even distribution (Hughes et al., 1982).

The limited number of analyses and the relatively poor sensitivity of the analytical techniques used provide insufficient data to enable a detailed assessment of the minor and trace element contents of the axes. However, even the limited analyses in Table 2 give an indication of the variability of the minor/trace elements. Most of the axes have low levels of nickel, arsenic, antimony, silver, cobalt, iron bismuth and zinc. However, three axes (DORCM2009.88.2.12; DORCM2009.88.2.69; DORCM2009.88.1.201) appear to have been derived from fahl-type ores, have distinctly higher but variable amounts of nickel, arsenic, antimony and silver, with two of the axes also having detectable cobalt. This variability suggests that the copper of the axes in the hoard(s) has not been derived from a stock that has become homogenised over time with continual remixing and re-melting, and thus appears to lack a distinctive ‘signature’, which supports the view that there was a good supply of raw materials, i.e. copper and tin. It is possible to interpret the data as consisting of two groups based on the minor/trace element content, but the limited size and quality of the dataset perhaps limits the usefulness of making wider, detailed comparisons.

The deliberate use of a high-tin bronze thin metal that was weak, brittle and could not be work-hardened implies that the axes were not intended to be practical tools. This is supported by the casting cores not being removed, which would have been required for any hafting. However, the micro-variations in size, shape and decorations potentially indicate that, rather than employ reusable stone or metal moulds for mass

production, casting occurred using individual clay moulds which were prepared using different wooden(?) patterns. The removal of the casting sprues and flashing together with the likely cleaning and polishing of the surfaces indicates that the neatness of each axe mattered. The use of a high-tin bronze alloy to have a distinctive silvery colour suggests that colour and lustre were also priorities. Finally, the form and decoration, with subtle variations on a consistent template, demonstrate clear purpose. Though no comprehensive archaeometallurgical analysis has been carried out on the other contemporary Dorset hoards, the socketed axes that have been analysed tend to be formed from similar metal with silver-coloured surfaces, indicative of high-tin bronze alloying (Northover 1983, 67; Northover and Sherratt 1987, 17; Rohl and Needham 1998, 109-10; Northover in Coombs *et al.* 2003, 220-3). There is no direct evidence that the socketed axes at Langton Matravers were made locally although slightly earlier metalworking evidence exists nearby, such as crucible and clay mould fragments at Bestwall Quarry, Dorset (Needham and Woodward 2009) [these sites are about 13 km apart]. There are also stone and clay moulds/fragments at sites in north Dorset (Skowranek 2008).

LANDSCAPE, SETTLEMENTS AND CRAFT PRACTICES ON THE ISLE OF PURBECK DURING THE EARLY FIRST MILLENNIUM BC

The Langton Matravers hoard(s) were buried amidst a distinctive series of contemporary settlements in the south of the Isle of Purbeck (Calkin 1949; fig. 10). The sites include Gaulter Gap, Kimmeridge one of the eponymous sites for Cunliffe's 8th-7th century BC Kimmeridge-Caburn pottery group (Cunliffe 2005, fig. A3) and the multi-phase site at Eldon's Seat (Cunliffe and Phillipson 1968) (Fig. 1). Here, Cunliffe defined three phases: one of undifferentiated Late Bronze Age date and two Early Iron Age, separated by deep layers of debris mainly interpreted as the matrix of field lynchets. Re-reassessment of the site indicates that the settlement was occupied for longer, since the Middle Bronze Age, and more intensively than previously thought (Needham and Woodward in prep). Cunliffe's Period II, contemporary with the Langton Matravers hoard(s), comprises the later houses and deep covering layers which contained fine thin-walled haematite-coated or burnished bowls (see Middleton 1987, 1995), along with some larger jars with incised geometric designs. This pottery belongs to Kimmeridge style II or slightly later (Cunliffe and Phillipson 1968, 235), dated *c.* 800 to 600 BC. The deep covering layers can be interpreted as midden material.

