

Classification of Lithic Artefacts from the British Late Glacial and Holocene Periods



Torben Bjarke Ballin



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Front cover: Levallois-like flint core from Stoneyhill Farm (photo: Beverley Ballin Smith), Aberdeenshire

Back cover: Conical microblade core of pitchstone from Colinhill, South Lanarkshire (photo: Beverley Ballin Smith)

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Every effort has been made to obtain permission to reproduce illustrations; if any have been reproduced inadvertently without permission, I hope that my apologies will be accepted.

Although support and advice has been received along the way, I take full responsibility for any surviving errors.

Preface

Only a small number of guidebooks on British lithic typology have ever been produced, the most important of these being Evans' *Ancient Stone Tools of Great Britain* (first edition 1872; second edition 1897) and – more than a century later – Butler's *Prehistoric Flintwork* (2005). In addition, volumes on lithic typology and technology have been published outside Britain, but in English, such as Inizan *et al.*'s *Technology of Knapped Stone* (1992; first English edition 1974). The latter is a highly useful typological manual to all lithics specialists and enthusiasts throughout the world. Recently, an attempt was made to produce a thesaurus or encyclopaedia of British lithics – including typological, technological and other aspects of the field – but this impressive project was sadly never completed (Healey 2005).

These different volumes were structured in a number of different ways. Some were organised by type (e.g., Evans 1897), others by period (e.g., Butler 2005), whereas some were organised alphabetically (e.g., Inizan *et al.* 1992 and Healey 2005). The structure of the present book corresponds mostly to that of Evans ('... *reducing the whole series into some sort of classification...*'; Evans 1897: 1), and it is sorted by type. However, where Evans' types were sorted according to the author's subjective idea of which types were the most important, spectacular or interesting, the present volume is organised on the basis of a form of hierarchical classification system, where the main classes (debitage, cores, preparation flakes and tools), are subdivided into main types (e.g., arrowheads, scrapers, piercers, etc.) and then sub-types (e.g., end-scrapers, side-scrapers, hollow scrapers, etc.) (Figure 1).

The intended audience of this volume is expected to include students, museum staff, non-specialist colleagues, local groups and lay enthusiasts. Although I hope readers will find the book useful, it is important to emphasise that my intention was not for it to *replace* the works listed above, but to *complement* them. Although the above volumes all deal with typological matters, their slightly different *foci* and structures mean that different people may find different works more or less useful in different contexts. Evans (1897), Inizan *et al.* (1992) and Butler (2005) will continue to be valuable reference works.

This typological guidebook represents approximately five years of work, from the first notes in 2015, through the ScARF workshop in early 2017 and the BAJR lithics guide later in 2017, to the final push during the 2020 Covid-19 lockdown, resulting in the publication of the present book. It should be borne in mind, though, that typological work never reaches an end. Over the years,debitage, core and tool types have been re-interpreted: some 'chisels' became 'bipolar cores', and new types were discovered, such as the Middle and Late Neolithic 'Levallois-like cores'. In a decade or two we are likely to be in a different place from the present, with yet other lithic types having been either reinterpreted or discovered. It may then be necessary to replace or complement *this* typological guidebook.

Until then – I hope you will find the book useful.

Classification and characterisation of lithic artefacts

The background to and aims of the present volume

As a lithics specialist, the author is frequently asked to organise lithics workshops, the main purpose of which is to teach anybody with an interest in prehistoric lithic artefacts the basic elements of this specialist field. Some of these workshops were aimed at staff and volunteers at local museums, whereas others were aimed at university-based colleagues, colleagues in archaeological units, enthusiasts taking part in adult and continuing education (DACE), or local volunteer groups.

In March 2017, the Scottish Archaeological Research Framework (ScARF) organised a lithics workshop in Edinburgh. The author was one of several speakers, and he gave a 'hands-on' presentation of the main types of lithic debitage, cores and tools that people interested in early prehistoric archaeology may encounter. Following this event, British Archaeological Jobs and Resources (BAJR) contacted the author, and it was agreed to transform the author's ScARF presentation into a BAJR guide for British lithics (Ballin 2017c). The latter guide should be perceived as a brief introduction to lithics showing the reader 'how to squeeze blood from stones' – that is, how to interpret the past through the lithic evidence.

However, although the BAJR guide might give the reader some ballast in terms of dealing with lithics, the guide's section on terminology and typology is basic, and some colleagues and enthusiasts may feel a need for more detail to allow them to process lithic artefacts collected or excavated in the field, or in old, unprocessed museum collections. To present a lithic assemblage in an unequivocal manner, and to allow it to be compared to other collections, the descriptive terminology and typology must be clear and it must be possible to distinguish clearly between formally related types. Simply put: What defines Object X as belonging to a particular class or type of artefact, and not another?

The purpose of this typological guide is therefore – in contrast to the more general BAJR guide – to present all the prehistoric lithic objects (including all artefact classes, types and sub-types) one might encounter in Britain, and to discuss their definitions: for example, what defines Object X as a tool and not a piece of debitage or a core; what defines a microlith as a microlith and not a knife or a piercer; and what defines a specific implement as a scalene triangle and not an isosceles one? To allow the individual categories of lithic objects to be classified and characterised in detail, it was necessary to first define a number of descriptive

terms, which forms the first part of this guide. The main part of the book is the lithic classification section, which offers basic definitions of the individual formal debitage, core and tool types. The intended audience of the volume is students, museum staff, non-specialist colleagues, local groups and lay enthusiasts.

Other lithic typologies have been published in the past, but with a different focus or structure, such as Butler (2005), which offered a period-by-period account describing the various types and sub-types as they developed through time. It is important to emphasise that the present volume does not replace those works; rather it should be seen as a supplement which focuses first and foremost on the definition of formal types by their differing shapes, sizes, retouch, etc. Some older typologies like Evans' (first edition 1872; second edition 1897) ground-breaking *Ancient Stone Implements of Great Britain* are also still useful.

It is necessary to emphasise that it will never be possible to produce a *definitive* typology on lithic artefacts from any country or region as typological work is an ongoing process. As we find new assemblages and individual lithic artefacts or develop new approaches to characterising and interpreting lithics, new meaningful (for example diagnostic) types or sub-types will be defined (e.g., the 'micro *petit tranchets*', see below) or old types will be reinterpreted (some 'chisels' are now defined as bipolar cores).

It is also important to underline what this volume is not and what it does not include. A previous attempt to put together a British lithics Glossary or Thesaurus (Healey 2005) was unfortunately never completed. This project was a collaborative effort which, although led by Elizabeth Healey, University of Manchester, involved distinguished lithics specialists such as the late Alan Saville, Caroline Wickham-Jones, Stephen Aldhouse-Green, Frances Healy and many more. In the draft introduction the aims of this glossary were defined as:

- Summarising the main aims of concern in contemporary lithics studies
- Highlighting current analytical practices
- Compiling a comprehensive and fully illustrated glossary of technological and typological terms as used in the UK.

It is this author's view that the project may simply have been too far-reaching as it attempted, in the most impressive way, to cover too much with the involvement of too many people – we have to realise that no two lithics specialists agree on all points.

The present volume is just a classification system, supported by an introductory section on basic descriptive terms necessary to define the various lithic types. It does not cover:

- Lithic raw materials.
- Reduction techniques. Only a basic introduction is given to allow the classification of cores as platform cores, Levallois-like cores and bipolar cores, etc.
- Analytical approaches like use-wear analysis, intra-site distribution analysis, experimental flint-knapping, technological attribute analysis (usually associated with blade production), ethno-archaeological comparison, etc. These approaches are all well-covered elsewhere in the archaeological literature.
- Northern Irish material is not generally included, as during prehistory this part of Britain tended to follow different typological and technological traditions. As for Ireland more widely, there are clear differences with mainland Britain (Bann flakes and butt-trimmed flakes, for example [Woodman *et al.* 2006: 118], and some arrowhead types [ibid. 127-155]). Hollow scrapers are included in this volume as the occasional imported piece may be found in south-west Scotland.
- And it was decided to cover only the period from the Late Upper Palaeolithic (LUP) to the Early Iron Age, as Lower and Middle Palaeolithic industries are covered extensively elsewhere in the archaeological literature (e.g., Roe 1981; Pettitt & White 2012).

Chronology

The basic chronological framework applied in this volume corresponds to that defined in Ballin (2017c: 6), and it is presented in Table 1. This chronological schema was developed for use in Scotland, but the author believes that it is also valid (with slight adjustments) in the rest of Britain.

The evidence suggests that the British LUP period is aligned with contemporary industries on the north-west European mainland identified as the Hamburgian/Creswellian,¹ *Federmesser-gruppen*, and Ahrensburgian techno-complexes, as Britain would have been in touch directly or indirectly with these groups across the then dry Doggerland and the English Channel area (Ballin 2016c; Ballin & Bjerck 2016; Brooks *et al.* 2011; Sturt *et al.* 2013).

¹ The Hamburgian and Creswellian industries have been suggested to represent local variations of the Late Magdalenian complex; e.g., Pettitt & White (2012: 435).

For approximately half a century, the British Mesolithic has been subdivided into an early and a late part, defined *inter alia* by the dominance of either broad or narrow blades/microliths. It is recommended that the terms ‘broad blade’ and ‘narrow blade’ should not be used as period-defining terms, as blades in various parts of the country differ in terms of width.

Instead, use of the terms ‘Early Mesolithic’ and ‘Late Mesolithic’ is preferred as these emphasise microlith *form* as well as *size*. Although idiosyncratic microlith forms occur at all times through the Mesolithic (cf. Butler 2005), the British Early Mesolithic period is associated mainly with obliquely blunted points and isosceles triangles (and in England a number of other types, such as Horsham points and Honey Hill microliths), and the Late Mesolithic period mainly with scalene triangles, crescents and edge-blunted pieces. As a rule of thumb, the transition between the two Mesolithic periods could be defined as the time when isosceles triangles were replaced, probably gradually over a few hundred years, by scalene triangles. The transition between the British Early and Late Mesolithic periods is defined as in Saville (2008), and supported by Conneller *et al.* (2016: Figure 8), with the appearance of the first scalene triangles dated to around 8400 cal BC and 8300 cal BC.

A number of Early Mesolithic industries known from England – such as the Deepcar, Horsham and Honey Hill industries (Reynier 2005) – have not yet been identified north of Lincolnshire (Butler 2005; Waddington *et al.* 2017). Within Britain, the Scottish Early Mesolithic material appears to be related to the English Star Carr group (Clark 1954; Conneller *et al.* 2018), but overall it seems to follow closely developments in north-west Europe (southern Scandinavia and northern Germany), until maybe a millennium into the Late Mesolithic period, when the Doggerland land-bridge connecting Britain and the European continent finally disappeared (Ballin 2016c; Ballin & Ellis 2019).

It has been suggested to define assemblages with basally modified microliths (i.e., Horsham and Honey Hill points) as Middle Mesolithic, as radiocarbon-dated assemblages with such microliths straddle what is presently known as the Early/Late Mesolithic transition from 8690–8335 cal BC to 6960–6460 cal BC at 68% probability (Conneller *et al.* 2016: Figure 8). However, it should be borne in mind that some of the radiocarbon-dated sites on which this suggestion is based may be mixed, such as Ashfordby in Leicestershire, which includes broad as well as narrow microliths, as well as a relatively large number of large and small scalene triangles (Cooper & Jarvis 2017).

The British Neolithic and Bronze Age phases are defined on the basis of not only lithic material but also pottery styles, supplemented by metalwork.

Table 1. Basic chronological schema for Britain's early prehistory (cal BC). The dates for Scotland are mainly based on dates from the various Scottish research framework (ScARF) panel reports (Saville & Wickham-Jones 2012; Brophy & Sheridan 2012; Downes 2012; information relating to the LUP Sonia Grimm pers. comm.). The post Mesolithic dates for England are based on Historic England's period list (<http://www.heritage-standards.org.uk/chronology>), and the LUP dates for England are based on Pettitt (2008, Table 2.1) and calibrated by the author using the calibration software OxCal 4.3 (Bronk Ramsey 2019).

Main periods	Sub-periods	Scotland	England
Bronze Age	Late Bronze Age	1,150-800	1,200-700
	Middle Bronze Age	1,550-1,150	1,600-1,200
	Early Bronze Age	2,200-1,550	2,600-1,600
	Neo/BA transition (Chalcolithic)	2,450-2,200	
Neolithic	Late Neolithic	3,000-2,500	2,900-2,200
	Middle Neolithic	3,500-3,000	3,300-2,900
	Early Neolithic	4,000-3,500	4,000-3,300
Mesolithic	Late Mesolithic	8,400-4,000	8,300-4,000
	Early Mesolithic	9,800-8,400	10,000-8,300
Late Upper Palaeolithic (LUP)	Ahrensburgian	10,800-9,800	11,000-9,500
	Federmesser-gruppen	12,000-10,800	11,900-11,000
	Hamburgian/Creswellian	12,700-12,000	13,000-11,900

Artefact classification

It is the author's view that the classification and definition of lithic types, like the classification of all other forms of material culture, is best carried out within a hierarchical system, a classification 'tree'. In this respect, the author has clearly been guided by his background as a librarian and his experience with Dewey's Decimal Classification System (Dewey 1876, with later updated versions). This system is based on objective content ('type'), and its hierarchical structure allows new discoveries to be slotted in at appropriate places.

The Dewey-style hierarchical classification system is based on formal similarities and differences and it is essentially interpretation-free. Some might comment that the names of the various types may be based on interpretation, but although the term 'end-scraper' implies that these pieces were used for scraping, general consensus today is that this is a formal and not functional term, and that although these pieces may mostly have been used for scraping, end-scrappers are first and foremost defined as elongated pieces with a mostly convex retouch at one end.

As shown in Figure 1, the author suggests a basic sub-division of lithic objects into the classes: *debitage*, *preparation flakes*, *cores* and *tools*. Some might suggest the addition of a fifth basic category, *by-products*, which would include pieces like tranchet flakes (axe-sharpening flakes), microburins and burin spalls, that is, waste products from the manufacture of axeheads, microliths and burins. This would make technical sense, but the author finds it more helpful in a lithics guide to deal with these artefacts in connection with their

complementary pieces: tranchet flakes with axeheads; microburins with microliths; and burin spalls with burins.

The author defines *debitage* as a category embracing all objects removed from cores in connection with the reduction of the latter (in accordance with Inizan *et al.* 1992: 84). Some colleagues define *debitage* as synonymous with *waste*, but it is the author's view that this definition is unworkable as it is based on an interpretation. When is a flake or a blade a waste product, a tool blank or an informal tool? The definition of *all* flakes or blades as either waste, blanks or informal tools would require use-wear analysis to be carried out, which is not always possible, whereas the definition of *debitage* as all pieces produced in connection with the reduction of a core is interpretation-free. When modified, a piece of *debitage* then becomes a formal tool. In some cases, analysts may find it relevant to add a category of 'utilised pieces' to their general artefact lists (i.e., pieces with macroscopic use-wear; see below) to embrace pieces of *debitage* which have *clearly* (i.e., without carrying out microscopic analysis) been used.

Selection of illustrations

Aesthetically speaking, it would have been preferable for the volume's accompanying illustrations to be all in the same format/style and created by one artist. Good examples of this approach are Vang Petersen's (1993) book *Flint fra Danmarks Oldtid* (Flints from Danish Prehistory) where all artefacts were drawn by the gifted Lykke Johansen, and John Evans' (1897) classic *Ancient Stone Implements of Great Britain*, where all artefacts were illustrated by John Swain in the form of beautiful engravings.

