Chapter 9
Morpho-Metric Variability of Early Gravettian Tanged "Font-Robert" Points, and Functional Implications

Annemieke Milks, Rob Dinnis, and Matthew Pope

Abstract Early Gravettian Font-Robert points – tanged tools created on blades – were initially defined as weapon armatures, and this is frequently referred to as their function. However, Font-Robert points have been described as a morphologically variable type, with suggestions that this morphological variability represents a functional variability. Here we discuss this issue with reference to a sample of Early Gravettian tanged artifacts (including Font-Robert points) from Maisières-Canal in Belgium, as well as two similar artifacts from Britain. Although many of the artifacts studied have a morphology and size commensurate with their function as lithic armatures, the majority are apparently unlikely to have functioned within a "complex" projectile technology, which contrasts with measurement data published on Font-Robert points from France. Instead, Font-Robert points from Maisières-Canal and Britain display a notable level of morpho-metric variability. By extension, this suggests a functional variability, a possibility that needs confirmation with use-wear analysis. These Font-Robert points may have served as technologically simpler throwing or thrusting spears, as knives, or as versatile, multi-function tools. Overall, we stress that morpho-metric data complements use-wear studies, when assessing potential projectile function, and can help make an assessment of which artifacts to target for such research techniques.

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Introduction

"Font-Robert" points are one of several characteristic lithic point types found within western European Gravettian lithic assemblages. They are of variable dimensions with length measurements ranging from ca. 30 to 137 mm (Lansac 2002; Pesesse and Flas 2012; AM pers. obs.). Crafted on blades, they are unified by their steeply retouched and well-crafted tang. Retouch of tangs and the distal part varies from direct, bifacial or, more rarely, inverse retouch; it includes abrupt, semi-abrupt, flat and shallow retouch, and ranges from being minimally invasive to covering the entire artifact (De Sonneville-Bordes 1960; De Heinzelin 1973; Demars and Laurent 1992; Pesesse and Flas 2012, 2013). Demars and Laurent's definition (1992) specifies a pointed shape for the body of the artifacts: Font-Robert points are thus a group of tanged tools unified by their characteristic tang morphology and their pointed shape. Returned to below, it can also be noted here that Early Gravettian assemblages containing Font-Robert points also contain other tanged tool types with the same characteristic tang morphology, including those with rounded bodies, burin-like terminations and various truncations (e.g., De Sonneville-Bordes 1960; De Heinzelin 1973; Delporte and Tuffreau 1984; Otte and Caspar 1987; Jacobi and Higham 2011).

Due to their characteristic tang morphology Font-Robert points are considered by many to be an index fossil of the early Western European Gravettian. They have been found in abundance in Belgian and central and southern French assemblages, with a smaller number also found in northern

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France, northern Spain, Britain, Germany and Italy (Otte 1979; Campbell 1980; Demars and Laurent 1992; Palma di Cesnola 1993; Mussi 2001; Conard and Moreau 2004; Jacobi 2007).

The earliest archaeologically secure radiocarbon dates for contexts containing Font-Robert points are ca. 28.0 ^{14}C kBP from the open-air site of Maisières-Canal in Belgium (Haesaerts and Damblon 2004; Jacobi et al. 2010). Dates for the Early Gravettian of other regions potentially match this early date (Conard and Moreau 2004; Pesesse and Flas 2012). With specific reference to Northwest Europe, it has been proposed that Gravettian facies containing Font-Robert points appear later in southern France than at Maisières-Canal, perhaps as a result of population movement relating to the onset of a particularly cold climatic event, and that these facies subsequently persist in both Belgium and southern France for several millennia (Desbrosse and Kozlowski 1988; Djindjian and Bosselin 1994; Djindjian et al. 1999). This model references radiocarbon dates from both regions as well as techno-typological differences between the lithic assemblage at Maisières-Canal and those of other Belgian and southern French sites which also contain Font-Robert points. In fact, the chronology of many of these sites is imprecise. In particular, chrono-stratigraphic problems at the key Font-Robert point site of La Ferrassie (see Bertran et al. 2008) and also potential methodological problems with radiocarbon dating of this period (see Higham 2011) make a direct reading of the radiocarbon data potentially misleading.

Irrespective of its precise chronology, lithic material from Maisières-Canal and from British findspots is commonly considered as particularly technologically and morphologically similar (e.g., Otte 1974; Campbell 1980; Jacobi 1980; Jacobi and Higham 2011). Often referred to are the use of flat distal retouch to shape the tanged tools and the shared presence of small and delicate transverse removals at the base of the tang of Font-Robert points and other tanged tools. In addition, there is a notable scarcity of backed bladelets in the Maisières-Canal assemblage, and no Gravettian backed artifacts are known from any British assemblage (Otte 1974, 1979; Campbell 1980; Jacobi 1980, 2007; Jacobi et al. 2010; Jacobi and Higham 2011; Pesesse and Flas 2013). Campbell (1980, 1986) referred to British material as "Maisièrian" to stress these similarities, a term which continues to be used to describe the Maisières-Canal assemblage (e.g., Pesesse and Flas 2012). By logical extension, this implies that British artifacts and those from Maisières-Canal are distinct from those in assemblages elsewhere. One point of difference stressed by Campbell (1986) is the larger size of "Maisièrian" tanged tools in comparison to the French tanged tools.

As a result of these perceived cultural differences, and probably also due to the absence of a detailed type definition, nomenclature used to describe Font-Robert points within all of these western European assemblages is markedly inconsistent. Some prefer to reserve the term "Font-Robert point" for those non-Maisièrian examples closer to southern French types (e.g., Otte and Noiret 2007). Gravettian tanged artifacts from Maisières-Canal and Britain are variously referred to as "tanged points", "stemmed points", "tanged tools", "*pointe à soie*", "*pointe à pédoncule*" or "*outils pédonculées*" (e.g., De Heinzelin 1973; Rots 2002; Otte and Noiret 2007; Dinnis 2009; Flas 2009; Jacobi et al. 2010).