Other sites with Kimmeridge-style pottery also appear to have incorporated midden deposits. At Gaulter Gap, Kimmeridge, Level II was a grey sand with hearths interspersed and contained much Kimmeridge-style pottery and briquetage (Davies 1936). Below these apparent midden layers lay Level III with simpler pottery (no haematite ware), hand-worked shale and a substantial animal bone assemblage, and this can now be interpreted as a Late Bronze Age plain ware occupation horizon. A series of pits and an oval area of dark material were found in a quarry on the very top of the limestone ridge west of Langton

Matravers (Calkin and Piggott 1938). The spread was over two feet (0.6 m) deep and contained a well stratified Early Iron Age 'A' layer, apparently another midden. This yielded over 1000 sherds of pottery, including many fine Kimmeridge-style bowls and geometrically decorated jars, five bone points, a flint industry and much animal bone. In addition, further down the spur to the north of Langton Matravers, some features on 1946 RAF aerial photographs may be ancient fields (RAF 1946. Aerial Reconnaissance Photograph, CPE/UK/1821:4Nov1946:F36//MULTI(7) 58SQDN (5400/5401)).

The Period 1 structures at Rope Lake Hole were also associated with Kimmeridge pottery and were sealed by substantial deposits, mainly from a shale-working industry (Woodward 1987, figs. 70-2). These upper deposits were quite thick, about 300 mm, implying another midden type deposit. At the recently excavated site at Compact Farm Late Iron Age roundhouses were sited on top of yet another Earliest Iron Age midden (Graham *et al.* 2002, fig.1.3). The midden was only sampled, but it was possible to demonstrate that there were some posthole structures cutting the top of the layers and, as usual, traces of timber structures beneath them. Further work has yielded a miniature Armorican socketed axe (L. Ladle pers. comm.). Further to the west, a broken and possibly unfinished socketed axe was found in a possible midden deposit next to a round house in the Earliest Iron Age settlement at Southdown Ridge above Weymouth. The deposit contained Kimmeridge style pottery, animal bone, cereals, and a flint tool for shale working (Brown *et al.* 2014).

Some of the field systems known in the area may also have originated in the Late Bronze Age or Earliest Iron Age (RCHME 1970, 629-32: field groups 20-4, 28). The houses and midden layers display evidence for the large-scale deposition of fine haematite-coated pottery and objects of bronze, bone and shale, along with substantial animal bone assemblages. The middens may be compared with others in southern Britain and it has been argued that they result from large social gatherings and feasting, intimately connected with a rich agricultural economy that specialised in dairying (Lawson 2000; Tullett 2008; Barrett and McOmish 2009; Gwilt and Lodwick 2009; Waddington and Sharples 2011).

This rich contemporary settlement and midden evidence makes the Isle of Purbeck distinctive (Sharples 2010, 80-1) and contrasts with the sparse evidence for contemporary settlements immediately to the north (Cox and Hearne 1991, 226-8). The recent debates concerning a contraction or collapse in settlement and society between 800 and 600 BC due to a colder and wetter climatic change (cf. Burgess 1985; Brown 2008; Charman 2010), as evaluated for south-west England (e.g. Amesbury *et al.* 2008) and elsewhere (e.g. Tipping *et al.* 2008), do not appear to apply to the Isle of Purbeck, where farming communities appear to have thrived during these centuries. The idea that certain areas of southern England prospered when others declined is lent further support by the change in economic and settlement activity from the Middle to the Upper Thames valley around 800 BC (Lambrick *et al.* 2009).

On Purbeck, the farming economy in the Earliest Iron Age was accompanied by two emerging local craft ‘industries’: salt-making, as evidenced by briquetage, and the manufacture of handmade bracelets and other objects of Kimmeridge shale. Finished and roughed-out bracelets were distributed widely in southern England (Lawson 2000, 210-11; Brossler *et al.* 2004, 98-9) while briquetage occurred in the Earliest Iron Age levels at Rope Lake Hole (Woodward 1987, tab. 26, fig. 77). This mainly comprised vessels and supports used in salt-making, rather than the small containers used for transporting it. Such containers are not yet known from contemporary sites inland in Dorset, but they do occur in 6th century BC Early Iron Age contexts at Danebury, Hampshire (Cunliffe 1991, 404-7). The emergence of these productive activities, linked to a very rich socio-economic milieu in Purbeck, indicate thriving communities within the vicinity of the Langton Matravers socketed axe hoard(s).