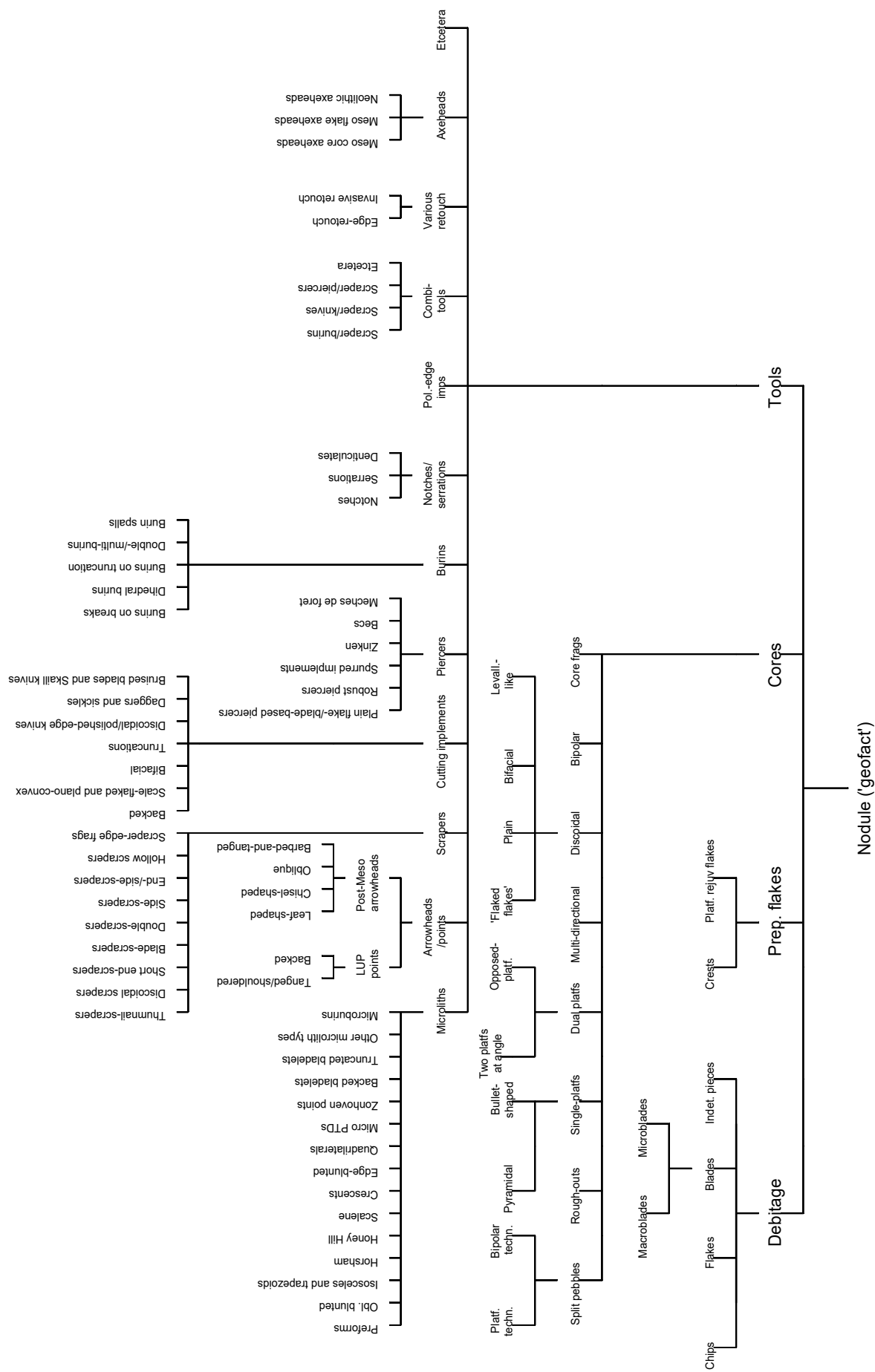


Figure 1: Hierarchical classification system (classification 'tree') covering British lithic types; it is possible to continuously and indefinitely subdivide the tree. The purpose of this figure is to illustrate the key principle behind hierarchical classification, and it does not include all types mentioned in the typological section

However, this was not possible for several reasons. Firstly, it would have been exceptionally expensive to employ an artist to carry out this work, and without funding this was not feasible. Secondly, it has taken several years to produce the guide, and it has been the author's fear that being too ambitious in terms of its topical focus (see above), the involvement of other specialists, or the production/selection of illustrations might sink the project. He therefore chose to illustrate the volume by borrowing existing illustrations, as he did when he produced his monograph *Klassifikationssystem for Stenartefakter* (Classification of Lithic and Stone Artefacts), which discussed the lithic artefact types encountered in southern Norway (Ballin 1996). A large number of the illustrations are therefore from the author's own publications or borrowed from archaeological units and colleagues he has worked with in the past. Excellent illustrations of some complex and rare types (e.g., tribrachs) were borrowed from Evans (1897), and John Swain's engravings are precise and aesthetically pleasing.² A small number of pieces were redrawn by Leeanne Whitelaw.

Due to the way illustrations were selected, it has not always been possible to include a scale in the figures. In these cases, the captions include information as to the greatest dimension (GD) of the artefacts. Also, different artists have followed different standards in terms of indicating the presence/absence of a bulb of percussion on blanks and tools. The following three systems were used by the artists responsible for this volume's artefact drawings (present/absent): ●/○; +/○; and +/● (see Martingell & Saville 1988: 22). It should also be noted that although the standard today is to illustrate flake and blade tools with their proximal end down and microliths with their tip (usually the proximal end) up, some older drawings follow other principles, and some microliths have been drawn with their proximal end down (see for example, the microliths from Jura (Figures 48 and 54).

² According to international copyright legislation, it is permissible to use illustrations from volumes 75 years after the author's death.

Basic descriptive terminology

The basic descriptive terminology primarily covers terms applied to describe the various elements of tool blanks (mostly flakes and blades); terms used to describe parts of the reduction process responsible for their creation; and the various forms of retouch encountered when characterising tools (as illustrated in Figure 2). As indicated by the section's title, this is intended to be a cursory presentation. If a more thorough discussion of the terms touched upon in this section is required, such as types of platform remnants, bulbs of percussion, etc. there are excellent and more comprehensive accounts available (e.g., Inizan *et al.* 1992; Madsen 1992; Sørensen 2006a; 2006b). Many of the definitions in this section represent an amalgamation of definitions in Inizan *et al.* (1992) and Hellskog *et al.* (1976).

The main elements of flakes and blades

The main purposes of Figure 3 are to demonstrate how specialists orientate flakes and blades, and tools based on flake and blade blanks, to make it possible to precisely refer to the various ends (proximal and distal), faces (dorsal and ventral) and lateral sides (left and right) of these blanks, as well as to show the attributes associated with the identification of a flake as an artefact and not a geofact.

A flake has two faces, namely its ventral face and its dorsal face. These terms were originally borrowed from palaeontology, where they refer to the lower and upper surfaces of fossils (e.g., Wienberg Rasmussen 1969). The ventral face of a flake is a smooth and unbroken, usually slightly convex surface, which is the face created when the piece was struck off its parent core. The dorsal face usually has a number of arrises or ridges, separating the negative scars left when previous flakes were detached. Occasionally, this face can also have the remains of the cortex or outer skin of the original nodule. At one end, the flake has a bulb of percussion, which may be more or less prominent. This bulb indicates where the blank was struck (the impact point) when it was detached from the core by whichever means (hard or soft percussion, or bipolar technique).

When describing a flake, and referring to its various elements, the piece is placed with its ventral face down and the bulb of percussion towards the person analysing it (Figure 3; also Martingell & Saville 1988: 2). The left lateral side of the piece is then the left side of the flake in this position, and the right lateral side is the opposite edge. The two ends of the piece, again based on the flake in this position, are referred to as the proximal and distal ends, which are Latin terms for 'nearest' and

Garvald Burn, Scottish Borders - debitage, cores and tools									
Year	2000	CAT No	1598	Orig SF No	0754				
Test Pit		Trench	4	East	018.5	North	140		
Other	Spit 2								
Artefact type	Scalene triangle			Sub-type					
Blank type	Microblade	Fragment	Medial-distal	Perc type	Uncertain				
Ret type	Fine retouch	Ret extent	Continuous	Ret position	Left lateral side				
Raw-material	Chert	Colour	Grey	Reduction seq.	Tertiary				
Length, mm	11.2	Width, mm	4.4	Thickness, mm	1.1	Greatest dim., mm	0.0	Burnt	☐
Comments	Truncation towards distal end. LHS fully blunted. Ancillary retouch along RHS.								
in 1598									

Figure 2: Descriptive database form (Ballin 2017c).

‘farthest away’ (from the analyst). The proximal end is therefore the end with the bulb of percussion, and the distal end the usually thinner and frequently pointed or tapering part of the blank. The area between the proximal and distal ends is called the medial zone.

The flake as an artefact is therefore defined as a relatively flat object with a recognisable ventral and dorsal face (the presence of a ventral face being the prime identifier), and a bulbar area. When talking about flakes struck off platform cores, flakes would have a platform remnant at the proximal end (that is, the remains of the originally much larger striking-platform of the parent core), whereas bipolar flakes would have a crushed ridge or terminal (see platform cores and bipolar cores, below). It is highly misleading to refer to the struck end of a bipolar flake as its ‘platform end’, as bipolar cores have no flat striking-platform.

A flake has other defining characteristics, with the main attributes being its ripples and hackles (or radial lines). The ripples are concentric lines, or waves, centred on the bulb of percussion, and even when the proximal end of a flake has broken off, it is possible to determine where the bulb would have been, and thus which end is the proximal end. In some cases, ripples may be weakly developed, but in those cases radial lines, if present, can help define where a broken-off bulb may have been. These lines radiate from the bulb, occasionally across the ventral face, but even when they are weakly developed it may (with the help of a magnifying glass) be possible to spot them along the lateral edges of the piece, again defining where the bulb was.

Main percussion techniques and technological attributes

A key element of characterising flakes and blades, and tools based on flake and blade blanks, is their technological ‘background’, that is, whether they were struck off their parent cores by the application of platform technique or bipolar technique, and, if formed by platform technique, whether the approach was hard or soft percussion. It is possible to be much more precise and sophisticated than this (e.g., Gingell & Harding 1981; Madsen’s 1992; Sørensen 2006a; 2006b; Pelegrin 2006), and for example subdivide the categories hard and soft percussion into whether one or the other form of hammerstone (quartzite, limestone, etc.) or punch/pressure-flaker (e.g., bone, antler, wood, copper-tip) was applied. It is also possible to determine whether the percussor hit the core’s striking-platform directly, or whether for example a soft intermediary implement (a punch or pressure-flaker) was also used (direct and indirect percussion). However, this level of detail is generally beyond the capabilities of non-specialists. To allow *standard* reports to be produced, which will allow these reports and their sites and assemblages

to be compared, it is suggested to generally focus on the characterisation of the applied techniques as hard or soft percussion or bipolar technique, unless a sophisticated research question makes finer definition of the applied techniques necessary and funding is in place for detailed attribute analysis of sizable populations of flakes or blades.

Platform techniques: *Hard percussion*, which tends to be direct percussion, is percussion by the use of a hard material, such as quartz, quartzite or flint. Hitting the striking-platform of a core with a hard hammerstone leaves a pronounced bulb of percussion on the flake’s ventral face, and due to the fracture dynamics of lithic materials, this bulb is, when well-developed, cone shaped. When *soft percussion* is applied (soft hammerstone or organic material punch), a more discrete bulb is formed on the flake’s ventral face, usually in the form of a light swelling in the bulbar area. *Pressure technique* is a form of soft percussion, where flakes (or more commonly blades) are manufactured by gradually pressing a blank off the parent core (with the help of an organic matter pressure-flaker or – in later prehistory – a copper-tipped one), instead of striking the core. In some cases, soft percussion blanks develop a slight lip below the platform remnant (ventral face), which can be felt with a fingernail. Some soft percussors (like antler hammers) may leave pronounced lips (see references above).

Although the presence/absence of a bulb or lip and the character of the bulb or lip (pronounced/discrete) are frequently used as the main defining characteristics in connection with the distinction between hard- and soft-hammer techniques (and in some cases the only characteristic), other attributes should also be taken into consideration, such as the width and depth of the platform remnant; whether platform collapse occurred; whether impact scars are present on the platform remnant, and bulbar scars (or *errailure* scars) below the platform remnant; and the character of the blank’s ripples and radial lines (Figure 3).

Bipolar technique: Bipolar technique is also called hammer-and-anvil technique (or even ‘nut-cracker technique’) (White 1968; Ballin 1999). This approach is a form of hard percussion, but it is not a platform technique. It is defined by the absence of core preparation (such as the preparation of a level striking-platform), and a pebble (or a flake fragment, an exhausted platform core or tool) is simply placed on a stone anvil (see below) and struck with a hard hammerstone. This frequently caused the original pebble or cobble to split as shown in Figure 4. In this case, one pebble disintegrated into four orange-segment flakes. If these pieces were then struck again in a similar manner, the knapper occasionally succeeded in manufacturing elongated blade-like (or microblade-like) flakes which, during the Mesolithic,

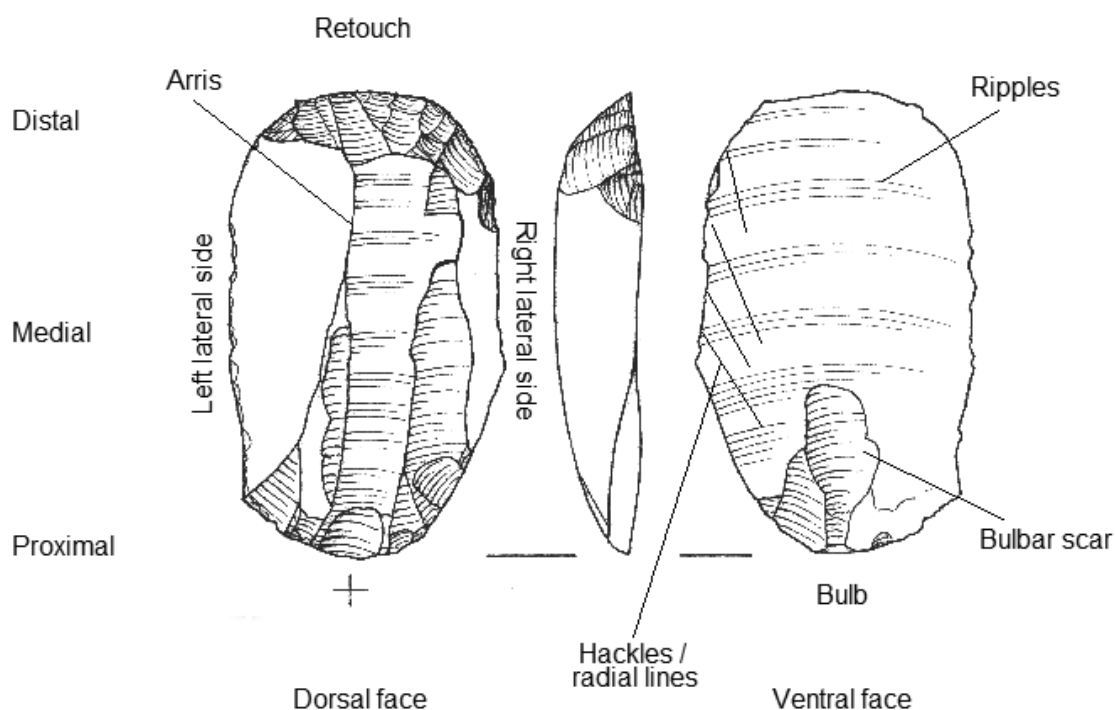


Figure 3: The main elements of flakes and blades – terminology and orientation (Ballin et al. 2017, Plate 11; artist: Marion O’Neil).

could be used *inter alia* as blanks for microliths; during for example the Early Bronze Age, squat bipolar flakes were frequently used as blanks for thumbnail-scrapers (see scraper section, Figure 67). The orange-segment flakes do pose a problem in terms of how to define them – some have the appearance of blanks whereas others look more like cores, such as the piece Figure 4.2, furthest to the left, which was struck a second time, detaching a blank from the ventral face(s) of the orange-segment flake.

Orange-segment flakes are not always common in assemblages produced by the application of bipolar technique, but they would usually be present, and when they are, they are diagnostic of this approach. Figure 5

shows how these pieces were formed, and they would tend to have one primary (fully cortex-covered) dorsal face, and two ventral (inner) faces. It should be borne in mind, though, that bipolar flakes (particularly from the later stages of a bipolar reduction process) also occur as ‘ordinary’ flakes with one ventral and one dorsal face. These flakes are recognisable as bipolar flakes by having a crushed proximal ridge, where a platform flake would have a flat platform remnant, as well as more densely spaced ventral ripples or Wallner lines (Ono 2004).

In the early years of modern archaeology, bipolar cores were frequently referred to as scaled pieces (*pièces esquillées* or *outils ecaillés*) or chisels/fabricators, but following White’s (1968) seminal paper on the



Figure 4: Four refitted orange-segment flakes and bipolar cores from the Norwegian site Lundevågen 21, SW Norway: 1) Refitted and 2) ‘exploded’ view (Ballin 1999; photo: Torben B. Ballin).

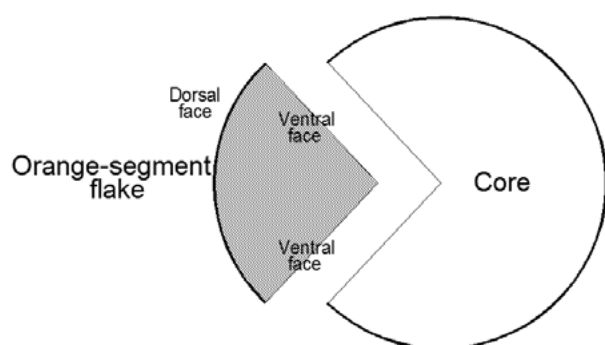


Figure 5: The elements of a bipolar orange-segment flake; the thick line indicates cortex.

production of such pieces on New Guinea, it is now clear that most of these pieces are waste cores. Today, the term 'bipolar core' is occasionally, and mistakenly, applied to cores with a striking-platform at either end; the term 'bipolar core' should instead be reserved for anvil-struck cores (which have no actual platforms), whereas a core defined by a level striking-platform at either end should be referred to as an opposed-platform core or a cylindrical core.

To define the prehistoric percussion techniques or production strategies of specific assemblages or industries beyond their basic attributes (above) is not always economically possible within the framework of a commercial project. The approach defined by Madsen (1992), for example, requires the inspection of 40 or more attributes, including the curvature of the blade, blade termination, the shape of the bulb of percussion, the preparation of the platform and the platform-edge, the size and shape of the platform remnant, fragmentation, and directionality (the use of, for example, single-platform or opposed-platform cores) (also see Inizan *et al.* 1992, Chapter 7).