Despite this, most *pointed* artifacts from all of these contexts fit the morphological criteria for Font-Robert points as outlined by Demars and Laurent (1992), and the broad similarity of all of these examples has led to some preferring the term "Font-Robert points" for Maisièrian and non-Maisièrian examples (e.g., Jacobi 2007; Pettitt and White 2012). Furthermore, in some cases the term "Font-Robert point" has been used to describe fragmentary tanged artifacts where little more than the tang is present, and therefore the morphology for the body of the artifact is completely unknown (e.g., Jacobi 2007; Jacobi et al. 2010; Pesesse and Flas 2013). Here, for the sake of simplicity, we use "Font-Robert point" to refer to those tanged artifacts which fulfill basic typological criteria as outlined by Demars and Laurent (1992) (i.e., steeply backed tangs opposed by a "point"), and we use "tanged artifact" as an inclusive term of all Gravettian tanged artifacts, irrespective of their tip morphology. Thus, Font-Robert points are a subset of Gravettian tanged artifacts. This study examined a sample of Gravettian tanged artifacts from Maisières-Canal (n = 52) and one example each from two British find-spots. The study focuses on the morpho-metrics of these tools, and in particular the Font-Robert points (n = 27).

It is important to clarify the terms used in this study from the outset. In order to avoid confusion, we accept the definition that "complex" projectile technology refers to higher velocity projectiles such as the bow and arrow or spear-thrower and dart, though "projectile" will still be used as a term inclusive of hand-thrown spears. Therefore "dart" refers to a spear thrown with a spearthrower, while "spear points" refers to spears, whether lower velocity hand-thrown spears or thrusting spears (Shea and Sisk 2010; Villa and Soriano 2010). The term "point" refers to the entire pointed lithic artifact, and "tip" to the part of the artifact at the opposing end of the tang.[1] "Weapon armature" is used when the points discussed could be darts, hand-thrown spear points or thrusting spear points, making an assignment to specific projectile technology difficult.

[1]Hughes (1998) uses "tip" to indicate the entire artifact, thus "tip cross-sectional area" refers to the maximum area of the entire artifact. We follow the terminology TCSA for "tip cross-sectional area", but use "tip" elsewhere to indicate the opposing end of the tang.

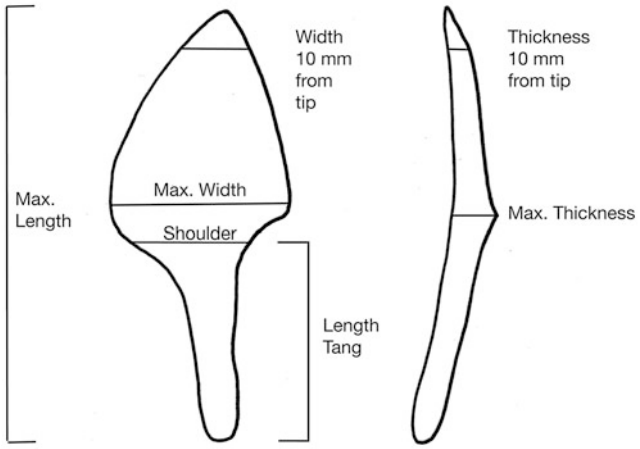

Fig. 9.1 Schematic drawing of measurements taken

Materials and Methods

A sample of tanged artifacts (n = 54) from Maisières-Canal and British collections was examined with the objective of determining their potential function as weapon armatures. Standard morpho-metric data were collected to allow overall metric consideration of the sample itself, and also comparison with similar data on Gravettian tanged tools from elsewhere, and specifically that of Shea (2006). Artifacts were deemed "complete" or "nearly complete" if they had a recognizable tip and tang, with only a small percentage of either missing. Only these complete and nearly complete artifacts were studied. Metric data were not collected for tangs that were incomplete. Measurement data collected can be viewed in Fig. 9.1. Mass measurements (grams) were also taken.

Sites and Material Studied

The *Champ de Fouilles* area at Maisières-Canal yielded a rich collection of nearly 35,000 artifacts in exceptionally fresh condition (Fig. 9.2) (De Heinzelin 1971; Haesaerts and De Heinzelin 1979). Clear stratigraphy, associated faunal material and radiocarbon dating have added to making the collection particularly useful for study (Haesaerts and De Heinzelin 1979; Haesaerts and Damblon 2004). Recent radiocarbon dates have confirmed earlier dating of the site, with the most secure individual date on human activity being from a reindeer bone bearing cut-marks: 27,950 ± 170 ^{14}C BP (OxA–18007) (Jacobi et al. 2010). The 130 tanged tools, of which ~36% are broken pieces, are among the most distinctive in the collection (De Heinzelin 1973; Otte and Caspar 1987; Pesesse and Flas 2012). A sample of 52 of these tanged tools was made available for study.