CONNECTIONS

The placing of the Langton Matravers hoard(s) high on a limestone spur overlooking the sea can be compared with the contemporary hoards on Portland just to the west (Pearce 1983, 479, pl. 55). The distribution in Dorset of the three axe types at Langton Matravers (Fig. 6a-c) also shows two types of location (as also noted by Pearce 1983, 325-6; fig. 10; 12): first, on high ground with clear views to the English Channel, notably sites on Portland and Purbeck, and second, sites close to rivers, especially the Frome and Stour, already seen in earliest socketed axe depositions of Taunton-Hademarschen type, *c.* 1400-1250 BC (O’Connor and Woodward 2004). A recent study in south-east England of the period 1400-800 BC, found that neither depositions on the high grounds nor near the rivers were closely related to settlement locations, even in areas of high density (Yates and Bradley 2010). However, there are exceptions to the broad pattern such as the seven or more Ewart Park phase hoards found at the Ebbsfleet peninsula, Kent (Lawson 1995; Andrews *et al.* 2009; Andrews *et al.* 2015), one of the few sites comparable to the deposition in four pits at Langton Matravers, although none of the recent Ebbsfleet finds were in pits. The landscape context of deposition of Llyn Fawr metalwork sees a coastal and riverine distribution overlooking water as well as a concentration in south-central England to south-east Wales (Fig. 5). This may well reflect the connections of communities living along the river valleys and coasts of southern Britain, an idea which is supported when the Langton Matravers hoard(s) is placed in its continental context.

Langton Matravers is just 3 km from the sheltered harbour of Swanage Bay and it would have been a relatively short trip over the Channel to north-west France (McGrail 1993; Bourgeois and Talon 2009). Swanage Bay is one several sheltered bays on or close to Purbeck. Others to the west include Weymouth and the small one at nearby Lulworth Cove. The earthworks of Bindon Hill on the ridge behind Lulworth run some 3 km east to above Mupe Bay, enclosing a coastal promontory (RCHM(E), 1970, Lulworth West (53), 489–92; Wheeler 1953), which may have had an important role in this period (Cunliffe 1987, 336-8,

fig. 231). These bays would have been invaluable in facilitating short-haul journeys by boat (Cunliffe 2009, fig. 6.10). To the east there was also extensive activity at Hengistbury Head in Christchurch Harbour in the Early Iron Age. The site yielded a single fragment of an Armorican socketed axe and the local iron ores could have been exploited at this time, though definite evidence is lacking (Cunliffe 1987).

The continental connections of the Langton Matravers hoard(s) can be seen in the decoration, morphology, composition and depositional characteristics of the axes. The primary concentration of over 500 rib and pellet decorated axes through hoards in Europe is in southern and eastern England for Sompting and Portland/Blandford/East Rudham axes and in the Channel Islands and north-west France for Armorican axes (Briard *et al.* 1977; Huth 1997; 2000; Coombs *et al.* 2003; Gomez de Soto *et al.* 2009; Rivallain 2012). However, decorative variations observed by Huth (1997) such as the additional pellets, additional ribs or rings or roundels around the pellets etc. are, barring one exception, exclusive to Britain and occur in the Langton Matravers hoard(s), nearly doubling the number of rib and pellet axes known. The origins of this decoration are unclear (Huth 2000, 176-84) but probably lie in earlier South-eastern type socketed axes in southern and eastern England (Needham 1990, 30; Schmidt and Burgess 1981, 211-17) before being found on both sides of the channel (Huth 2000, 176-84). There is a degree of overlap when comparing the socketed axe morphology at Langton Matravers hoard(s) with the East Rudham type socketed axes in eastern England but not with the Armorican axes in the Channel Islands and France. Closer parallels can instead be found in concentrations to the north-east Netherlands, north-western Germany, Belgium and north-eastern France (O'Connor 1980, 231-3, map 76; Butler and Steegstra 2005-2006; O'Connor 2007, 68) providing a slightly different cross-channel orientation. The high-tin bronze composition of the Langton Matravers axes rendering them unusable as-cast silver-coloured tools is comparable to the relatively few programmes of compositional analyses involving comparable axes (e.g. Northover and Sherratt 1987). However, it should be stressed that the high-tin alloys do not generally appear in tin-bronze Sompting type axes nor in the typically high-lead Armorican type axes in southern Britain (Northover and Sherratt 1987; Northover in Coombs *et al.* 2003). Leaving aside the presumed imports of Armorican type axes, it has been argued that there is a striking decrease in the lead contents of bronzes from the Ewart Park to Llyn Fawr phases (e.g. Craddock 1979; Northover 1983).