Percussion angle

1. *Acute*: $< 80^\circ$.
2. *Abrupt (or steep)*: $\geq 80^\circ$ and $< 90^\circ$.
3. *Obtuse*: $\geq 90^\circ$.

As shown in Inizan *et al.* (1992: Figure 6), the platform remnant of a platform flake is characterised by two different angles: the angle between the platform and the flake's dorsal face, and the angle between the platform and the flake's ventral face. In the past, the author has used the term flaking angle or percussion angle to describe the former. Some specialists would, when attempting to characterise a blade industry, measure the former and some the latter. The author chose to measure the angle between the platform and the dorsal face, as this angle would have been carefully shaped by trimming and abrasion to provide the angle

the prehistoric knapper preferred (i.e., it defines an intention or mental template), whereas the angle with the ventral face describes the actual result and thereby also production accidents caused by for example inner weaknesses like internal chalk balls, fossils, fault planes, and sheets of micro-crystals.

Reduction sequence

Flakes and blades result from a process of sequential reduction where earlier removals bear more cortical surface than those removed further into the core. There have been attempts to define more complex sequences, with multiple levels, defined by specific percentages of dorsal cortex (Clarkson 2008), but in those cases the problem was always how to measure precisely (for example in per cent) how much of a dorsal surface was cortex-covered?

The author generally applies a simple tri-partite terminology for the definition of a flake's position in the reduction process, namely:

1. *Primary*: The dorsal surface is entirely covered by cortex.
2. *Secondary*: The dorsal surface is partially covered by cortex.
3. *Tertiary*: Inner pieces without dorsal cortex.

Type of retouch

Tool types based on flaked blanks are usually defined by their secondary retouch. The precise characterisation of this retouch is therefore essential, and a number of descriptive elements relating to the modification of tool blanks are discussed and defined below.

1. *Edge retouch*: Retouch limited to the edge zone of a tool, that is, the outer sixth of the maximum width of an artefact. The angle of this retouch is mostly abrupt.³
2. *Invasive retouch*: Retouch embracing the entire, or part of, the central zone of a tool, that is, the inner four sixths of the width of an artefact. The angle of this retouch is generally acute. *Complete invasive retouch* means that more than 90% of the dorsal and/or ventral faces of an artefact are retouched. Implements like daggers tend to

³ This definition may sound overly precise and it would, admittedly, be too time-consuming to measure all relevant retouches and calculate whether a specific retouch reached more or less than one sixth in from a blank's edge. It is expected that an experienced specialist would be able to estimate by eye whether a retouch belonged to one or the other of these categories, just as the definition of some pieces of debitage as chips and others as flakes (greatest dimension above or below 10mm) would be by eye (some assemblages have tens of thousands of chips).

be characterised by complete invasive retouch, whereas leaf-shaped, oblique and barbed-and-tanged arrowheads may be characterised by partial or complete invasive retouch, as well as (in rare cases) edge-retouch only.

As it can be difficult to distinguish between retouch and continuous lateral use-wear, it may occasionally be necessary to add a category of 'utilised pieces' (see below).

Orientation of retouch

1. *Normal retouch*: Retouch, initiated from the ventral face (impinging on the dorsal face).
2. *Inverse retouch*: Retouch initiated from the dorsal face (impinging on the ventral face).
3. *Alternating retouch*: Retouch which along the same lateral edge alternates between normal and inverse.
4. *Propeller retouch*: Retouch which is normal along one lateral edge and inverse along the opposing edge. This form of retouch defines many piercer tips and tangs of tanged arrowheads.
5. *Bifacial retouch*: Retouch which along the same lateral edge, and the same extent of edge, combines retouch from either face and where the retouch is commonly (although not exclusively) invasive. If this modification is steep, it is referred to as *sur enclume* retouch (i.e., 'made on an anvil'); this retouch is commonly (although not exclusively) encountered on LUP points.

Fineness of (edge) retouch

1. *Very fine retouch*: The length of the individual retouch removals > 0.5mm and ≤ 1mm.
2. *Fine retouch*: The length of the individual retouch removals > 1mm and ≤ 3mm.
3. *Coarse retouch*: The length of the individual retouch removals > 3mm and ≤ 5mm.
4. *Very Coarse retouch*: The length of the individual retouch removals > 5mm. Helskog *et al.* only applied the three former categories; the fourth category is suggested as an adaptation to quartz assemblages, the tools (and thereby the retouch) of which are generally considerably larger and coarser than those from flint assemblages.

A term occasionally used in British Stone Age archaeology is *microlithic retouch*. This has no accurate definition, other than its association with microliths and thereby its fineness. However, microliths are not the only tools to have delicate retouch, and it is suggested that the term 'microlithic retouch' should be

replaced by the more precise terms 'very fine retouch' and 'fine retouch'.

Morphology of retouch

1. *Scaled or scalar retouch*: The individual removals are in general short and wide, being widest at the distal ends and resembling fish scales. The removal terminations are often hinged.
2. *Stepped retouch*: As above, but the terminations are stepped instead of hinged.
3. *Parallel retouch*: A series of elongated removals separated by parallel arrises (ridges). The retouch of the so-called ripple-flaked lop-sided arrowheads (cf. Clarke *et al.* 1985, illus 7.7; Green 1980: 38) is parallel retouch. Lomborg (1973: 28ff) distinguishes between complete and partial parallel retouch, with the former stretching from edge to edge, whereas the latter has been initiated from either edge with the removals meeting in the middle.
4. *Sub-parallel retouch*: A series of elongated removals separated by approximately parallel arrises.

Angle of retouch

1. *Low*: Approximately 10°.
2. *Semi-abrupt*: Approximately 45°.
3. *Abrupt*: Approximately 90°.

This graduation schema is suggested by Inizan *et al.* (1992: 75), who admit that other graduation schemas may be relevant in other contexts. Helskog *et al.* (1976: 23) suggest the following graduation:

1. *Very acute*: 0°-15°.
2. *Acute*: 16°-45°.
3. *Abrupt (or steep)*: 46°-75°.
4. *Very abrupt (or steep)*: 76°-90°.
5. *Obtuse*: > 90°.

Delineation of retouch

1. *Straight*: Self-explanatory.
2. *Concave/convex*: Self-explanatory.
3. *Notched/denticulated/serrated*: A notch is a small concave feature mostly in the lateral edge of an implement. The notch may have been formed by one larger removal but was commonly formed by retouch, that is, made up of a series of smaller removals. The length of the chord is ≤ 10mm, and the depth of the notch is ≥ ⅓ of the length of the chord (to distinguish these pieces from concave

and hollow scrapers; below). A denticulation is defined as at least 2 notches (which are often single removals), with the distance between the notches being $\leq$ the largest adjacent length of chord.

4. *Shouldered/nosed*: These retouch forms are usually found at the distal or proximal ends of flakes (often scrapers). If the course of the retouch is concave-convex, the retouch is said to form a shoulder. If the course of the retouch is

concave-convex-concave, the retouch is said to form a nose.

5. *Tanged*: Double-sided retouch at the distal or proximal end of an implement (usually tanged points/arrowheads, but tanged scrapers and knives are also known). In many cases, the retouch forms more or less distinct shoulders with both lateral edges, but some tanged points have no well-defined shoulders.

The typology of lithic debitage, cores and tools

In this section, it is important to emphasise that the following typology is an example of morphological or formal classification, and not a functional one. An end-scraper, for example, is defined as an implement with a convex working-edge at one end, but it is highly likely that the piece would also have been used for cutting, if it had a sharp, unmodified lateral edge. Prehistoric people were practically minded, and tended to follow the 'Swiss Army Knife principle', where all useful edges, ends and corners performed one or another task. However, in a *morphological* typology the individual pieces are defined and classified according to their modification, which is thought to show the maker's original intentions. In some cases, it may be relevant to carry out specialised use-wear analysis to test what *actually* went on at a specific site, and it has been shown that many unmodified lithic blanks, as well as fragments, were used (e.g., Juel Jensen 1986).

Debitage

Debitage includes the unmodified flaked products (blanks and waste material) from the reduction of a core (cf. definition in Inizan *et al.* 1992: 84). This category embraces chips, flakes, blades, and indeterminate fragments (Figure 6). Preparation flakes (below) are

commonly included in this category, but in this guide they are perceived as a separate category, as they represent a specialised task.

Chips: All flakes and indeterminate pieces the greatest dimension (GD) of which is $\leq 10\text{mm}$.

Flakes: All lithic artefacts with one identifiable ventral surface, $\text{GD} > 10\text{mm}$ and $L < 2W$ (L = length; W = width).

Indeterminate pieces: Lithic artefacts which cannot be unequivocally identified as either flakes or cores, for example due to the absence of a recognisable ventral face or due to flaking/disintegration along internal fault planes. Generally, the problem of identification is due to irregular breaks, frost-shattering or fire-crazing. The term 'chunk' is commonly used as a synonym for 'indeterminate piece', but this is not recommended as many indeterminate pieces are small and flat (for example flake fragments which, due to exposure to fire, shed the entire ventral face). The term 'shatter' is also occasionally used, but it does not precisely indicate the character of the pieces.

Blades and microblades: Removals where $L \geq 2W$. In Scotland, blades (or macroblades) are defined as $W > 8\text{mm}$, and microblades $W \leq 8\text{mm}$ (Ballin 2000: 11). In southern Britain, blades and microblades are defined as broader and narrower than $W = 12\text{mm}$ (Barton 1992; Butler 2005: 35). Microblades are often referred to as bladelets.

'Accidents': In some special cases, it may be relevant to classify the flakes and blades of an assemblage in terms of how well they were executed, and the distal ends of some blanks define them as accidental by-products. This group includes short *hinged flakes* and short *flakes with stepped distal ends*, which dug deeply into the parent core and then broke off, instead of producing the intended longer blank. The consequence of accidents like these frequently was that the parent core needed its flaking-front adjusted to allow production to continue, or the core was discarded. *Overpassed flakes* are blanks which instead of just removing a thin surface-layer off the core (the flake), cut diagonally through the parent piece and removed a large part of the core's apex. In many instances, the resulting heavily shortened core was discarded. In most cases, these accidental products are just recorded as flakes.

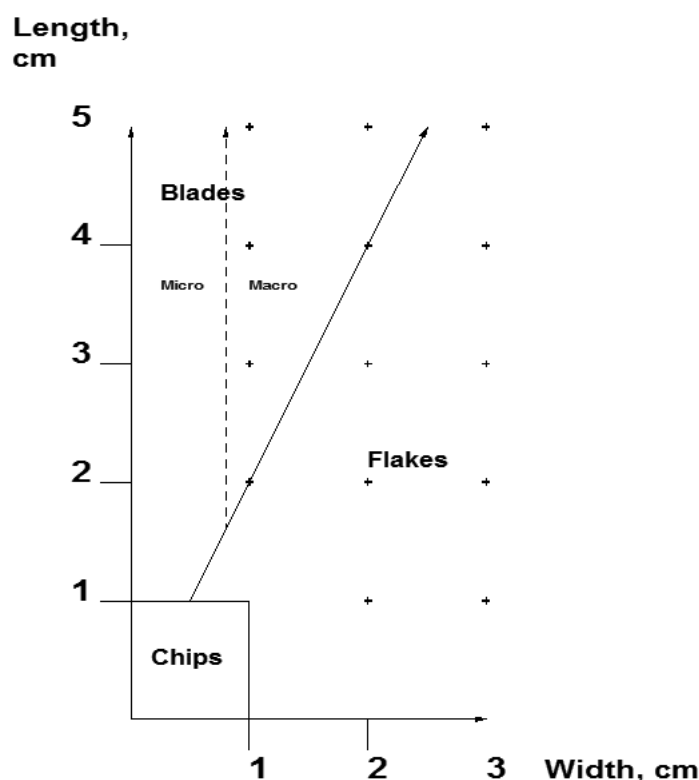


Figure 6: Metrically defined debitage categories (microblades as suggested for Scottish assemblages).

Core preparation flakes

This group of flakes and blades are frequently included amongst the debitage, as these pieces were commonly used as tool blanks. However, they were not simply produced as blanks, but had an important role to play in terms of shaping the original flake or blade core (crested pieces) and, later, to prolong the core's life by adjusting the platform and its edge/edge-angle (platform rejuvenation flakes or core tablets) (cf. Inizan *et al.* 1992).

Crested pieces: These are flakes and, most commonly, blades with a dorsal crest running entirely or partially from the proximal end to the distal end (Figure 7). The crest was formed by removing small flakes at a perpendicular angle to the blade's long axis. The purpose of the crest was to direct and shape the first blade struck from the core (for which reason a crest is also referred to as a 'guide ridge'), and a core's first crested piece would usually have had small flakes removed to either side of its crest (a bilaterally crested piece). Crests were also commonly shaped during the reduction process to adjust the core-side (the flaking-front) and its ridges. These later crests would in many cases only have had small flakes removed to one side of the dorsal crest (a unilaterally crested piece).

Although crested pieces are not diagnostic *per se*, some industries tend to produce more of these pieces than others due to the application of different operational

schemas: LUP industries produced many crested pieces, a substantial number of which are bilateral; Mesolithic and Neolithic industries produced fewer of these pieces, most of which are unilateral; and Bronze Age industries produced few to none, due to the application of a much more simplistic operational schema (Ballin 2002a; 2019a).

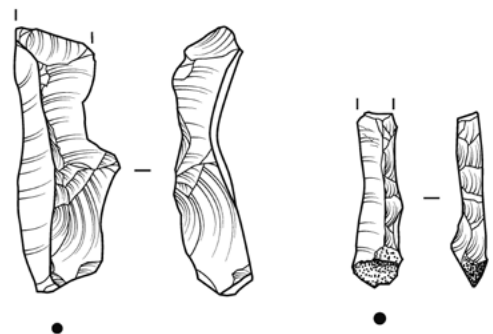
Platform rejuvenation flakes: During the reduction of a flake or blade core, it would occasionally be necessary to adjust the core's platform and its angle with the flaking-front. In these cases, the old platform of the core was removed by striking the side or flaking-front of the piece (Figure 8). A complete platform rejuvenation flake is also referred to as a core tablet.

Like crested pieces, platform rejuvenation flakes are not diagnostic *per se*, but they tend to be more common in assemblages associated with more sophisticated lithic industries and their operational schemas. They tend to be common in LUP assemblages, present but less common in Mesolithic and Neolithic assemblages, and absent in Bronze Age assemblages (Ballin 2002a; 2019a).

Platform-edge flakes: In some archaeological traditions, such as the prehistoric archaeology of Scandinavia, some pieces were classified as platform-edge removals, intended to adjust the platform-edge only. However, Ballin & Lass Jensen (1995: 69) showed that platform rejuvenation flakes and platform-edge flakes tend to



Figure 7: Crested pieces: 1) A bilaterally crested piece – GD= 93mm; and 2-3) unilaterally crested pieces – GD = 17-28mm, all from Milltimber Zone 4, Aberdeenshire (Ballin 2019c, illus 2.72, 2.86; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.) The former piece is thought to date to the LUP and the latter two are likely to be Late Mesolithic.



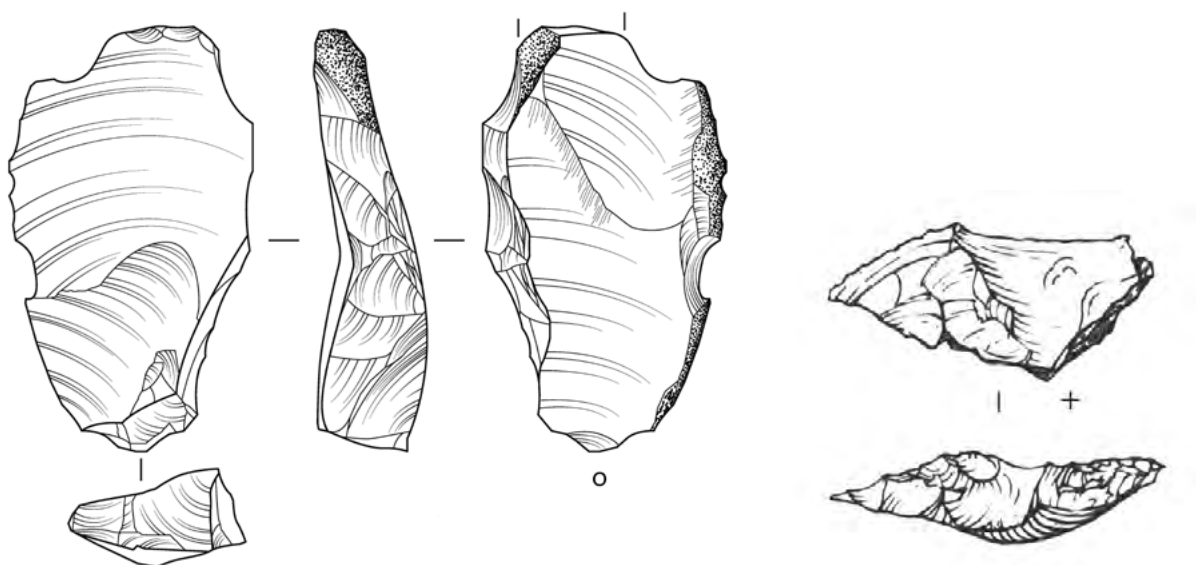


Figure 8: Platform rejuvenation flakes: 1) A full platform rejuvenation flake from Milltimber Zone 4, Aberdeenshire – GD = 52mm (Ballin 2019c, Illus 2.87; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.); and 2) a partial platform rejuvenation flake from Garthdee Road, Aberdeen – GD = 36mm (Ballin 2014b, Illus 16; artist: Jan Dunbar; courtesy of Murray Archaeological Services Ltd.).

form a metric continuum, and platform-edge flakes are most likely *partial platform rejuvenation flakes*, and it is therefore suggested that they are referred to as such. On occasion, these flakes are misidentified as crested pieces.