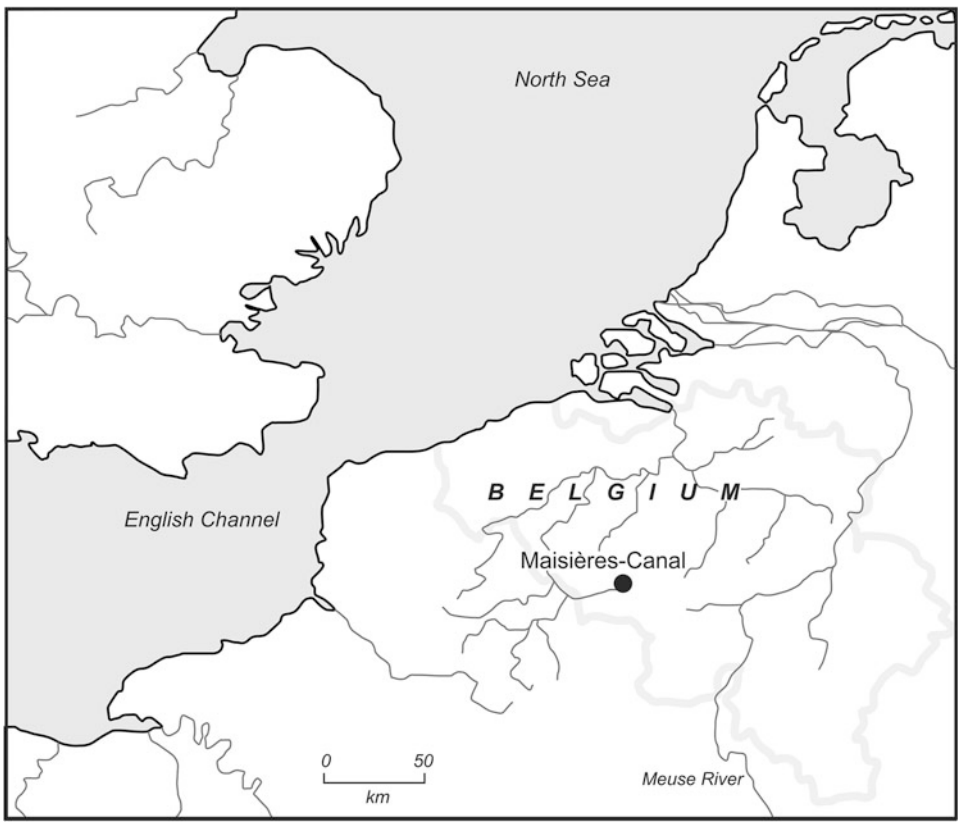

Fig. 9.2 Location of Maisières-Canal (courtesy of Sylvia Bello)

Tanged artifacts from seven British find-spots (Jacobi et al. 2010) can be attributed to the Early Gravettian largely based upon their typology (Fig. 9.3). At none of these sites have these artifacts come from a well-stratified Gravettian assemblage, and only at Kent's Cavern can a pre-Last Glacial Maximum age be soundly inferred (Jacobi and Higham 2011). However, without a precise typo-morphological parallel elsewhere in British prehistory, and as a result of the similarity to material from Maisières-Canal as described above, these artifacts are generally accepted as Gravettian (Campbell 1980; Jacobi 1980, 2007; Bahn and Pettitt 2009; Dinnis 2009).

The Bramford Road tanged tool (Fig. 9.6a) was discovered in terrace gravels of the River Gipping in Ipswich (Suffolk, England) along with a mix of artifacts from various periods (Jacobi 2007; Jacobi and Higham 2011). A complete Font-Robert point (Fig. 9.5) from Pin Hole, Creswell Crags (Derbyshire, England) is the most impressive and well-preserved of the British Gravettian tanged tools, and was one of two recovered from demonstrably Pleistocene deposits in the cave (Jacobi and Higham 2011). These two complete tanged artifacts from Bramford Road Pit (n = 1) and Pin Hole (n = 1) were studied. For curatorial reasons no other complete or near-complete British examples were available for study.

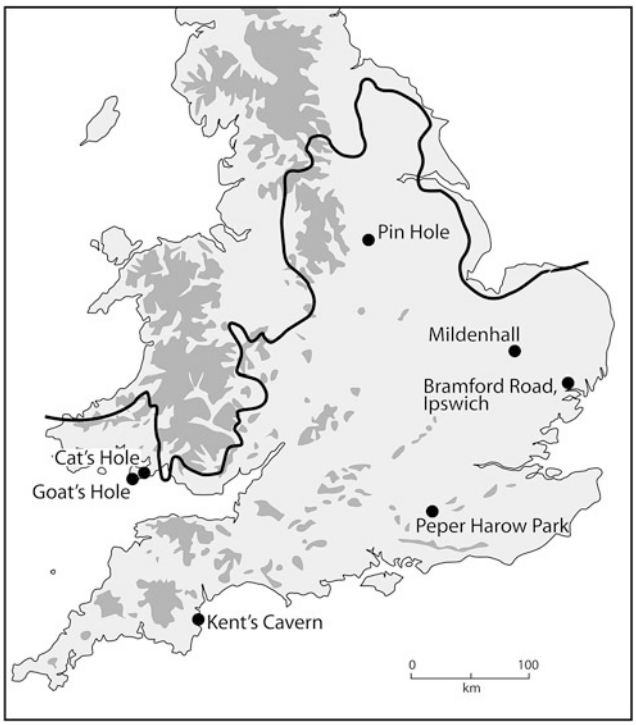

Fig. 9.3 British find-spots containing Gravettian tanged tools (From Jacobi et al. 2010: 36, reprinted with permission of Sylvia Bello and Tom Higham)

The Function of Gravettian Tanged Tools

The initial description of Gravettian Font-Robert points from the southern French site of Grotte de Font-Robert (Corrèze) defined them as weapon armatures (Bardon et al. 1908). This functional supposition continues (e.g., Jacobi 1980; Peterkin 1993; Pike-Tay and Bricker 1993; Shea 2006; Dinnis 2009), in spite of the oft-noted variation already alluded to. Two experimental studies have examined the function of Font-Robert points, reaching different conclusions. The first, by Otte and Caspar (1987), examined a small sample of tanged tools from the Maisières-Canal assemblage using combined macro- and microscopy, comparing observed use traces and breaks against an experimental replica sample. For Otte and Caspar, these artifacts are likely to have been hafted domestic tools, but unfortunately their microwear study did not include looking for traces of projectile use. The more recent study of Lansac (2002) tested replicas of Font-Robert points from the French sites of La Font-Robert, Pré-Aubert and La Grotte des Morts. Lansac's experiments produced results consistent with Font-Robert points functioning as weapon armatures, and more specifically as darts.