In north-west France, hoards of as-cast high-lead bronze Armorican axes date mainly to the end of the Bronze Final III/Hallstatt C (*c.* 800-650 BC) (O'Connor 2007, 70-3; Milcent 2009, 454-7; Gomez de Soto *et al.* 2009; Roberts *et al.* 2013) and are, contemporary with the Langton Matravers hoard(s). Virtually all of the Armorican axe hoards are carefully arranged in pits. The average hoard size is 100 axes (Briard 1965; 1987), but up to 4000 axes were found at Mauré-de-Bretagne (Briard 1965, 313). Aside from the approximately 400 axes from Langton Matravers, the next largest axe hoard in Britain is the Ewart Park hoard from Foulsham, Norfolk which contained only 141 axes (Maraszek 2006, 451-2, Taf. XXXIII-VIII), even though axe hoards are by far the largest group of hoards in Late Bronze Age England (Huth 1997, 125,

Tab. 15). The large-scale manufacture of as-cast non-functional axes at Langton Matravers is perhaps more comparable to hoards in north-west France (Huth 1997; Huth 2000; Milcent 2009; Rivellain 2012) (Fig. 12).

It is these cross-channel connections that are proposed as the inspiration for the sheer scale of the hoard(s) at Langton Matravers. In north-west France, the large scale contemporary deposition of distinctive high lead-bronze axes in pits is comparable. It can be no coincidence that Armorican axes from the Channel Islands and north-west France are found in hoards along the coast to the east and west of the Portland/Blandford type socketed axe hoards, but their distributions do not overlap (Northover 1988).

CONCLUSIONS

Why were 373 apparently individually made, poorly and partly finished, cast high-tin bronze socketed axes, unsuitable for normal use, and 404 fragments placed in four pits on the Isle of Purbeck sometime between *c.* 800-600 BC? Interpretations in previous studies of the Bronze Age-Iron Age transition have tended to centre on the functionality of bronze, the value of bronze, and the presence of iron.

The mass production of morphologically similar, functionally useless socketed axes – as opposed to the useful tools for everyday manual tasks common in hoards during the preceding Ewart Park phase (e.g. Roberts and Ottaway 2003) – has led to suggestions regarding their role in trade or even as a proto-currency (e.g. Briard 1987). There is no doubt that bronze objects also served as widely tradable ingots that were recycled to form locally desirable forms and that this process is crucial to understanding cross-channel relations during the mid-2nd-early 1st millennium BC (e.g. O'Connor 1980; Needham *et al.* 2013). However, the socketed axes from Langton Matravers do not seem to be obvious candidates for trade or currency. They retain their clay casting cores, and were made using a very high tin and lead content. This composition would have lowered their melting point but direct recycling would have been more difficult as additional pure copper would have been needed to produce a more usable alloy.