Core-side flakes: One of the main reasons for discarding a core is that one or more removal attempts were unsuccessful, with flakes terminating in deep distal hinges or steps (see Figure 14.1-2). This formed an irregular flaking-front, and prevented further controlled blank production. One way of dealing with this problem – instead of discarding the core, and if the core had enough mass – was to simply remove the entire flaking-front or core-side. This was a common way of adjusting a core's shape in the Danish LUP Broomian (Andersen 1972: 19). However, it is difficult to distinguish between these intentional core-side flakes and flakes which are simply slightly thicker than other flakes in the assemblage. Should it be relevant to use this term in connection with the characterisation of an assemblage, it is necessary to explain precisely how, at a given site, core-side flakes are defined against ordinary thick flakes.

The term *flanc de nucleus* is used to characterise specific core-side rejuvenation flakes. These flakes removed all or large parts of the core's flaking-front, and the negative scar from the removed *flanc de nucleus* then served as a striking platform in connection with the re-orientation of the core (e.g., de Bie & Caspar 2000: 62).

Cores

Cores are the residual nuclei left behind after the removal of debitage. They were reduced to produce flake and blade tool blanks, and these removals are

referred to as debitage (above). This category includes core preforms; platform cores; as well as bipolar (anvil-struck) cores (Clark 1954; Inizan *et al.* 1992). The platform cores are generally subdivided into pieces with one, two, or multiple platforms, but they also embrace flat discoidal cores, which were reduced by striking the cores' circumference (Clark 1960). Clark's core typology also includes keeled cores, a term which has been used confusingly to describe for example bipolar cores, handle-cores and some discoidal cores, and should therefore be avoided.

Cores are distinguished from split pebbles by having had three or more flakes removed, whereas split pebbles have fewer than three flake scars. Cores would commonly be reduced and gradually transformed following this formula: Single-platform cores $\Rightarrow$ dual-platform cores $\Rightarrow$ irregular (multi-directional) cores $\Rightarrow$ bipolar cores. This, however, is an idealised sequence and some knappers diverted from it if it was practical or beneficial to do so. The latter stage is usually only included in regions with insufficient (in terms of amount and nodule size) supplies of raw material.

The dimensions (L x W x T) of cores are measured in the following ways: in the case of single-platform cores, the length is measured from platform to apex (opposed-platform cores: platform to platform), the width is measured perpendicular to the length with the main flaking-front orientated towards the analyst, and the thickness is measured from flaking-front to the often unworked/cortical 'back-side' of the core. In the case of bipolar cores, the length is measured from terminal to terminal, the width is measured perpendicular to the length with one of the two flaking-fronts orientated

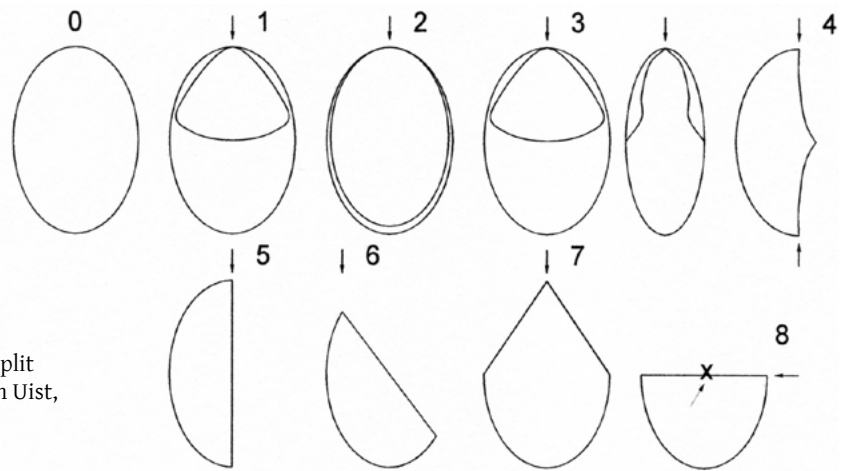


Figure 9: A raw quartz pebble (No. 0) and split quartz pebbles (Nos 1-8) from RUX6, North Uist, Western Isles (Ballin 2018b: Figure 5.16).



Figure 10: A selection of split pebbles of quartz from RUX6, North Uist, Western Isles (Ballin 2018b: Figure 5.14; photo: Beverley Ballin Smith).

towards the analyst, and the thickness is measured from flaking-front to flaking-front. More ‘cubic’ cores, like cores with two platforms at an angle and irregular cores, are simply measured in the following manner: largest dimension by second-largest dimension by smallest dimension.

Pre-cores: This category includes a number of preforms, which were abandoned before actual systematic blank production commenced.

Split pebbles are pebbles (greatest dimension < 64mm)⁴ or cobbles (greatest dimension ≥ 64mm) which have had one or two flakes removed, and they are also

commonly referred to as ‘tested pebbles’. It is assumed that the prehistoric knapper struck one or two flakes off these pieces to test the quality of the raw material, and if they flaked in an irregular manner – for example due to internal flaws and weaknesses – the pebbles were discarded. Occasionally, split pebbles were struck in free-hand style, but in for example western and northern Scotland, as well as in parts of western Britain, most of these pieces are early-stage bipolar cores (Ballin 2018b) (Figure 9). This latter form of split pebbles usually have one or two crushed terminals, in addition to scars of flake removals (Figure 10).

The preparation of cores also includes platform-edge trimming and abrasion, as well as (in some industries) faceting of the platform surfaces. A particular form of finely faceted flakes or blades are referred to as *en éperon* flakes/blades, which have a small spur (*éperon*) at the centre of the platform-edge (Figure 11). Most

⁴ In this volume, pebbles and cobbles are defined as in the geological literature (Hallsworth & Knox 1999: Figure 13), that is, pebbles measure between 4-64mm and cobbles between 64-256mm. The size category below pebbles is granules and the one above cobbles is boulders.

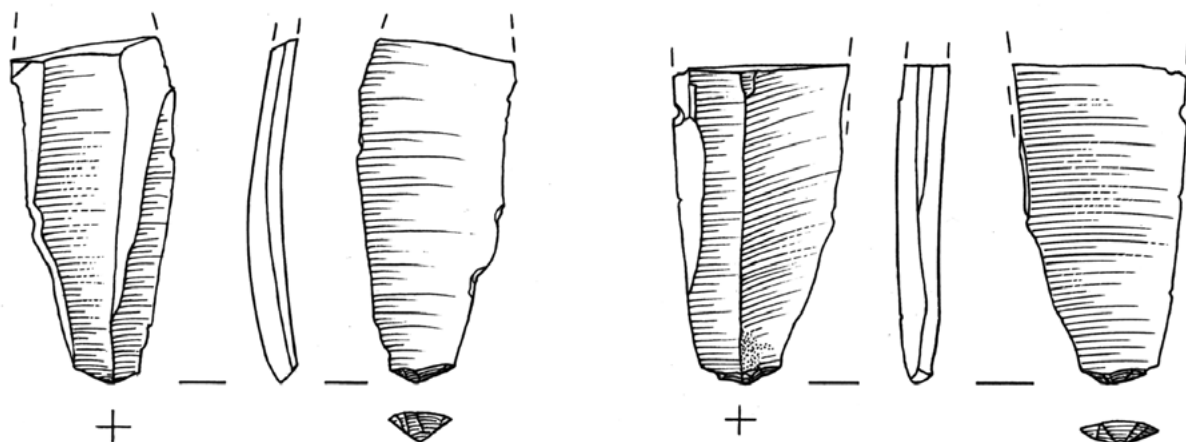


Figure 11: Two en éperon blades from Howburn, South Lanarkshire – GD = 29-31mm (Ballin et al. 2018, Plate 1; artist: Marion O'Neil).

likely, this spur formed the impact point of an antler hammer or the seat of a punch or pressure-flaker, and these pieces are highly diagnostic of the Hamburgian, Creswellian and late Magdalenian industries (Barton 1990; Jacobi 2004; Ballin et al. 2018). Trimming, abrasion and faceting would usually be carried out before, as well as during, blank production. British Middle and Late Neolithic industries are also characterised by a high number of finely faceted platform remnants, but they do not display spurs. The latter blanks are associated with Levallois-like industries.

Core rough-outs are more sophisticated preforms from a slightly later part of the operational schema, and they represent efforts to carefully transform a pebble or cobble into a platform-core and prepare the piece for blank production (e.g., Ballin 2019a). Usually, this includes the formation of a striking-platform and one or two (commonly diagonally positioned) crests, as well as full or, most commonly, partial decortication (Figure 12).

Single-platform cores: It is possible to subdivide cores with one platform into two formal groups, namely conical single-platform cores and handle-cores. Single-platform cores are generally undiagnostic, but well-

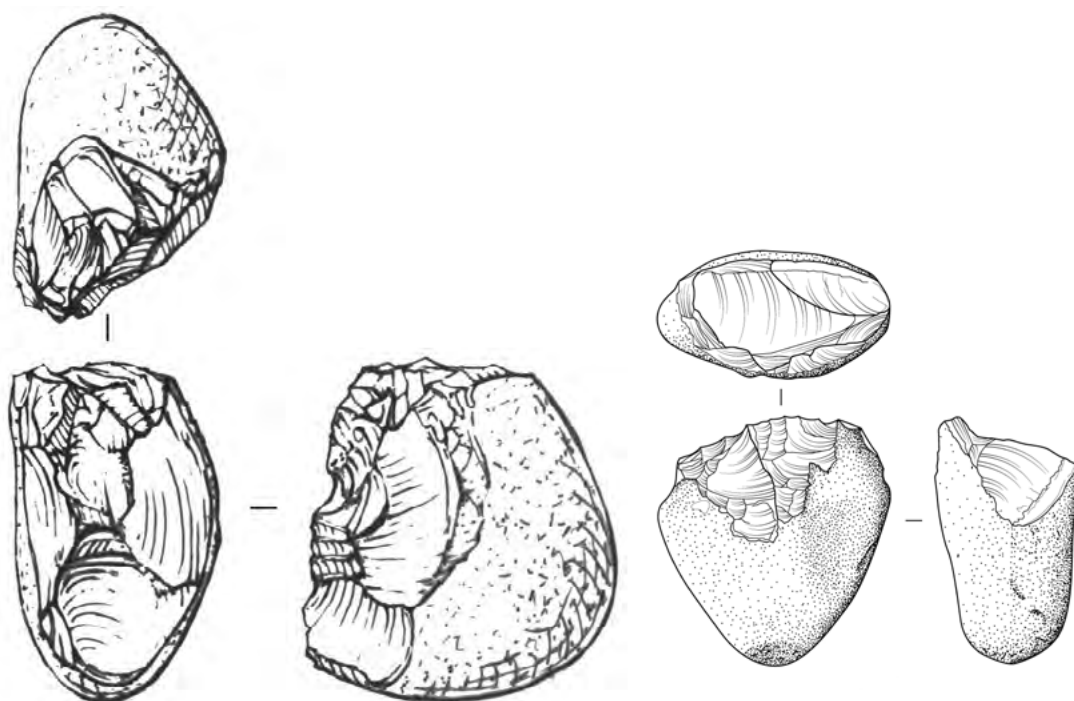


Figure 12: Core rough-outs: 1) A specimen from Garthdee Road, Aberdeen – GD = 30mm (Ballin 2014b, Illus 16; artist: Jan Dunbar; courtesy of Murray Archaeological Services Ltd.); and 2) one from Standingstones, Aberdeenshire – GD = 36mm (Ballin 2019e, Illus 4.14; artist: LeeAnne Whitelaw; courtesy of Headland Archaeology Ltd.). The former has a prepared crest and the latter a prepared platform.

Figure 13: Single-platform cores:
 1) Broad (pyramidal) conical core (quartz) from Barabhas, Lewis - GD = 62mm (Ballin 2018b: Figure 30; photo: Beverley Ballin Smith); and 2) slender (bullet-shaped) conical core from Colinhill, South Lanarkshire - GD = 29mm (Ballin 2019b: Figure 7; photo: Beverley Ballin Smith; courtesy of GUARD Archaeology Ltd.). The former has a conical platform and probably dates to the Late Neolithic/Early Bronze Age period, whereas the latter has a plain platform with an abraded edge and it is thought to be Early Neolithic.



executed specimens tend to be associated with more sophisticated operational schemas pre-dating the Bronze Age period.

Conical single-platform cores are defined by having a round or oval platform, and their flake and blade scars tend to meet at the core's apex, giving these pieces a pyramidal or bullet-shaped conical outline

(Figure 13). The pyramidal cores generally have acute platform edge-angles (see percussion angles, above), whereas bullet-shaped ones usually have steep edge-angles. Within both categories, some specimens have been knapped along the entire circumference of the platform, whereas others have a cortical or otherwise unworked 'back-side' (Figure 14).

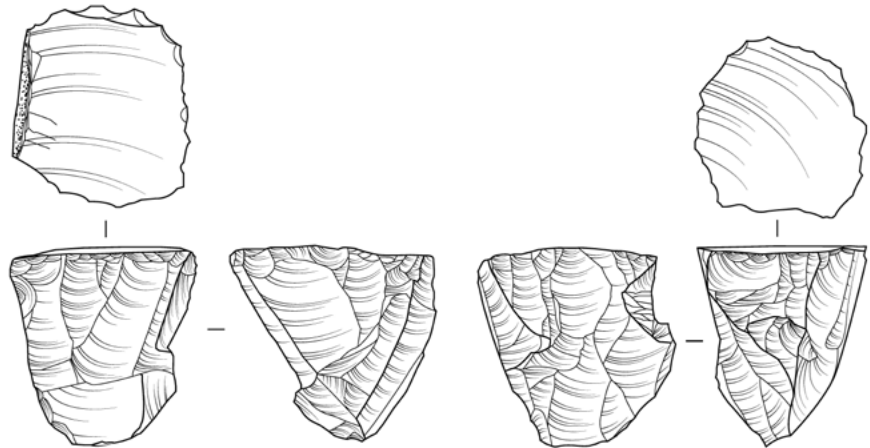
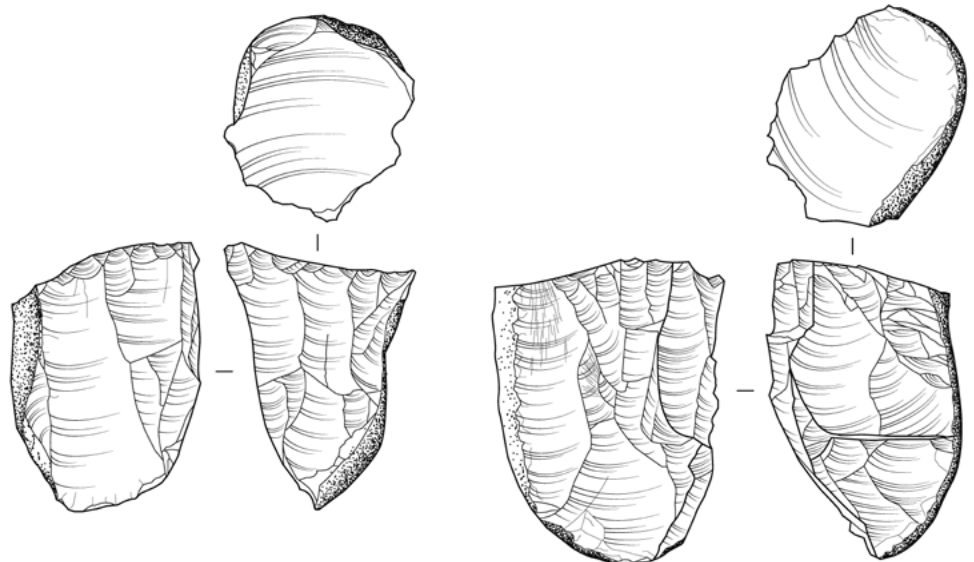


Figure 14: A selection of typical Late Mesolithic conical single-platform cores from Milltimber Zone 5, Aberdeenshire (Ballin 2019c, illus 2.77; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.). The upper two cores display scars from short hinge- and step-terminating flakes or blades, which may be the reason why they were abandoned.



Handle-cores have their flaking-front at one end of an elongated platform, or a flaking-front at either end of an elongated platform, and an opposed keel rather than a pointed apex. In southern Scandinavia, handle-cores form a distinct, well-defined type, and the knapper clearly had a mental template (Figure 15.1). They are diagnostic of the region's Middle Mesolithic period (Ballin 2016a). Handle-cores are also found in for example Scotland, but in this region they seem to represent adaptation to the size and shape of available pebbles, and they are not diagnostic (Figure 15.2; also Ballin & Barrowman 2015).