Determining Potential Function as a Projectile Point

The potential projectile function of tanged artifacts, and more specifically of Font-Robert points, was assessed with reference to three criteria (Villa and Soriano 2010). Projectile point use should be distinguishable via:

(a) evidence of hafting
(b) presence of impact fractures or microwear on at least some points
(c) morphology: a sharp tip and thin cross-section

Here we consider these criteria with reference to the studied sample of tanged artifacts from Maisières-Canal, Pin Hole and Bramford Road, focusing particularly on their morphology.

Within the category of morphology, metric analysis is often used in order to calculate tip cross-sectional area (TCSA),[2] and tip cross-sectional perimeter (TCSP) values (e.g., Shea 2006; Wadley and Mohapi 2008; Sisk and Shea 2009; Shea and Sisk 2010; Villa et al. 2009; Villa and

[2]TCSA values are calculated using the maximum widths and thicknesses in mm of the tools: **Area (in mm^2) = (0.5 × width) × thickness**.

Soriano 2010). Smaller TCSA improves projectile penetration, as the higher the TCSA value, the more the projectile is slowed in flight, reducing effectiveness (Hughes 1998). We can thus use TCSA values from archaeological samples as a means of testing hypotheses about weapon armature and/or projectile point usage. Alongside using TCSA values of lithic points to assess potential projectile function, it was first shown by Shea (2006) that values could be used, with caution, to assign a delivery system to potential projectiles (e.g., Shea 2006; Villa and Soriano 2010; Sisk and Shea 2011). This is useful, as the means of using macroscopic and microscopic analytical techniques to distinguish between delivery systems are only just beginning to be explored (Iovita et al. 2016; Sano et al. 2016).

TCSA can be used to sort potential projectile points into possible delivery systems, based upon correlation of sizes with different delivery systems using collated data from ethnographic and recent prehistoric examples along with experimental data (Shea 2006 and references therein, but see Clarkson 2016). Using this reference sample, points which are too large to be included in spear point categories are frequently viewed as suggestive of non-projectile functions such as knives (e.g., Harrold 1993; Shea 2006). The values are approximate, for in reality calculating the area of an object is complicated, and point cross-sections, which vary as a result of flake scars and retouch, are highly individualized. In addition, some of the sample reference collections for comparison are small, especially for spear points, and Shea (2006) cautions that comparisons should not be made without this in mind. Here we use TCSA rather than TCSP to directly compare our measurements with published TCSA values for southern French examples (Shea 2006).

Recently, use of TCSA has been questioned, with critics maintaining that it is only able to assess the *potential* but not the *probability* of lithic points to function as projectile points (e.g., see Lombard and Phillipson 2010). Sisk and Shea (2011) have themselves stressed that such studies utilizing TCSA are only intended as a first step towards understanding the *potential* of a lithic point to function as a projectile. This caveat is stated here, and we are mindful to use TCSA only to identify the potential for projectile technologies amongst the sample studied, along with a discussion on possible delivery systems. Nevertheless, TCSA remains a useful additional source of data for retaining and rejecting hypotheses about projectile function of lithic artifacts, of discussing potential delivery systems, and a way of making inter-site and inter-regional comparisons of artifacts within a typological category.

Results

Evidence of Hafting

The retouched tangs of all Gravettian tanged artifacts suggest hafting. Rots (2002) has provided direct evidence, using macro- and microscopic wear analysis on the tanged burins from Maisières-Canal, that these tangs were indeed a component of a complex haft. Given the similarity of British examples to those from Maisières-Canal, these too are assumed to have been hafted. As noted, it is the presence of a retouched tang which unifies many typological components of the Maisières-Canal assemblage. Tangs are almost exclusively created on the proximal end of wide blades, and are all dorsally retouched, with both abrupt and semi-abrupt retouch, occasionally covering the entire dorsal surface. Ventral retouch of the tang is rare, and was seen on only nine tools from the sample.

The size of these tangs is clearly deliberately standardized (Table 9.1). Standard deviations (SD) for thicknesses and widths of the tangs are small suggesting that tang widths and thicknesses were tightly controlled to fit into the hafts. In 28 tools, the maximum thickness of the tang, was equal to or exceeded the maximum thickness of the body. Lengths of the tangs are related to the size of the overall tool, but are still much smaller than the SD of the lengths of the overall points. Figure 9.4 is a scatterplot showing the relationship between overall artifact length and tang length. The r^2 value (0.55) shows that while there is a relationship between size of the artifact and size of the tang, the length of the artifact is not a good predictor for length of the tang. Tang sizes are much more standardized than overall tool size. This suggests potential rejuvenation of tools, with tangs remaining relatively constant in size while the body of the artifact is reworked or resharpened and thus reduced in size. Whatever their function, rejuvenation of hafted tools is logical, as the greatest investment in the manufacture of the tool would have

Table 9.1 Descriptive statistics for artifact length and tang measurements from sample studied

Measurement	Mean	Standard deviation	Minimum	Maximum	*n*
Tang width	13.3	3.3	8	21	49*
Tang thickness	8.9	2.7	4	15	49*
Tang length	34.8	7.5	19	51	49*
Artifact length	85.8	18.5	54	137	54