Existing theories suggest that the dramatic reduction in bronze from the peak during the Ewart Park phase to the Llyn Fawr phase and then the Early Iron Age should be interpreted as a collapse in value. This perspective is based around the adoption of iron and the subsequent dumping of bronze as a collapsed commodity (e.g. Burgess 1979) but it has recently been revised with the proposal that bronze lost its social or ritual value, with the consequence that fewer bronze objects deposited after 800 BC (Needham 2007). Therefore, those that were deposited represent a 'residual' activity. There can be no question that the treatment of bronze, as witnessed by the depositional evidence, changed substantially from *c.* 1000-600 BC and that this was related to the perceived value of bronze objects.

However, for the Langton Matravers hoard(s), the interpretation of a collapse in bronze value explains neither the socketed axes nor the regional evidence. As Sharples (2010, 114 building on Thomas 1989, 263) notes, Needham's (2007) perspective is primarily based on the evidence from the Thames Valley

to the east, where the numerous Ewart Park hoards are succeeded by a solitary Llyn Fawr find, the Sompting socketed axes found at Tower Hill, Berkshire (Coombs *et al.* 2003). The contrast is not nearly as stark in Wessex, where there is a lower concentration of Ewart Park hoards but a far higher concentration of Llyn Fawr ones (Pearce 1983; O'Connor 2007), including Langton Matravers. Furthermore, the Langton Matravers axes do not indicate a devalued material – approximately 400 were individually made in a specific local form with a deliberately high level of tin, a judgment reflected in the entire repertoire of Llyn Fawr metalwork. The complexity of craftsmanship exhibited in the Gündlingen swords (Colquhoun and Burgess 1988, 114-21) sheet-metal cauldrons, and buckets (Gerloff 2010) or the stylistic variety in ornamental objects from pins to horse gear (O'Connor 1980, 253-65), implies considerable effort and attention to detail, not only in making the actual objects, but also in their selection for deposition.

Therefore, there is no compelling evidence that communities in southern Britain were suddenly unable to source copper and tin, as theories of a collapse in bronze supply require (e.g. Thomas 1989), or that they had forgotten how to work bronze due to the appearance of iron. Instead, regions in coastal areas and major river valleys across Britain demonstrate cross-channel and inter-regional connections in bronze as demonstrated by Gündlingen swords found in rivers from the Thames Valley to the Moray Firth, (O'Connor 2007, 68-71, fig. 4), Armorican axes found from Cornwall to Peebleshire (Northover 1988, 76-9, fig. 41; O'Connor 2007, 68), broad distributions of different types of razors (Jöckenhovel 1980; O'Connor 2007, 71, 77), Class B cauldrons (Gerloff 2010) and Sompting type axes (Burgess 1970, fig. 2; Coombs *et al.* 2003; O'Connor 2007, 68). Maritime connections can also be seen in the pottery styles and decoration of southern England and northern France as well as in linear boundaries, ringwork settlements and cremation rites (Marcigny and Talon 2009).

The ironworking at Hartshill, Berkshire dating to *c.* 1000 BC represents by far the earliest dated evidence for iron in Britain and is broadly contemporary with the earliest phase of iron use on the near continent (Rovira 2001; Collard *et al.* 2006; Gomez de Soto and Kerouanton 2009). It pre-dates early ironworking sites as at nearby Cooper's Farm, Berkshire (Fitzpatrick 1995; 2011) and Potterne (Lawson 2000), the few iron objects found in Llyn Fawr bronze hoards such as the eponymous find (Collard *et al.* 2006, tab. 6, fig. 19; see also O'Connor 2007; Gerloff 2010, nos. 59 and 41-2) and the recent discovery at Hindon, Wiltshire (Boughton 2013). The small number of early iron objects such as socketed axes, socketed spearheads, a rivet and a sword frequently lack context but appear to be imitations of contemporary bronze forms (Collard *et al.* 2006, tab. 6, fig. 19). It is traditional to compare the evidence for bronze and iron before suggesting that the Bronze Age-Iron Age transition either involved the gradual or rapid replacement of one metal by another. The problem with this metal-orientated perspective is that there is so little bronze *or* iron during Llyn Fawr and even less during the Early Iron Age. The contemporary absence of gold creates a virtually ametallic four centuries (*c.* 800-400 BC) in a prehistory that is still largely structured by the Three Age system.