Dual-platform cores: Dual-platform cores are cores with two platforms, which may be positioned either at two opposed ends (*opposed-platform cores*; Figure 16) or at more or less perpendicular angles to each other (*cores with two platforms at an angle*; Figure 17). Prismatic opposed-platform cores struck along the entire circumference of both platforms, and with roughly parallel lateral sides, can be referred to as cylindrical cores (Ballin *et al.* 2018). Many cores with two platforms at an angle attain a roughly cubic shape and they can be difficult to distinguish from irregular cores.

It is correct that opposed-platform cores appear in LUP as well as Mesolithic environments, but examination of assemblages from these two periods suggests that LUP and Mesolithic opposed-platform cores were produced following very different operational schemas. It is suggested that the opposed-platform cores from the LUP are primary cores (e.g., Barton 1992; Weber 2012;

Vermeersch 2013; Ballin *et al.* 2018), and that they were shaped by carefully preparing relatively large nodules, resulting in the production of numerous crested pieces and core tablets. The Mesolithic opposed-platform cores, on the other hand, are probably mostly secondary cores, which resulted from the reduction of exhausted single-platform cores (Ballin 2019a; forthcoming c).

Irregular (multi-directional) cores: These are defined by having been reduced from three or more directions (Figure 18), and are known by many names. The author refers to them as irregular cores, whereas other colleagues prefer to call them multi-platform, multi-directional, polyhedral, or amorphous cores. They commonly display few of the attributes of more sophisticated cores (conical and opposed-platform cores), such as regular platform-edge trimming, but in cases where they represent the final stage of the gradual transformation of single-platform cores into dual-platform cores into irregular cores, they may have surviving trimmed platform-edges relating to their earlier 'lives' as more sophisticated cores. Some industries, such as later prehistoric ones or quartz industries may be dominated by irregular and bipolar cores (cf. the Early Iron Age assemblage from Burland on Trondra, Shetland; Ballin 2014a).

Discoidal cores: Discoidal cores are generally defined by being fairly flat (disc-shaped) cores, which were reduced by striking their circumference (thus also referred to as centripetal cores). They may have had flakes removed from one face only, or from both faces.

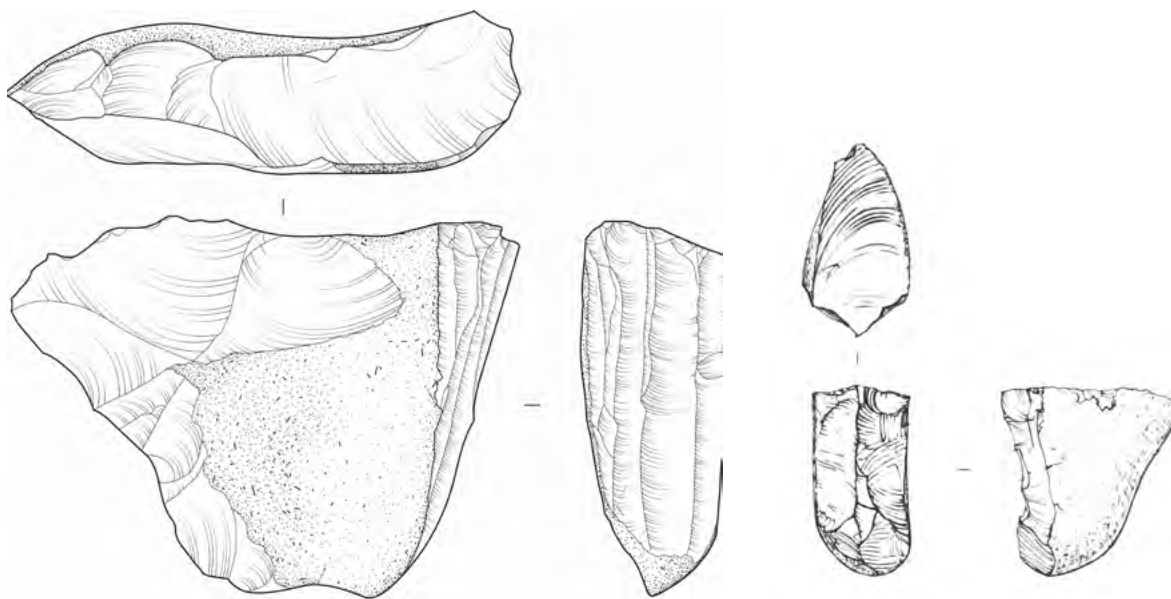


Figure 15: Handle-cores: 1) Well-defined handle-core from Nørholm, Denmark – GD 92mm (Ballin 2016a: Figure 12; artist: Leeanne Whitelaw); and 2) a less sophisticated Scottish handle-core from Garthdee Road, Aberdeen – GD = 39mm (Ballin 2014b, Illus 18; artist: Jan Dunbar; courtesy of Murray Archaeological Services Ltd.). Notice the keel running along the rear of the Danish handle-core.

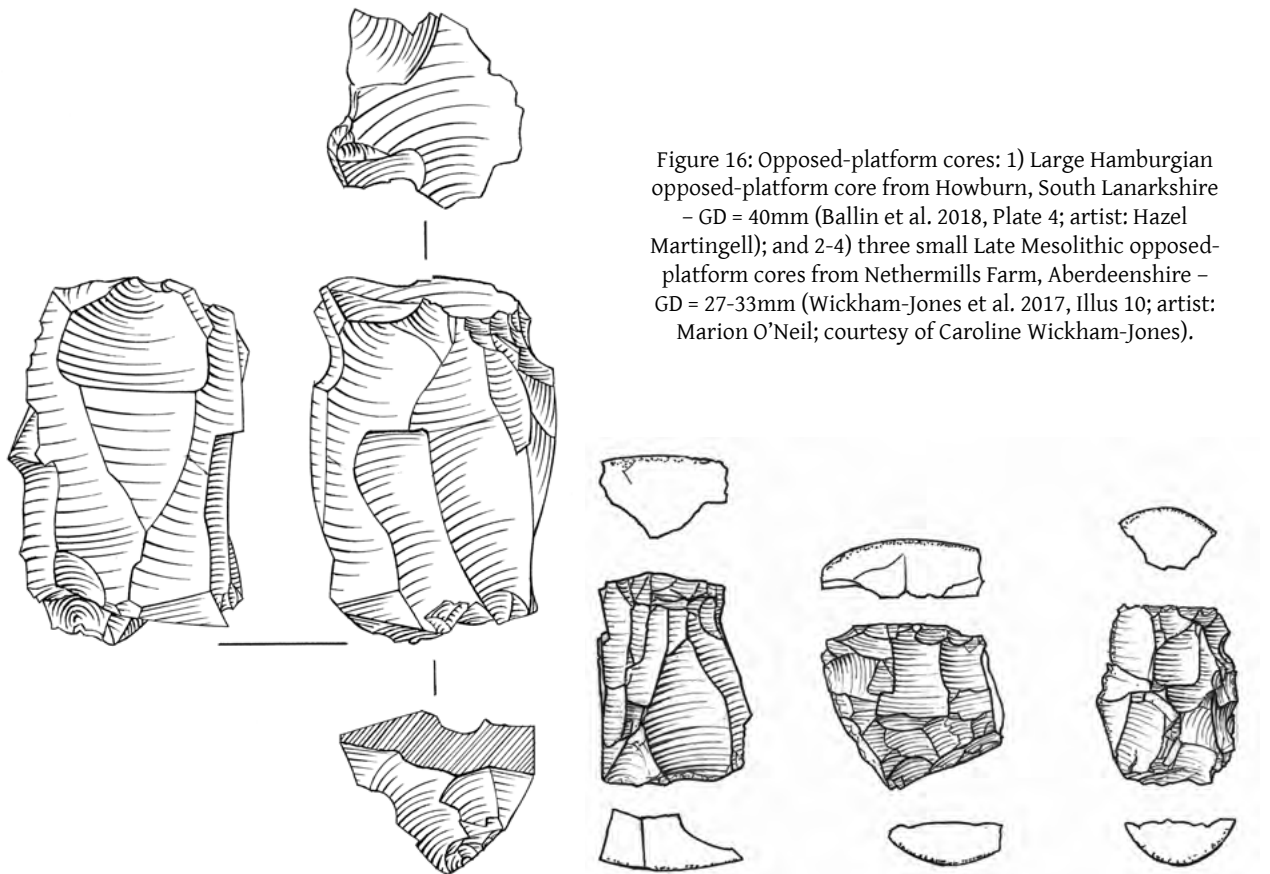


Figure 16: Opposed-platform cores: 1) Large Hamburgian opposed-platform core from Howburn, South Lanarkshire – GD = 40mm (Ballin et al. 2018, Plate 4; artist: Hazel Martingell); and 2-4) three small Late Mesolithic opposed-platform cores from Nethermills Farm, Aberdeenshire – GD = 27-33mm (Wickham-Jones et al. 2017, Illus 10; artist: Marion O’Neil; courtesy of Caroline Wickham-Jones).

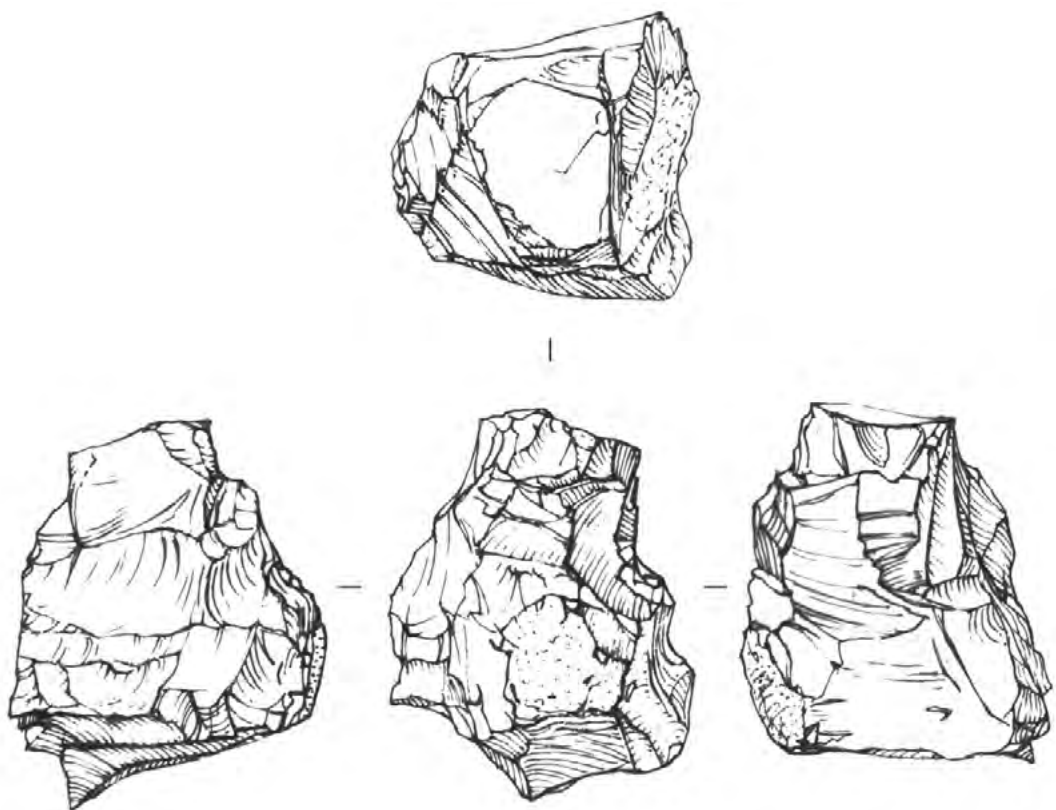


Figure 17: Core with two platforms at an angle from Garthdee Road, Aberdeen – GD = 44mm (Ballin 2014b, Illus 18; artist: Jan Dunbar; courtesy of Murray Archaeological Services Ltd.).

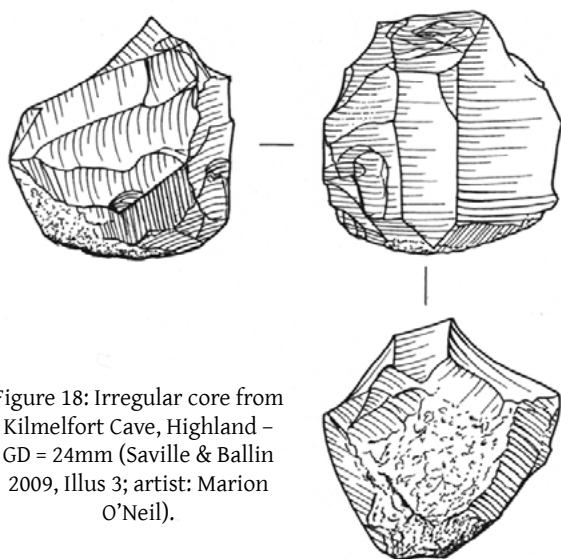


Figure 18: Irregular core from Kilmelfort Cave, Highland – GD = 24mm (Saville & Ballin 2009, Illus 3; artist: Marion O'Neil).

This category includes a number of sub-forms, some of which represent expedient approaches, whereas others represent highly sophisticated operational schemas. Older archaeological literature occasionally refers to discoidal cores as keeled cores, but as this term has also been applied to short handle-cores and bipolar cores, this term should be avoided (see above).

Plain discoidal cores are flat cores, usually with one flaked face (flaking front), whereas the other face may be cortical (Figure 19). In this case, it is not possible to determine whether a core was based on a flake blank or whether it started its 'life' as a flat nodule.

Kombewa cores (Inizan *et al.* 1992: 57) are discoidal cores based on thick flakes, which have had flakes removed from their ventral face (Figure 20). When a flake blank is removed from a Kombewa core's ventral face (its flaking-front), this flake blank will have two smooth ventral faces – due to this fact, such flakes are also referred to as bi-convex flakes or Janus-flakes (after the Roman god Janus who had two faces). In Denmark, these cores were referred to by Andersen (1978) as scale-flaked cores and the cores' bi-convex flakes were used as blanks for transverse arrowheads. The original platform remnant and bulbar area of the original flake was occasionally prepared (trimmed). Ashton *et al.* (1991) referred to these cores as 'flaked flakes'. They are also known from

early gunflint industries where the bi-convex flakes detached from the Kombewa cores or 'flaked flakes' were used as blanks for gunspalls (Chandler 1917).

Bifacial discoidal cores are slightly more sophisticated pieces, and they were flaked across both faces (Figure 21). In Wickham-Jones (1990), this category was defined in the following manner: '[Bifacial discoidal cores ...] are cores from which removals are taken from alternate faces of the core by applying percussion to the core edge. In this way, the negative scar of a previous removal becomes the platform for the next removal'. In connection with the author's work on Scottish (mostly Early Neolithic) pitchstone assemblages (Ballin 2009), a sub-type of bifacial discoidal cores was defined, namely *discoidal cores of Glen Luce Type*. These pieces are defined by the opposed faces having been reduced from perpendicular angles, and it is thought that they obtained their discoidal shape due to the tendency of pitchstone blanks to curve in an exaggerated manner along their long axes (Figure 22).

The *Levallois-like approach* corresponds broadly to the well-known mainly Middle Palaeolithic Levallois technique (cf. Roe 1981: Figure 3:9). Figure 23 shows the operational schema of the Levallois, as well as the Levallois-like production, and how a Levallois/Levallois-like core was formed.

In this case, the centripetal principle (Figure 23.II) primarily relates to the preparation of the core,

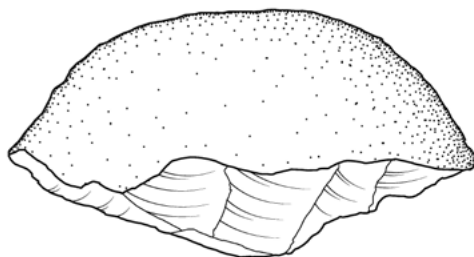
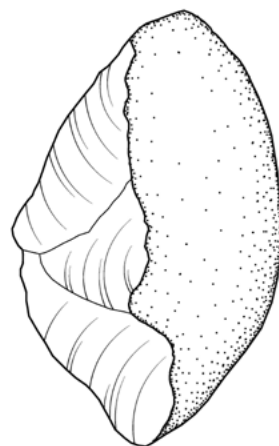
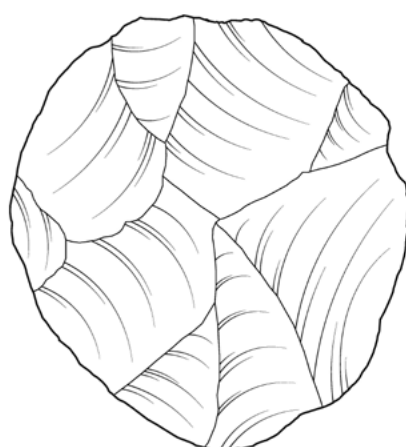


Figure 19: Plain discoidal core from Carnoustie, Angus – GD = 45mm (Ballin forthcoming a; artist: Jordan Barbour; courtesy of GUARD Archaeology Ltd.).