*Tangs which were partially broken were not included in measurements

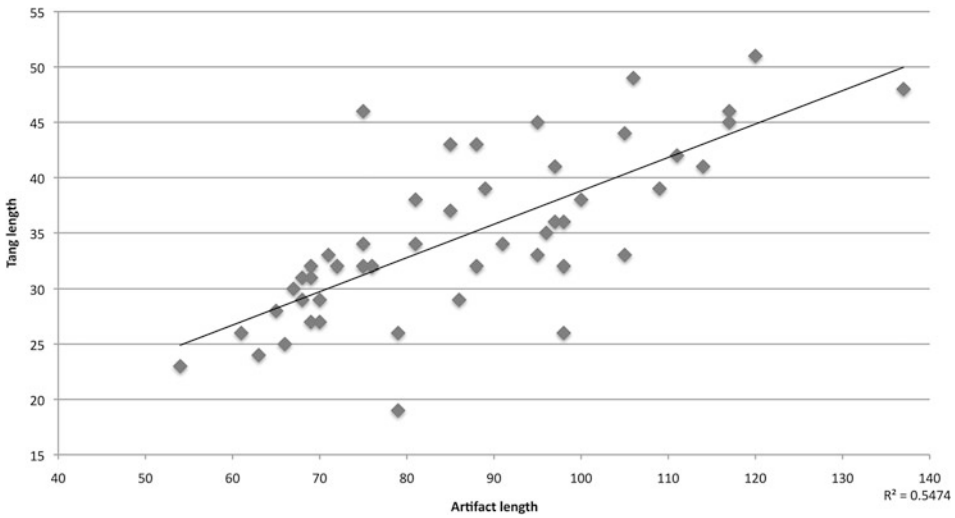

Fig. 9.4 Scatterplot showing length measurements (mm) for tanged tools' overall length to tangs' lengths (n = 49). Data for artifacts were not plotted if tangs were incomplete

been the creation of the tang and its attachment to the haft. This standardization also accords with Rots' (2002) suggestion of that they may be designed to fit directly into antler.

Impact Fractures

Pesesse and Flas (2012) recently published a macrofracture analysis of 121 tanged tools from the Maisières-Canal collection (excluding tanged burins and rough-outs), suggesting that there is good evidence that the tanged tools were used as weapon armatures. However, their analysis included crushing as well as step, feather and hinge terminating fractures, and recent experimental studies have shown that these fracture types can occur from pre- and post-depositional processes. Crushing can occur as a result of other uses for tools such as butchery, woodworking, engraving, chiseling and trampling (Shea et al. 2002), and hinge, feather and step terminating fractures can occur as a result of both manufacture and trampling (Sano 2009; Pargeter 2013 and references therein). Moreover, they do not report any bifacial spin-off fractures, or unifacial spin-off fractures >6 mm, considered by many to be reasonably reliable impact fractures (e.g., Sano 2009; Pargeter 2011). This makes the assessment of frequencies of impact fractures in the Maisières-Canal collection difficult, but there are still some clues that suggest that a projectile function for at least some of the tanged tools is possible. One line of evidence is the percentage of the tanged tools (9%) with multiple impact fractures, a percentage that is significantly higher than those produced in knapping experiments (0.6%) but still lower than those from hunting experiments (30%) (Pargeter 2013). Maisières-Canal has been interpreted as a short-term residential site (Haesaerts and De Heinzelin 1979; and see Roebroeks 2000). Frequencies wouldn't be as high at a residential site as at a hunting site (Villa and Lenoir 2009) and recycling, which has been observed on the Maisières-Canal tanged tools (discussed below), would obscure the fracture signature. The other line of evidence is the location of impact fractures in relation to retouch on at least one of the tanged tools. Both Sano (2009) and Pargeter (2013) stress that the relationship of impact fractures to retouch can help to infer use as a weapon, and Pesesse and Flas (2012: Figs. 3, 4) clearly illustrate an example of a tanged tool with multiple impact fractures overlapping previous retouch. The percentages and location in relation to retouch of multiple impact fractures suggest that a proportion of the tanged tools may have served as weapon armatures.

The Pin Hole point (Fig. 9.5) also displays a possible impact fracture, with a burin-like fracture extending from the tip along the right lateral edge (30 mm). Intriguingly, Clarkson's experiments (2016) only produced burin scars >15 mm when fired as mechanically-aided projectiles, and not as hand-delivered spears. While this burin scar may conceivably relate to its use as a weapon armature, it could also have occurred from it being dropped, during knapping or possibly from some other use (Sano 2009; Pargeter 2013). As the Pin Hole point is not part of a large assemblage of tanged tools, and the burin-like fracture does not overlap previous retouch, little can be inferred with confidence about the cause of this burin-like fracture. Because of these issues with equifinality, as Shea et al. (2002) point out, it is important to incorporate data from metric analysis, as well as data from microwear analysis, where possible. We present a morpho-metric analysis of a sample of the tools below, but

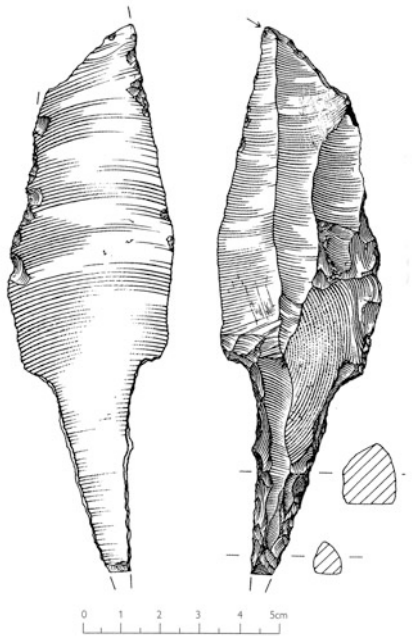

Fig. 9.5 Pin Hole tanged tool. (Drawing by Joanna Richards, from Pettitt and Jacobi 2009: 23, courtesy of Paul Pettitt and Joanna Richards)

microwear analysis to look for evidence of weapon use has yet to be undertaken on the distal body of Gravettian tanged tools.