The majority of the surviving material culture of the communities in southern Britain during these four centuries is ceramic (see Cunliffe 2005, 87-103, fig. A2-7), bone and flint (cf. Young and Humphrey 1999), rather than metal. Perhaps it is in this broader craft-working sphere that a better explanation for the Langton Matravers axes should be sought. The contemporary appearance of the similarly localised Kimmeridge-Caburn pottery style breaks from the widespread tradition of plain-ware Post-Deverel-Rimbury (PDR) ceramics by concentrating on bipartite bowls and tripartite jars that were frequently burnished and/or coated with haematite, i.e. red iron ore, and fired to a shiny copper/red colour (Cunliffe 2005, 92-3, fig. A3; Middleton 1987; 1995). It is highly probable that the iron ore came from one of the rich sources in the surrounding regions (Salter and Ehrenreich 1984, fig. 10.2) though no evidence has yet been found of contemporary iron smelting, only earlier iron smithing. The Kimmeridge-Caburn style is one of six localised pottery styles found from south-central England to north-east England (Cunliffe 2005 92-7, fig. 5.3; fig. A4-A7). Although the evidence is fragmentary, the earliest iron objects and iron production correlates closely in distribution and date with these regions (see Collard *et al.* 2006, fig. 19 for distribution).

The smithing, and maybe even smelting, of iron may then not have been a novelty in southern Britain between 800-600 BC. It is apparent that in different regions of southern and eastern Britain, iron objects were included at this time in votive deposits that had traditionally been reserved for bronze ones. Iron had to be integrated into tradition – whether by use of iron ore in the surface colouring of ceramics or by votive deposition with bronze. It is perhaps in the context of this process of integration that the high-tin silvery socketed axes at Langton Matravers can be understood. Indeed, it could be argued that the deliberate manipulation of their colour was to imitate that of iron.

As no high-tin bronze socketed axes of later date have been found and there is only relatively limited evidence for the votive deposition of iron objects after *c.* 600 BC, it can be argued that this practice lasted for a maximum of two centuries, and probably only for several decades. It can be placed into the broader sequence spanning 1000-400 BC, where the roles of bronze and iron to communities were gradually refined and redefined from a peak in the quantity and range of bronze (and gold) objects being deposited as votive *c.* 1000-800 BC, to the careful preparation and selection of bronze (but not gold) objects for votive deposition *c.* 800-600 BC, to the rare deposition of bronze ornaments and bronze/iron bimetallic objects during 600-400 BC, to the widespread adoption of iron production and objects only after *c.* 400 BC, but with bronze (and subsequently gold from *c.* 300 BC) being a major medium of decoration, adornment and votive deposition (Fitzpatrick 1984; Garrow *et al.* 2010; Joy 2011; Garrow and Gosden 2012). Compositional analyses of copper alloy objects throughout the first millennium BC indicate that the composition of the bronze changed only after *c.* 500 BC but it is only towards the end of the millennium that bronze is finally joined by another copper alloy, brass (e.g. Dungworth 1996). Rather being the product of a collapsed commodity or even a residual ritual relic, it is argued that the Langton Matravers hoard(s) represented a short-lived ritual experiment - a deliberately lavish offering of bronze axes, deliberately made to resemble the colour of iron.

Together with the haematite-coated decorated pottery and Kimmeridge shale bracelets, the Langton Matravers hoard(s) represent the material expression of a distinct regional community – one whose settlements, subsistence practices and craft industries appear to have been developing and whose orientation was coastal, and Continental, rather than inland. The idea of a major shift in society or even a crisis has been proposed in both southern England (e.g. Needham 2007; Sharples 2010) and throughout France (e.g. Milcent 2009) with explanations ranging from environmental change to economic collapse to social breakdown. The evidence from the Isle of Purbeck challenges those theories by suggesting not only that axe manufacture and deposition was closely connected to broader changes but also that it was done by communities who thrived rather than declined.

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