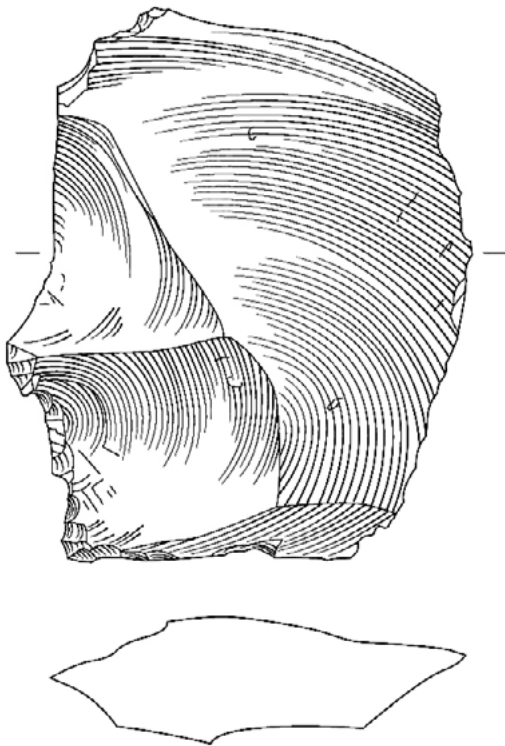


Figure 20: Kombewa core/'flaked flake' from Hoxne Lower, Suffolk – GD = 110mm (Ashton et al. 1991: Figure 5; redrawn by Leeanne Whitelaw). Hoxne is a Lower Palaeolithic location – this figure has been used as few drawings exist of these simple cores from later sites.

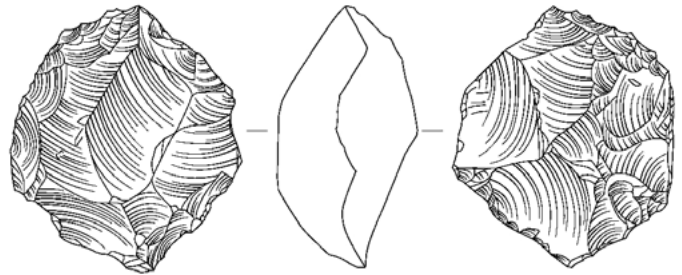


Figure 21: Bifacial discoidal core from Raunds, Northamptonshire – GD = 30mm (Ballin 2011c: Figure SS3.48; redrawn by Leeanne Whitelaw).

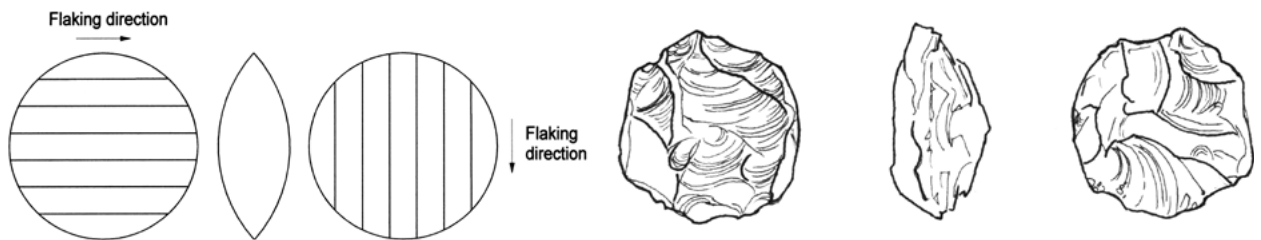


Figure 22: Discoidal core of Glen Luce Type: 1) Schematic illustration of a discoidal core of Glen Luce Type; and 2) a specimen from Biggar, South Lanarkshire – GD = 35mm (Ballin 2009: Figure 15; artist: Sandra Kelly).

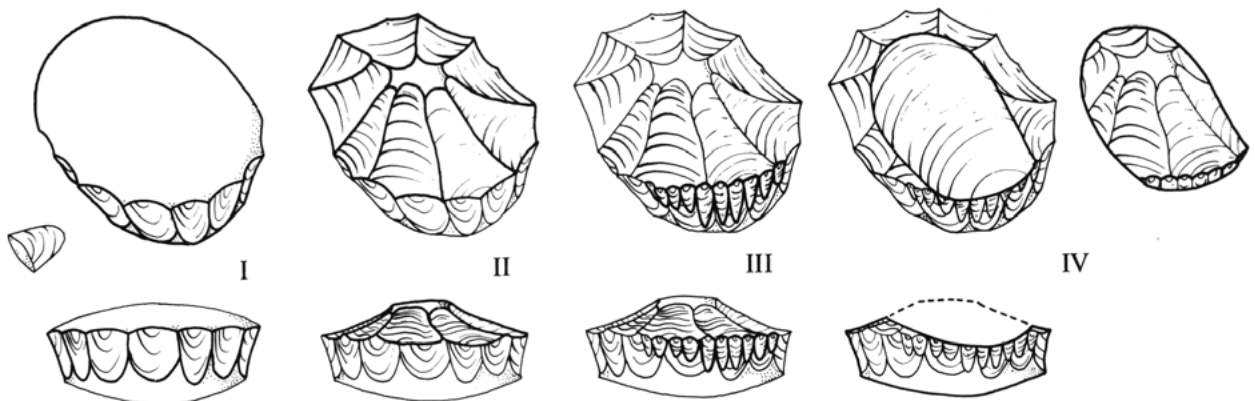


Figure 23: The operational schema of the Late Acheulean / Mousterian Levalloisian (Roe 1981: Figure 3:9): I. Basic shaping of nodule; II. preparation of domed dorsal surface; III. preparation of faceted striking platform on core; IV. the flake and the struck core, with their characteristic features. Drawn by the late M.H.R. Cook/courtesy of Derek Roe.

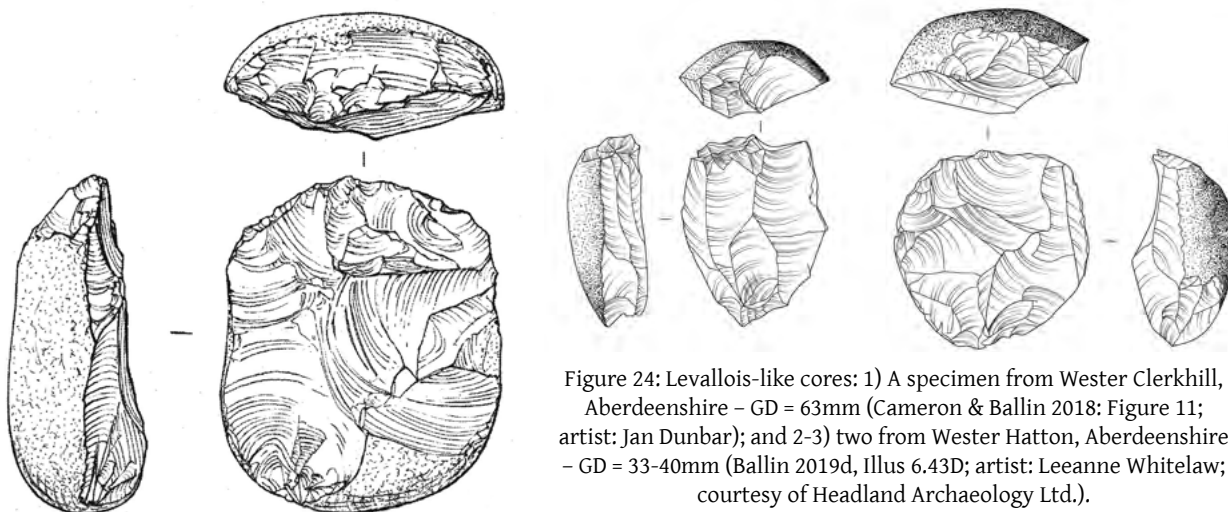


Figure 24: Levallois-like cores: 1) A specimen from Wester Clerkhill, Aberdeenshire – GD = 63mm (Cameron & Ballin 2018: Figure 11; artist: Jan Dunbar); and 2-3) two from Wester Hatton, Aberdeenshire – GD = 33-40mm (Ballin 2019d, illus 6.43D; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.).

whereas flake and blade blanks were detached by striking a prepared (finely faceted) platform at one end of the core (Figure 23.III-IV). As shown in Figures 24-25, they tend to have a domed lower face. In contrast to the traditional Palaeolithic Levallois core, British Levallois-like cores are later Neolithic, and following their initial preparation they tend to have a neat crest running down each lateral side. It has been suggested (Ballin 2011a), that the main aim of the Levallois-like cores was to allow the production of two different types of tool blanks from the same core: regular blades from the area below and around the lateral crests (for cutting implements), and broad flakes from the main, flat flaking-front (for chisel-shaped and oblique arrowheads) (also see Durden 1995).

The geographical distribution of these cores and of the Levallois-like technique in general, has been discussed for some time, but although little has been written about the topic south of the Anglo-Scottish border, they probably occur throughout the country. Levallois-like cores are clearly well-represented in Scotland (e.g., Suddaby & Ballin 2010; Ballin 2011a; 2019d; Cameron & Ballin 2018), but they are also common in Yorkshire (Moore 1963); Saville (1981a: 46-48; Figure 24.F47) identified several cores from Grimes Graves in Norfolk as 'Levalloisoid'; Wainwright drew attention to prepared discoidal cores at Lion Point, Essex (Longworth *et al.* 1971: 121); David & Painter (2019: 5) identified Levallois-like cores in the assemblage from Petworth, West Sussex; and as c. 30% of the scrapers from Durrington Walls (Wainwright & Longworth 1971: 168) have finely faceted platforms, the presence of Levallois-like cores at this location can be assumed.

Bipolar cores: Bipolar cores are cores from which flake blanks were detached without initial preparation, and they were reduced by placing a pebble or cobble (or possibly a discarded core or thick flake fragment) on a stone anvil and then hitting it with a hard



Figure 25: Levallois-like core from Stoneyhill Farm, Aberdeenshire (Ballin 2011a: Figure 2.12; photo: Beverley Ballin Smith).

hammerstone (Ballin 1999; David 2017). These pieces have in the past been referred to as scaled cores/pieces, *pièces esquillées* or *outils ecaillés*, or – before White (1968) correctly identified them as cores and not tools – as chisels or fabricators (cf. Mercer 1971: 18-19). They are also occasionally called anvil-struck cores. As mentioned in connection with the discussion of technological approaches, the term bipolar core may also, *inappropriately*, be used to describe opposed-platform cores. This practice is usually followed in parts of the world characterised by abundant supplies of good-quality chalk flint (e.g., Denmark and southern England), where hammer-and-anvil technique was not practiced, as in these areas an approach to save resources was not needed. Basically, a bipolar core is a bipolar core (i.e., a core with two opposed terminals or crushed ridges, and no flat platforms), and an opposed-platform core is an opposed-platform core (i.e., a core defined by a level striking platform at either end).

Bipolar cores occur in several forms, and some are quite homogeneous, indicating a well-defined reduction

process (Figures 26-27), whereas others are more heterogeneous, indicating pebble-bashing rather than -knapping. It is quite likely that in some industries bipolar reduction aimed at producing predetermined flakes and blades/microblades for specific purposes (for example microliths and thumbnail-scrapers), whereas in others the purpose was simply to produce blanks with sharp edges.

Occasionally these cores would be re-orientated during the reduction process, in which case they would have two sets of opposed terminals (reduction axes) at a

perpendicular angle to each other. Some bipolar cores are unifacial (one flaked face), whereas others are bifacial (two opposed flaked faces). Whether a bipolar core became uni- or bifacial depended on the size of the original nodule and the extent of the reduction process. The blanks from bipolar cores were discussed above in connection with the presentation of the bipolar technique.

Bipolar cores are not diagnostic *per se*, but within specific parts of Britain they are associated with specific industries and periods: As mentioned above, they are

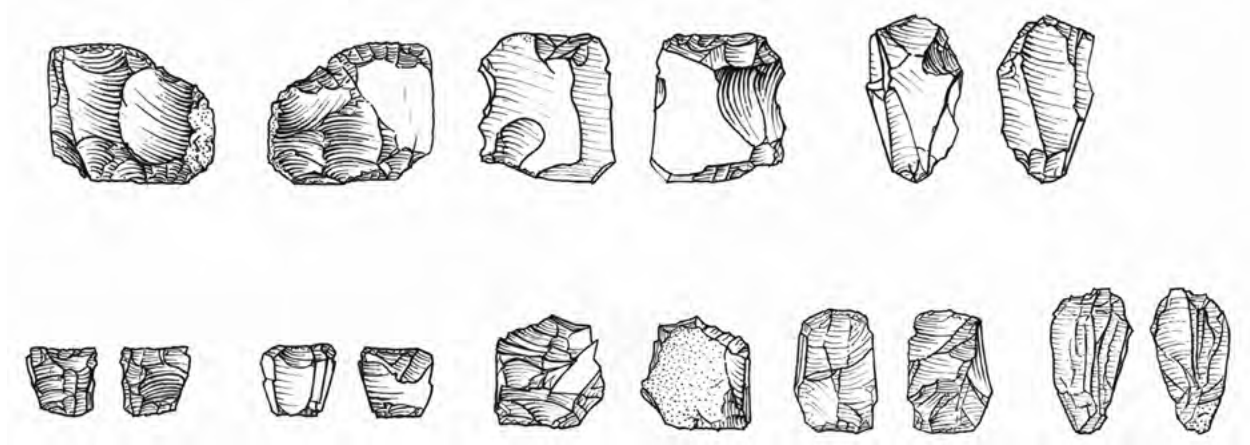


Figure 26: Probably Mesolithic bipolar cores from Nethermills Farm, Aberdeenshire – GD = 13-32mm (Wickham-Jones et al. 2017, Illus 11; artist: Marion O’Neil; courtesy of Caroline Wickham-Jones).

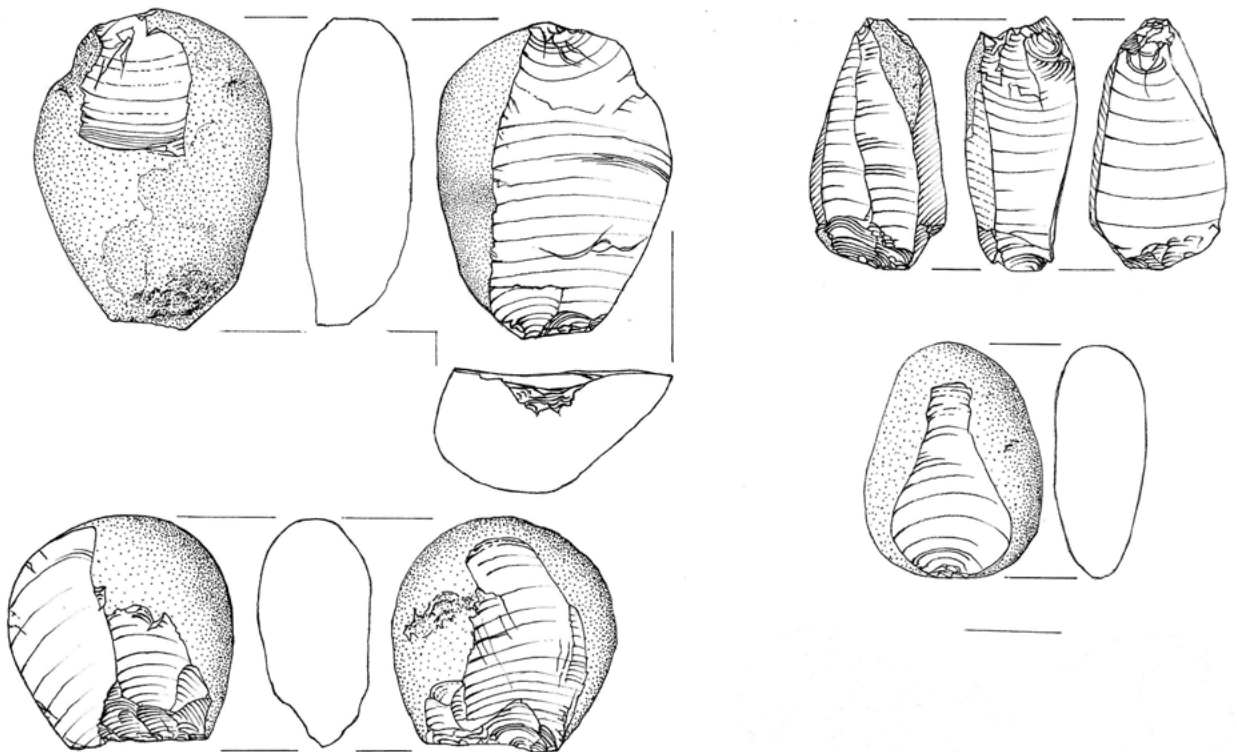


Figure 27: Probably Early Bronze Age bipolar cores from Freshwater West, Pembrokeshire – GD = 30-41mm (David 2017: Figure 11; artist: Andrew David; courtesy of Andrew David).

almost absent in the eastern and southern parts of England, where flint was plentiful; in western Scotland, they tend to be associated with most of prehistory; and in eastern and southern Scotland, they are relatively rare in LUP, Mesolithic and Neolithic contexts, but more common in Bronze Age assemblages (Ballin forthcoming b). They also tend to be quite common in Welsh Bronze Age assemblages (David 2017).