Morphology

Blade production at Maisières-Canal is typically bi-polar, with blade detachment from opposed platform cores producing straight-profiled, relatively sturdy blades that taper distally to a point (Otte 1979; Jacobi et al. 2010; Pesesse and Flas 2012). These blanks are ideal for the production of Font-Robert points and other tanged artifacts, although it should be stressed that the blanks selected for tanged artifacts included a few with a pronounced curvature. The British artifacts are made on similar wide blade blanks. Many of the bodies and tangs of tanged tools from Maisières-Canal, as well as the complete example from Pin Hole are asymmetrical, with tangs and bodies often curving to one side (e.g., Figs. 9.6b, d, 9.7e and 9.5).

As already described, tanged artifacts at Maisières-Canal are typologically variable. 25 could not reasonably be described typologically as a "point", but, as has been noted by others, are rounded into scraper-like tips, terminate in burins, or end in a truncation (Table 9.2) (De Heinzelin 1973; Otte and Caspar 1987; Rots 2002). Furthermore, of the 27 remaining Maisières-Canal Font-Robert points, one displayed a pronounced ventral curvature. A straight profile is an important feature for lithic weapon armatures as an excessively curved profile will bend and break on impact (e.g., Bergman and Newcomer 1983; Jacobi 2007). This curved-profile point is thus excluded from consideration of TCSA values on the basis that it could not have functioned as a weapon armature. Three other points with a slight curvature have remained in the analysis. Of the two British artifacts that from Pin Hole can reasonably be described as a Font-Robert point, whereas that from Bramford Road (Fig. 9.6a) is more difficult to assign to a typological category, largely due to its heavy edge damage, though the morphology at point of discard is best described as a scraper-like tip. In total, 27 of the 54 tanged artifacts examined had the basic morphological criteria to have potentially functioned as weapon armatures.

Table 9.2 Morphology of tanged tools in sample (n = 54)

Morphology	n
Pointed	28
Scraper-like/rounded	12
Burin-like	9
Truncation	2
Broken*	3
Total	54

*A few tools' tips were damaged in such a way that it was not possible to reliably infer their morphology prior to breakage

Retouch of tanged tools is highly variable. A few pieces bear no retouch on the body itself (Table 9.3), while others have retouch completely covering the dorsal face of the tool. Type of retouch on the distal part varies from abrupt and semi-abrupt retouch to flat retouch. Ventral retouch of the body is rare (Table 9.3) and relates in every case to the tip of the tool. Of the seven tools bearing ventral retouch on the body, six have pointed tips, suggesting a concern for the pointiness and thinness of the tip of the tool itself. Six tools have dorsal and/or ventral retouch confined to 10 mm from the tip of the tool, further highlighting that within the collection there are tools for which retouch is shaping the tip of the tool. The thinness and pointiness of the tips of tools is considered to be a significant factor for performance of weapon armatures' penetration and durability (Hughes 1998; Shea et al. 2002). None of the tools' bodies have backed edges, and backed pieces occur in only 0.4% of the entire *Champ de Fouilles* lithic assemblage (Pesesse and Flas 2012).

The Pin Hole point (Fig. 9.5) is unusual amongst the British Gravettian tanged tools in that it has an absence of dorsal retouch applied to the distal part of the tool (Jacobi

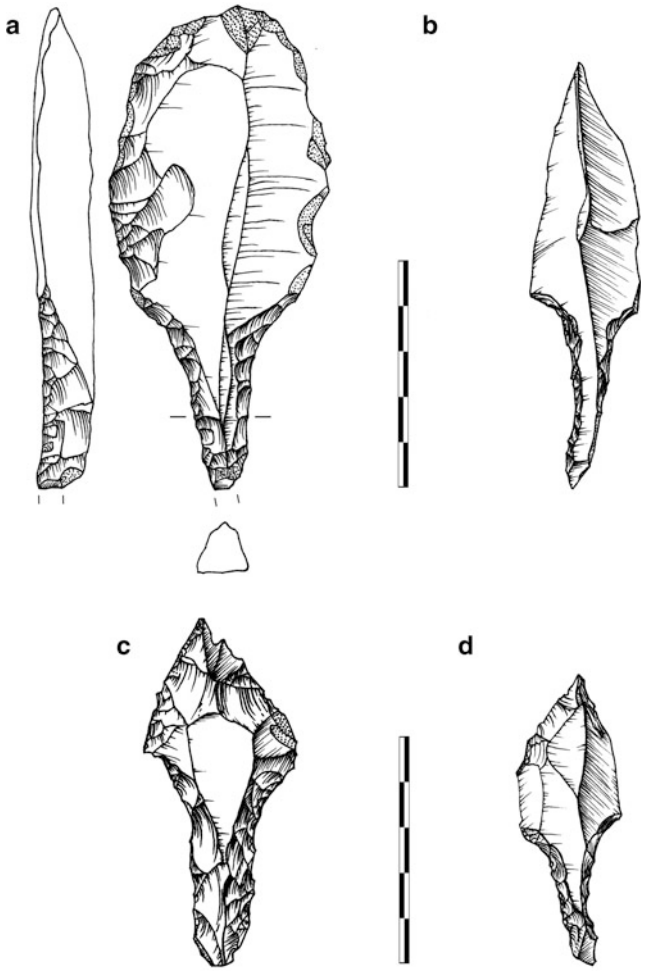

Fig. 9.6 **a** Bramford road tanged tool; **b–d** Maisières-Canal tanged tools (Drawings by M. Terrade modified after Otte 1985 [**a**] and De Heinzelin 1973 [**b–d**])

1980). There are some minimally invasive removals from the ventral side of the tool (Jacobi and Higham 2011), as well as edge damage and a burin-like removal from the tip of the tool (30 mm long), that could be use-related. Otherwise the body of the tool is largely unmodified. In contrast, the Bramford Road tool (Fig. 9.6a), with a rounded tip, has flat retouch applied to the dorsal surface, with heavy post-depositional edge damage.

Table 9.3 Retouch of distal part (body) of tanged tools (n = 54)

Retouch location	All tanged tools (n = 54)	Pointed tools (n = 27)
No retouch on body	4	2
Ventral retouch on body	7	6
Retouch confined to 10 mm from tip	6	5
Edge retouch extending below 10 mm from tip*	44	20

*Includes burin removals

TCSA and Mass

Descriptive statistics for the 27 tools classified as Font-Robert points can be found in Table 9.4. In this group, TCSA values range from 60 to 279 mm^2 (Table 9.5), all of which fall within the range suggested for spear points. Additionally, only one of the tools in the whole sample has a TCSA value (413 mm^2) that extends beyond Shea's (2006) spear point reference sample's range (but see Clarkson 2016). 19 of the 27 points (70%) are too large to fall into the reference sample's dart category, with the remaining eight falling into both dart and spear categories. Thus, on the basis of TCSA values, a classification of them as darts seems unwarranted. This is in contrast to published TCSA values for Font-Robert points from France, which appear to be better characterized as darts, albeit on the large side of that category (Shea 2006), and confirms Campbell's (1986) observation that they are on the whole larger than examples from France. To illustrate with an example, one candidate for a weapon armature in the Maisières-Canal assemblage

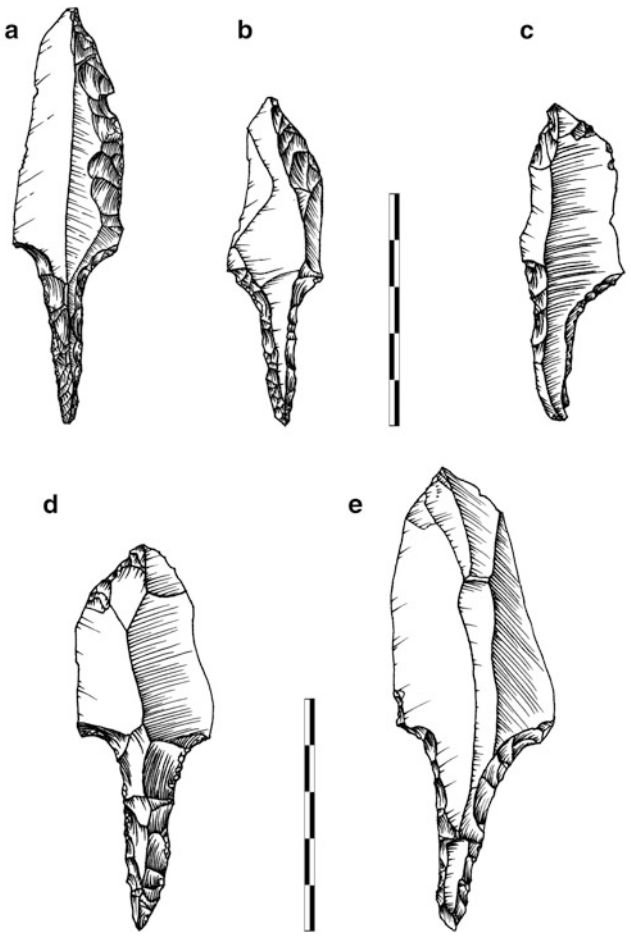

Fig. 9.7 **a–e** Maisières-Canal tanged tools (Drawings by M. Terrade modified after De Heinzelin 1973)

Table 9.4 Descriptive statistics for Font-Robert point measurements from Maisières-Canal and Pin Hole (distances in mm, mass in grams)

Measurement	Mean	Standard deviation	Minimum	Maximum	*n*
Length	87	18.1	87	137	27
Width	18.7	6.8	9	34	27
Thickness	5.5	1.9	2	9	27
Mass	19.5	11.5	6	54	27

Table 9.5 TCSA values (mm^2) of Font-Robert points from Belgian, British and French sites, compared with examples of ethnographic and recent archaeological darts and thrusting spear points

Samples	Mean	SD	Min	Max	*n*	Source[a]
Ethnographic/recent archaeological sample of darts	58	18	20	94	40	1
Experimental thrusting spear points	168	89	50	392	28	1, 2
Font-Robert points from La Ferrassie, Flageolet I, Les Vachons[b]	61	26	20	140	34	1
Font-Robert points from Maisières-Canal, Pin Hole	142	66	60	279	27	3

[a]*Sources 1* Shea 2006 using data from Thomas 1978 and Shott 1997; *2* Shea et al. 2001 cited in Shea 2006; 3, points measured by Milks
[b]Points with TCSA >120 mm^2 ($n = 4$) were removed from Shea's analysis. Without removing these larger points, the average TCSA is 73 mm^2 (SD = 47)

has a thin, pointed tip, with shaping of its tip by very fine, regular retouch along the left ventral edge, extending 15 mm back from the tip (Fig. 9.6b). The distal part lacks any retouch apart from that confined to the tip. This point has a TCSA of 96 mm^2, falling outside the known dart range. Based upon its TCSA value, therefore, it is unlikely to have functioned as a component of "complex" projectile technology, but it could well have been intended as a spear point.