Core fragments: This category includes fragments of cores which are too small to allow the pieces to be referred to a specific core category.

Formal tools

Formal tools are modified blanks (pieces of debitage), shaped by secondary flaking/retouch (which may be edge-retouch or invasive retouch; see above), grinding/polishing, or pecking. Occasionally, unmodified blanks may display macroscopic use-wear (chipping visible with the naked eye or by the use of low level magnification) along one or more edges, or on pointed parts, and these pieces are referred to as informal tools or utilised pieces (see below).

Arrowheads

Arrowheads are defined as the piercing and cutting lithic implements inserted into the front end of arrow shafts. They may have been used as weaponry in connection with inter-human hostilities, or in connection with hunting. In this guide, no distinction is made between arrowheads and spearheads, which are

seen as smaller and larger forms of the same implement types. Arrowheads would usually have served their functions in a solitary capacity, whereas the usually much smaller microliths, which in many (if not most) cases served the same functions, were produced by the application of very specific technological approaches (see below), and they usually formed parts of composite tools involving several lithic parts. Arrowheads are also popularly referred to as points. The category includes numerous sub-types, and the following is a presentation of the main forms known from British prehistory.

Tanged arrowheads

Although a small number of bifacial tanged arrowheads have been found in Britain (see barbed-and-tanged arrowheads, below), the term ‘tanged arrowheads’ is mostly used to describe flake- or blade-based pieces. The tang is the part of the arrowhead which would have been slotted into the arrow shaft and, as explained in the section on descriptive terminology (above), a tang is defined as either the distal or proximal part of an implement characterised by double-sided retouch. In many cases, this retouch forms more or less distinct shoulders with both lateral edges, but some tanged points have no shoulders. They also frequently have additional retouch at the tip.

The tang modification may have been carried out from the ventral or dorsal face. However, many tangs are characterised by having propeller retouch, where one lateral side was modified from the ventral face and the other from the dorsal face. As tanged arrowheads tend

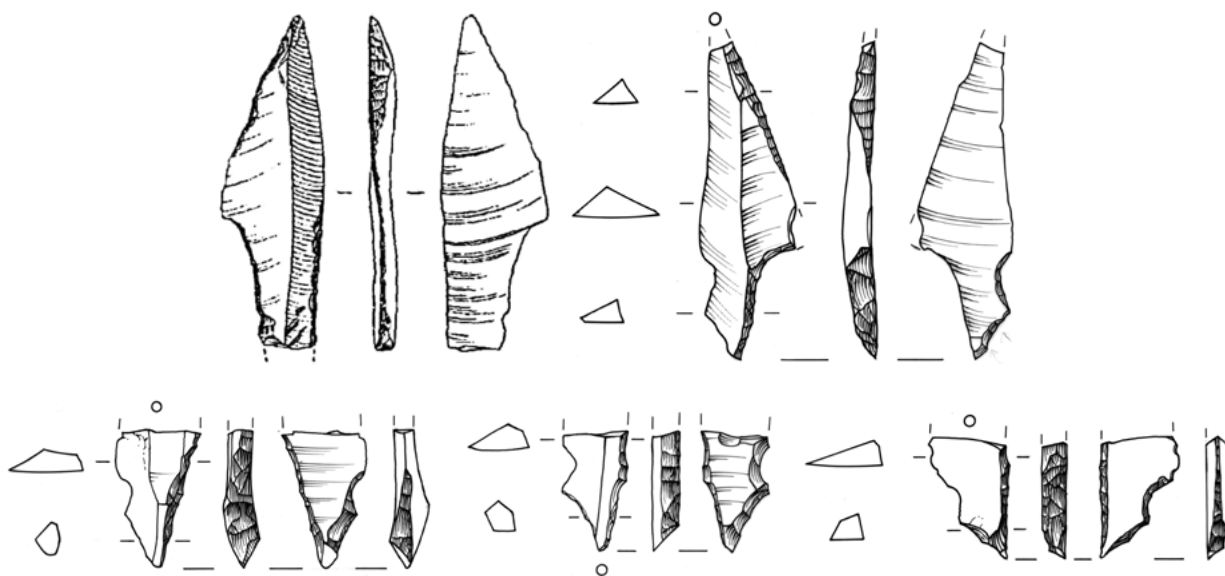


Figure 28: Hamburgian shouldered and tanged points: 1) An Early Hamburgian shouldered point (‘Classic Hamburgian’ or Meiendorf point) from Bjerlev in central Jutland, Denmark – GD 43mm (Holm & Rieck 1992: Figure 8; artist: Jørgen Holm; courtesy of Jørgen Holm); 2) an intact Late Hamburgian tanged point (Havelte point) from Howburn, South Lanarkshire – GD = 42mm (Ballin et al. 2018, Plate 5; artist: Marion O’Neil); and 3-5) a number of tang fragments from Havelte points, showing the distinct ‘notch-and-spur’ feature – GD = c. 14mm (Ballin et al. 2018, Plate 7; artist: Marion O’Neil).

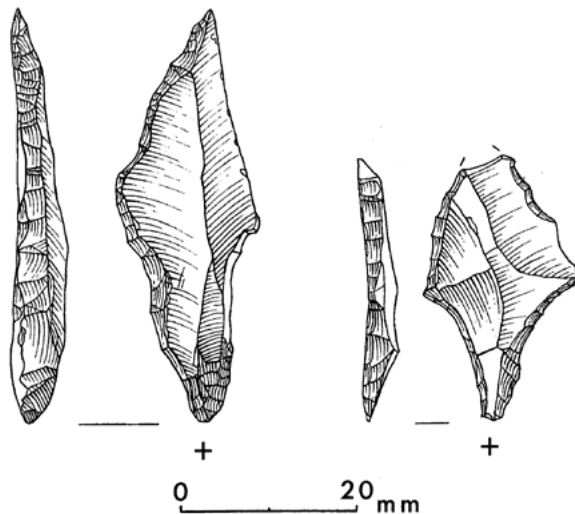


Figure 29: Ahrensburgian tanged points: 1) A specimen from Balevullin, Tiree (Ballin & Saville 2003: Figure 3/after Morrison & Bonsall 1989: Figure 3; artist: Marion O'Neil); and 2) one from Shildaig, Loch Torridon, Highland (Ballin & Saville 2003: Figure 3; artist: Marion O'Neil).

to be considerably thicker than most microliths, many tanged points (and other LUP points) were modified in *sur enclume* style, that is, on an anvil, resulting in chipping from both ventral and dorsal faces.

In Britain, flake- and blade-based tanged arrowheads are rare, usually associated with LUP sites and assemblages (Ballin 2017a). Some of these pieces are not sufficiently morphologically distinct to allow them to be referred to one or the other sub-type, but some are. The earlier 'Classic' Hamburgian (Weber 2012) is characterised by *shouldered points* with a 'tang' defined by a retouched concavity in one lateral side of the base, leaving the other side either unmodified or only lightly retouched, as well as an obliquely truncated tip (Figure 28.1). Presently, such points are extremely rare in Britain. Figure 4.25.1 from Hengistbury Head in Dorset (Barton 1992) is probably the British point which most closely resembles a Hamburgian shouldered point, whereas other 'shouldered points' from this site may be variant forms of Creswellian angle-backed points.

However, typologically certain Late Hamburgian *Havelte points* have been found in Britain, although presently only in Scotland (Howburn, South Lanarkshire; Ballin *et al.* 2018). Havelte points (Figure 28.2) are not shouldered points, but asymmetrical tanged arrowheads, where one lateral side of the tang is shorter than the other. They almost always have additional retouch of the tip. Of 35 intact and fragmented tanged points recovered at Howburn, 29 have an asymmetrical tang; 17 display propeller retouch; 10 were retouched *sur enclume*; and 15 had in one side of the tang a so-called 'notch-and-spur' (Figure 28.3-5), a very distinctive hafting device.

Ahrensburgian arrowheads are known in many shapes and sizes. The Ahrensburgian is first and foremost characterised by tanged points with a symmetrical tang and although some of those arrowheads have an oblique truncation at the tip, many have an unmodified tip. They tend to be somewhat smaller than the Hamburgian points. A piece from Tiree in western Scotland belongs to a very distinctive and easily recognisable sub-type of Ahrensburgian points (Figure 29.1). It has a tang which is approximately half the length of the tool, and the left side above the tang is fully retouched. This retouch is approximately straight and forms an almost right-angled junction with the tang. Figure 29.2 shows a related point from Shildaig, Loch Torridon, Highland.

It has been suggested (Ballin & Bjerck 2016) that a piece from Brodgar on Mainland, Orkney (Figure 30), closely resembles Scandinavian Fosna-Hensbacka *single-edged points* (dating to the LUP/Early Mesolithic transition), but small numbers of similar pieces have also been recovered from partially contemporary north-west European Ahrensburgian contexts (such as Eskebjerg in Denmark; Buck Pedersen 2009: Figure 22).

Curve-, angle-, and straight-backed points

Although in Britain backed points may be found in most LUP contexts, they are common in, and diagnostic of, British Creswellian (by some seen as part of the Magdalenian), as well as British *Federmesser-Gruppen* assemblages. In connection with his presentation of the lithic assemblage from Gough's Cave in Somerset, Jacobi (2004: Figure 23) shows a variety of backed points associated with the Creswellian, including the well-known trapezoidal points, triangular *Dreieckmesser vom*

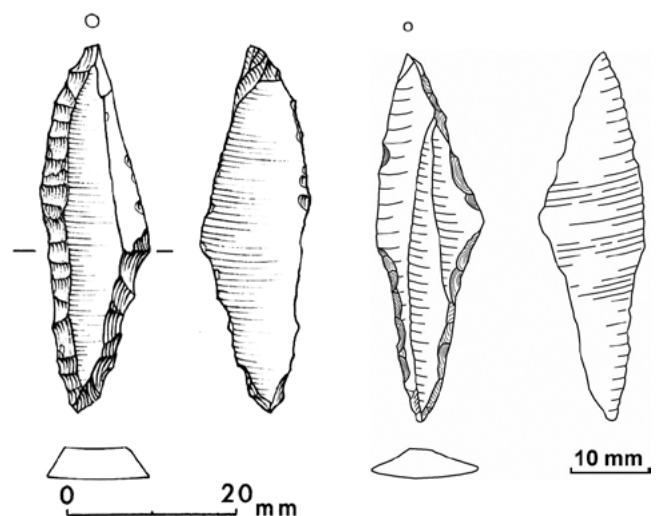


Figure 30: Single-edged tanged points: 1) The single-edged point from Brodgar, Orkney (Ballin & Bjerck 2016: Figure 4; artist: Marion O'Neil) – the ventral chipping at the tip may represent impact damage; and 2) for comparison, a similar Fosna-Hensbacka point from Kållerød in western Sweden (Schmitt 1999; artist: Annette Olsson; courtesy of Lou Schmitt).

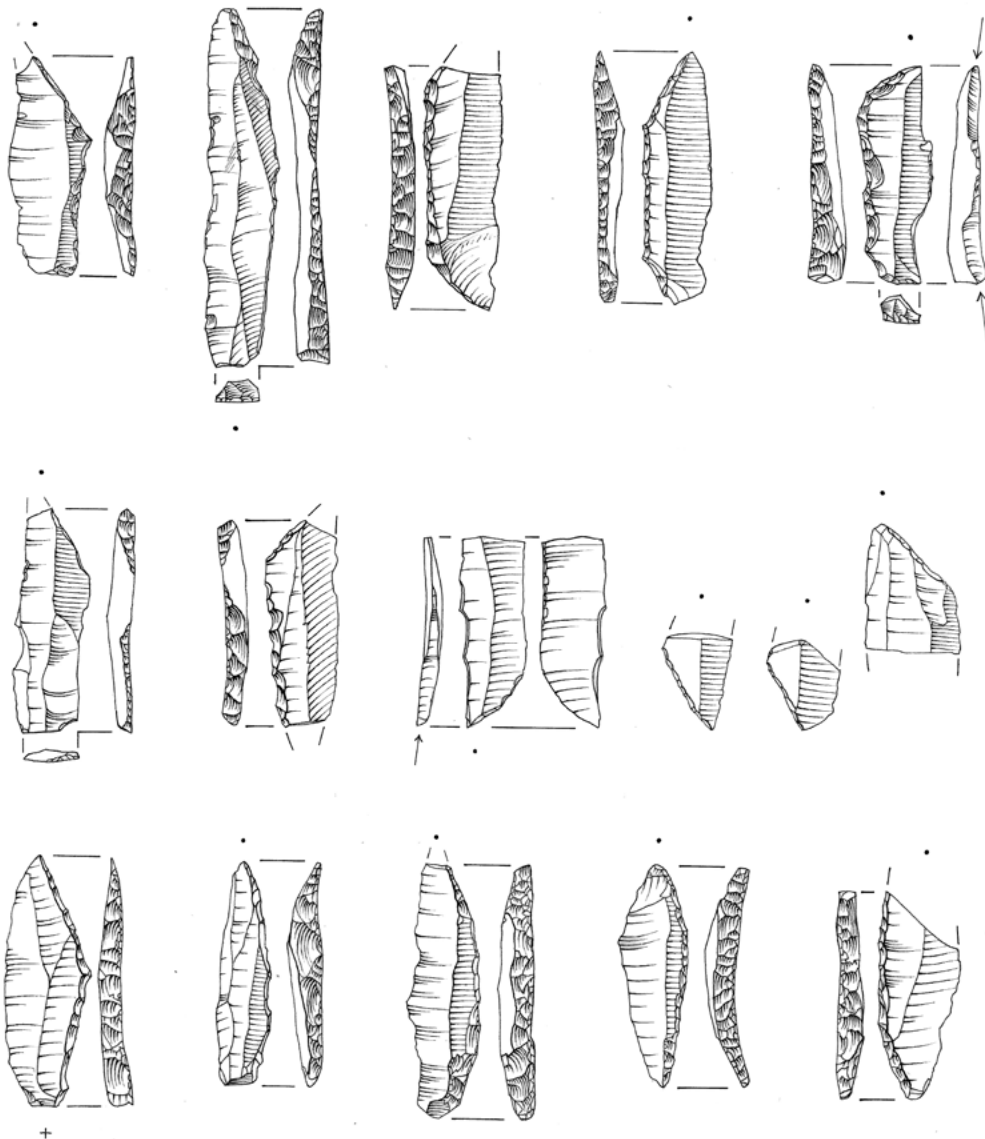


Figure 31: Creswellian backed points from Hoyle's Mouth, Pembrokeshire – GD = 36-60mm
(David 2007: Figure 2.20; artist: A. David; courtesy Andrew David).

Kent Type (Schwabedissen 1954: 9), curve-backed points, as well as pieces with attributes from more than one of the main sub-types (also see Figure 31).

Federmesser-Gruppen points have been recovered from a number of sites across Britain, such as at Seamer Carr in the Vale of Pickering in North Yorkshire (Conneller 2007), Nanna's Cave, Pembrokeshire, Wales, and at Kilmelfort Cave in Highland Scotland (Saville & Ballin 2009). The typical and diagnostic *Federmesser* (or 'penknife') point has a fully retouched, usually slightly curved lateral side, and basal retouch which meets the lateral backing at an acute angle (Figure 32.1-5; also see Barton 2005: Figure 132), but as shown in Figure 32.6-9, and in papers on Continental *Federmesser-Gruppen* sites (e.g., Schwabedissen 1954), many assemblages associated with this industry are dominated by simpler, individually less diagnostic backed pieces.

Leaf-shaped arrowheads

Early Neolithic leaf-shaped arrowheads are generally based on flake blanks, and they commonly have their tip at the proximal end. In their typical forms they are characterised by invasive retouch across both faces, although in some cases this only covers the edges of the points, with rare pieces only displaying edge-retouch.