Otte and Caspar (1987: Fig. 2: 1, 2) proposed that pointed tools from Maisières-Canal could be hafted knives. They suggest that the smallest and lightest points in the collection could be considered as projectiles, while the majority of tanged tools are better understood as domestic tools. However, as stated above, none of the Font-Robert points included in the analysis falls outside the reference sample's range for hand-delivered spears. Therefore a weapon armature function for these artifacts cannot be excluded based on size alone. Furthermore, evidence for knife-use does not rule out use as weapon armatures. We can thus retain the hypothesis that some of the Font-Robert points from Maisières-Canal, along with the Pin Hole point, could have functioned as a weapon armature on the basis that they fit the criteria discussed above, including evidence of hafting, impact damage, tip morphology and thin cross-section. Whether these potential spear points could have been hafted as hand-thrown or thrusting spears remains difficult to assess due to small or nonexistent reference samples available for comparison. Shea's (2006) data on spear point TCSA are based upon experimental points for thrusting spears only. Thus we have no metric data – apart from mass and diameter (see Noetling 1911 cited in Cundy 1989; Palter 1977; Villa and Soriano 2010) – for hand-thrown spears, which presumably would be different from those for thrusting spears. On the basis of size, the larger examples within the sample of Font-Robert points studied, if seen as components of weapons at all, would most probably have functioned as spear points. However, consideration of individual point morphology – be it the obvious differences in their shape or differences in their retouch – leaves one in little doubt that assigning function to artifacts based upon their size alone is unsatisfactory.

Discussion

Based on their typo-morphology, 50% of the 54 artifacts studied look unlikely to have functioned, at least immediately prior to the point of discard, as weapon armatures. However, there are certainly artifacts in the Maisières-Canal collection, as well as from Britain, that qualify as Font-Robert points following Demars and Laurent's (1992) definition. Once those examples that cannot be considered as weapon armatures on morphological grounds are excluded, TCSA values suggest their potential to have functioned as spear points. Clearly though, even within the homogeneous Maisières-Canal assemblage, macroscopic considerations alone suggest that Font-Robert points are not unified by a single function. This presumed functional versatility supports in part both Otte and Caspar's (1987) study suggesting their use as hand-held tools as well as Pesesse and Flas's (2012) work suggesting the presence of projectile points amongst the tanged tools.

Sizes of Font-Robert points studied are highly variable, and intriguingly have a mean TCSA value that is over twice as high as those from southern France (Table 9.5). These differences may support a chrono-cultural distinction between Maisières-Canal and other sites in Belgium and France, but their implication certainly extends to functional

considerations. TCSA values, for example, may allow Shea's (2006) sample from southern France to be seen as darts and therefore a component of "complex" projectile technology. The same measurements put into question whether this would have been the function of the vast majority of Font-Robert points studied from Maisières-Canal and Britain.

In light of this consideration of artifact taxonomy, morphology and function, it is important to note that evidence for the recycling of tools at Maisières-Canal is easy to find. For example, a non-tanged "Maisières point" from Maisières-Canal housed at the British Museum has been reworked into a dihedal burin prior to its discard (RD pers. obs.), and Pesesse and Flas (2012) report that several tanged burins in the assemblage bear retouch beneath their burin facets consistent with their former life as other tool types. Recycling of artifacts certainly confuses both observable tip-shape and microscopic use-traces in terms of primary mode of use, and it is logical that where an artifact is discarded is the site where it had been recycled (Hays and Surmely 2005). Therefore evidence of recycling amongst the collection of tanged tools from Maisières-Canal supports the possibility that weapon armatures were re-worked into burins, scrapers and other domestic tools. Shott (2016) also highlights the significance of curating projectile points to extend their longevity for their original function, which would also have increased morpho-metric variability of discarded tools

It is easy to conceive how this technological versatility may have extended to a functional versatility. The morphological and, by logical extension, functional variability of the tanged tools studied may alternatively be explained by viewing them as versatile tools. They could perhaps have had multiple functions, acting as knives or spear points simultaneously, or potentially, one subsequent to the other, a practice known ethnographically, particularly for projectile points amongst highly mobile hunting groups (Ahler 1978; Greaves 1997; Nelson 1997). Gravettian people appear to have lived highly mobile lives, as indicated by movements of raw materials and shells across vast distances, and experienced downturns and rapid shifts in climate (Roebroeks 2000). There is evidence from microwear and morpho-metric studies on other Gravettian tool types which support both the use of multipurpose tools and the practice of recycling of projectile points (Harrold 1993 and references therein). However, it must be stressed that there are clear examples that cannot be satisfactorily viewed to have functioned as a weapon armature at any point in their life history. The pronounced curvature of one tanged tool, and the tanged tool with an extremely large TCSA are two such examples. Therefore the tanged tools as a group cannot be viewed either as versatile tools or recycled weapon armatures as there are examples that would not fit into either category.

As for most archaeological taxa, tool typologies are clearly necessary, but their interpretative usefulness is inevitably limited. Irrespective of the complexity and standardisation of any particular artifact type, to understand its life history and functional use(s) ideally requires investigation using many different methods (e.g., see papers in Bracco et al. 2006; also Hardy et al. 2008; Dinnis et al. 2009). In many cases a combination of technological considerations, use-wear, residue and macro-fracture analysis and experimental replication is required before the functional history of artifacts can be soundly inferred. Here, we have highlighted that basic morphological data in conjunction with metric analysis is still useful when discussing potential projectile function.

For Font-Robert points, a systematic controlled experimental program of artifacts that represent the morphological variability seen in the archaeological record – using them as darts, hand-delivered spears and knives – would contribute towards a better understanding of this complex type. Combining this with a comprehensive microwear analysis of the Maisières-Canal collection would be favorable and, given its fresh condition, possible. In the meantime, we caution against using Gravettian tanged tools as a proxy for the presence of projectile technology, in spite of some evidence supporting that possibility. Indeed, this caution extends to using Gravettian tanged tools as a proxy for any single functional activity at all.

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