They vary in a number of ways (Green 1980), with some pieces being small and some large (Types 1-4), whereas some are squat and others elongated (Types A-C) (Figure 33), and some are *drop-shaped*, with others being *double-pointed*. Pieces with two angled lateral sides are referred to as *lozenge-* or *kite-shaped*, and pieces with a concave delineation of their lateral sides near their tips are called *ogival* points. Kite-shaped pieces tend to be late within the Early Neolithic period

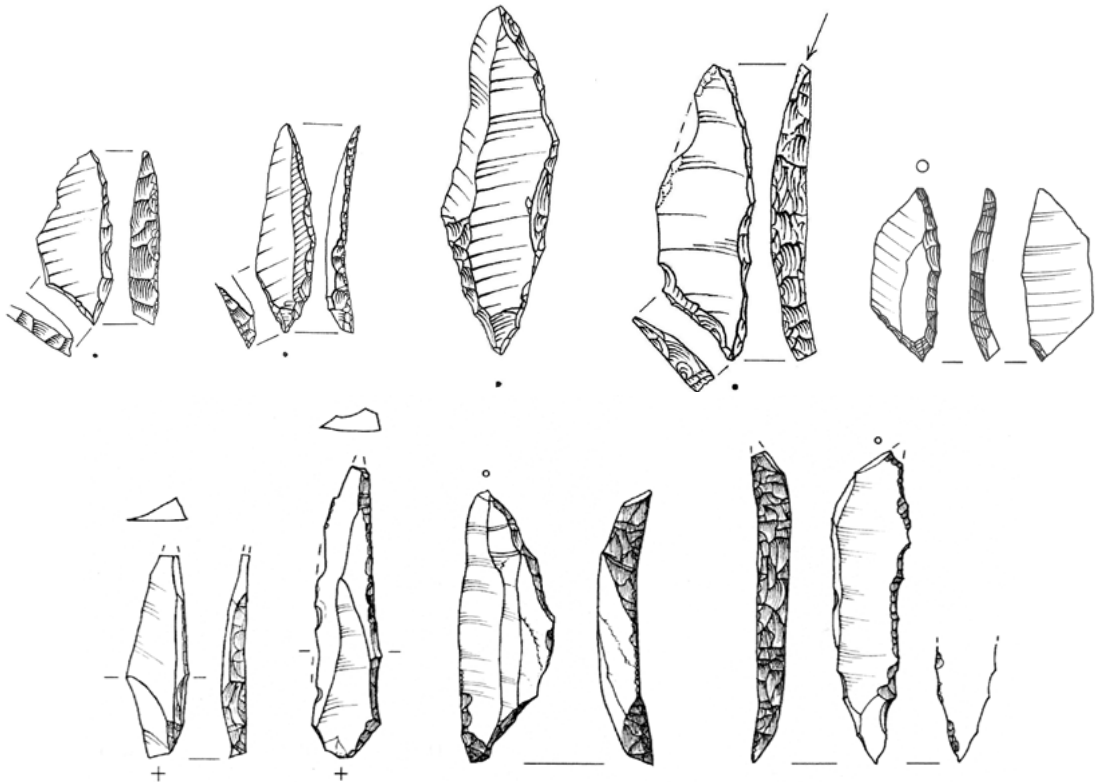


Figure 32: Federmesser points: 1-4) Typical Federmesser points from Nanna's Cave and Potter's Cave, Caldey Island, Pembrokeshire, and King Arthur's Cave, Herefordshire – GD = 15-45mm (David 2007: Figures 2.12, 2.13, 2.14; artist: Andrew David; courtesy of Andrew David); 5) typical Federmesser point from Howburn, South Lanarkshire – GD = 22mm (Ballin et al. 2018, Plate 7; artist: Marion O'Neil); and 6-9) other less diagnostic backed points from Kilmelfort Cave, Argyll – GD = 27-41mm (Saville & Ballin 2009, Illus 5; artist: Marion O'Neil).

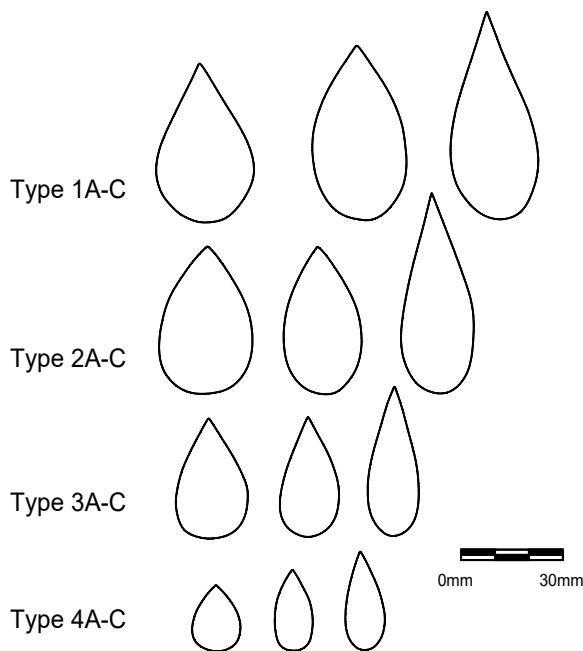


Figure 33: Green's (1980: Figures 26-29) size (1-4) and shape (A-C) categories (re-drawn by the author). These types are based on Principal Components Analysis. It was chosen to select drop-shaped examples for this illustration, but the types shown here also occur as double-pointed, kite-shaped and ogival pieces.

(Kinnes *et al.* 1983), and appear to be more common in northern England, Ireland and Scotland. Ogival points are particularly common in the Cotswolds, Somerset, Devon and south-west Scotland. Some plain pieces were clearly functional implements for daily use, whereas 'fancy' specimens may have been used for display or for particular ceremonial or burial contexts. A selection of leaf-shaped arrowheads is shown in Figure 34.

Chisel-shaped and oblique arrowheads

These were referred to by Clark (1934c) as '*petit tranchet derivative arrowheads*' (PTDs), with *petit tranchets* being the small microlithic transverse arrowheads found in many European (and on rare occasions British) Late Mesolithic contexts (ibid. 37; also see the discussion of micro *petit tranchets* below and Figure 56). He introduced a detailed PTD typology although Green notes that '*...Clark recognised that there was no sharp division between his types, which he lettered A to I, but he considered that the subdivisions were necessary for the definition of the range of variation present within this class of artefacts*' (Green 1980: 30).

Clark's Type A is the classic Mesolithic *petit tranchets*, whereas Types B-F (*chisel-shaped arrowheads*) are associated with the Middle Neolithic and Types G-I (*oblique arrowheads*) with the Late Neolithic (Figure



Figure 34: Leaf-shaped arrowheads: 1-5) Drop-shaped, double-pointed, and kite-shaped leaf-shaped points from Elgin Museum in Moray – GD = 20-35mm (Ballin 2014c, Figure 1; photo: Leanne Demay); and 6) ogival point from Auchategan in Argyll – GD = 31mm (Ballin 2006: Figure 6; photo: Beverley Ballin Smith).

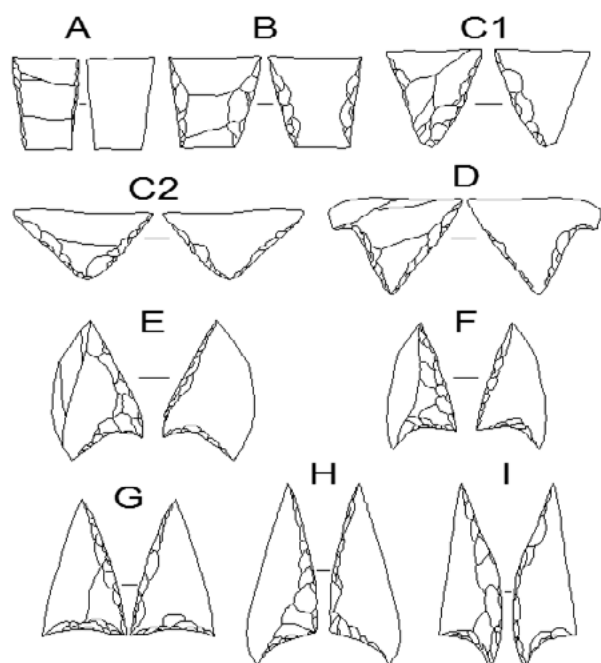


Figure 35: Clark's 10 main PTD forms. Types E and F have been rotated to bring their orientation into line with present consensus on their likely hafting form. Re-drawn by the author (Ballin 2011b, Plate 1) from Clark (1934c, Figures 1-2).

35; also see Figure 36). It has been suggested that, although oblique arrowheads are almost certainly exclusively Late Neolithic, chisel-shaped arrowheads may possibly be found in assemblages dating to both Neolithic periods. However, this claim may be based on the confusion of two formally related types, namely asymmetrical variants of chisel-shaped arrowheads of Type C2 and oblique arrowheads of Type G (Ballin 2011b).

Green (1980: 30) suggested a functional subdivision of the Middle and Late Neolithic arrowheads, where

Classes B-D and the parent form, Class A, were hafted as transverse arrowheads, whereas the asymmetry of Classes E-I indicates that those were hafted obliquely, that is, with an acutely pointed tip, one sharp lateral cutting-edge, and one lateral barb. The interpretation of some pieces as transverse and some as pointed arrowheads is supported by macroscopic use-wear and breakage patterns (for example the pieces in the Airhouse/Overhowden collection; Ballin 2011b).

The oblique arrowheads may also be subdivided into ripple-flaked (see morphology of retouch, above), British and Irish forms (Green 1980: 38). Ripple-flaked pieces are exceptionally well-executed pieces with parallel invasive retouch; the British pieces are Clark's standard types; and the Irish forms have one straight edge and no well-defined barb (these three types are compared in Green 1980: Figure 38). Flanagan (1966a: 524) subdivided the latter into pointed and elongated pieces.

Following excavations at Marden Henge, Wiltshire, and Santon Warren, Norfolk, Bishop *et al.* (2011) defined an additional type of oblique arrowhead, namely the *long-tailed oblique*. This form is characterised by being markedly 'lop-sided' and having an acute tip, a hollow base, and asymmetrical 'tails' composed of a small sharp barb on one side and a longer and thicker stem on the other. The longest tail is commonly as long as the main body of the arrowhead or longer. Many (if not most) are ripple-flaked (Figure 37, right), but some are not (Figure 37, left). Contexted specimens are generally associated with 'special' places like henges.

Barbed-and-tanged arrowheads

Barbed-and-tanged arrowheads (BATs) are, as the name implies, defined by having a central tang, which allows the lithic tip to be inserted into the arrow shaft, as well as two

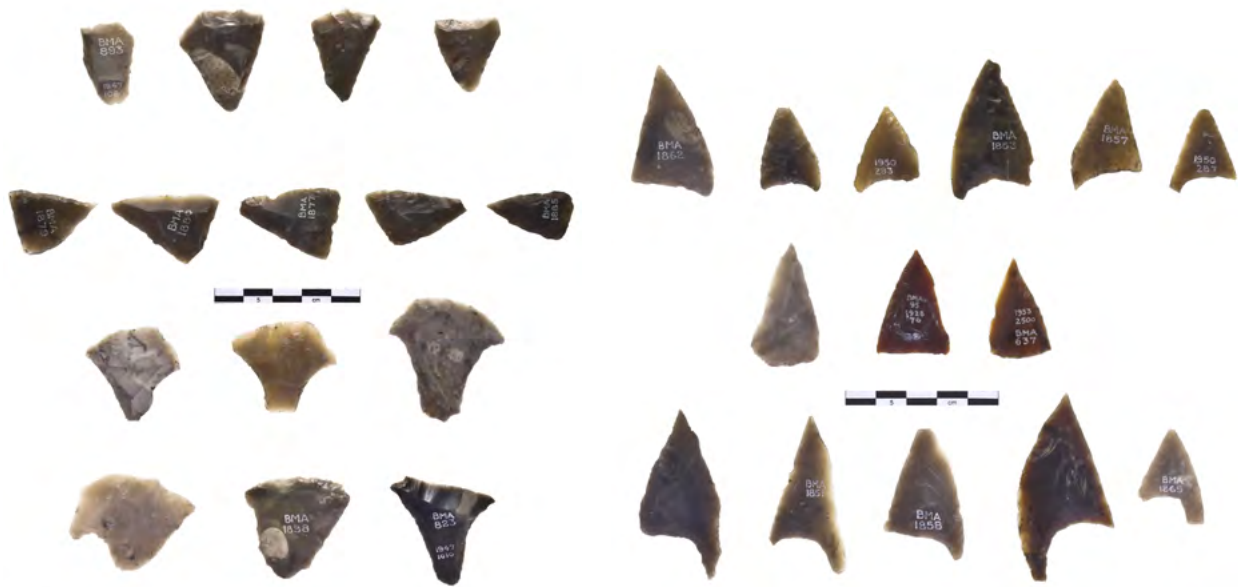


Figure 36: PTDs from sites near Overhowden Henge, Scottish Borders (Ballin 2011b, Figures 4-5; photo: Joyce Smith; courtesy of National Museums Scotland): 1) Chisel-shaped arrowheads; and 2) oblique arrowheads.



Figure 37: 'Long-tailed obliques': 1) A specimen from Santon Warren, Norfolk; and 2) one from Marden Henge, Wiltshire (Bishop et al. 2011; photo: Jim Leary; courtesy of Barry Bishop).

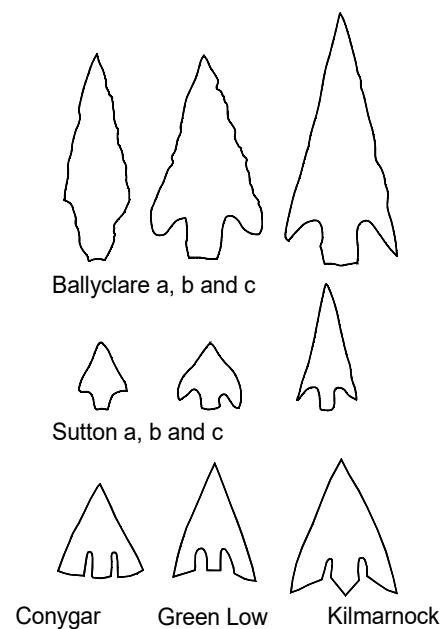


Figure 38: Green's (1980: Figures 44-46) barbed-and-tanged arrowhead typology (redrawn by the author).

more or less well-defined lateral barbs (Figure 38). This category was discussed in great detail by Green (1980), who defined a number of sub-types, and a summary of these is presented in Green (1984) and Butler (2005). The following is a summary of Green's BAT typology.

Green sub-divided the BATs according to size, shape and weight. He suggested a divide between large and small

BATs at 8 grams and $L = 50\text{mm}$, but for practical reasons this author suggests a focus mainly on length. The main purpose of this division is to allow a distinction to be made between his *Ballyclare Type* and his *Sutton Type*. Green also distinguished between 'miscellaneous' (ordinary) forms of BATs and 'shaped' or 'fancy' forms, where the latter are regionally and/or chronologically diagnostic. The miscellaneous forms include the

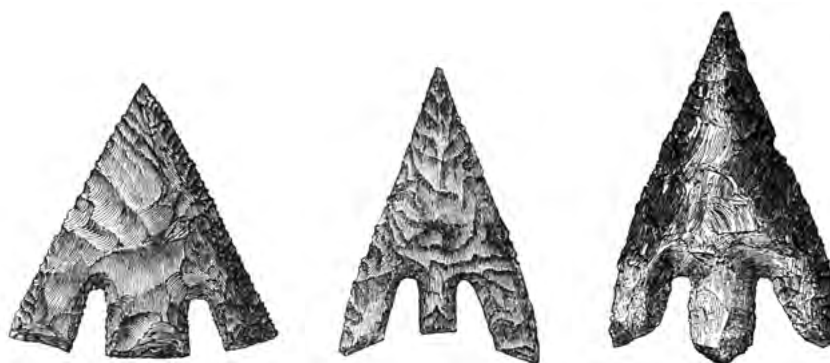


Figure 39: 'Fancy' barbed-and-tanged arrowheads: 1) Conygar point from Rudstone in Yorkshire; 2) Green Low point from Lambourn Down in Berkshire; and 3) Kilmarnock point from Aberdeenshire (Evans 1897: Figures 318, 319, and 326; artist: J. Swain) – GD = 35-45mm.

Ballyclare and Sutton Types, whereas the 'fancy' forms include the *Green Low*, *Conygar Hill (Conygar)* and *Kilmarnock Types* (Green 1984; see also Figure 39):

MISCELLANEOUS

Ballyclare (large)

Ballyclare A: With no or vestigial barbs.

Barb length / tang length (BL/TL) ratio ≤ 0.19 .

Ballyclare B: With round or square barbs ('unshaped').

With square, sub-square or round tang.

BL / TL ratio > 0.19 .

Ballyclare C: With pointed barbs.

With square, sub-square or round tang.

BL / TL ratio > 0.19 .

Sutton (small)

Sutton A: With no or vestigial barbs.

Barb length / tang length (BL/TL) ratio ≤ 0.19 .

Sutton B: With round or square barbs ('unshaped').

With square, sub-square or round tang.

BL / TL ratio > 0.19 .

Sutton C: With pointed barbs.

With square, sub-square or round tang.

BL / TL ratio > 0.19 .

'FANCY'

Conygar Hill (Conygar)

Squared tang.

Squared barbs.

Green Low

Tang squared, sub-square, rounded or triangular/pointed (in the latter case barb length must exceed tang length or the arrowhead is of Kilmarnock Type)

Barbs obliquely cut.

Kilmarnock

Tang either of triangular shape or with pointed base (which may be sharp or rounded).

Barbs are either pointed, squared or obliquely cut (in the latter case tang length must exceed barb length or the arrowhead is of Green Low Type).

Green summed up the geographical distribution of BATs in the following manner:

Ballyclare points are mainly found in Ireland and to some degree the highland zone of Great Britain. Polished Ballyclare points are exclusively Irish. Sutton arrowheads are common throughout Britain and Ireland. 'Fancy' arrowheads are rare in Ireland.

Green Low arrowheads are rare outside England and Wales, and almost completely absent in Ireland and Scotland. Conygar Hill arrowheads are common throughout Britain and Ireland. Kilmarnock points are confined to Scotland and appear sporadically in northernmost England (Northumberland & Cumbria and Yorkshire), Wales and Ireland.

Figures 40-41 show a number of common Scottish BATs – all arrowheads in Figure 40 are Sutton points, whereas two of the rough-outs in Figure 41 (Nos 5 and 7) are identifiable by their triangular tangs as Kilmarnock points.

The BATs include early and late forms (within the Early Bronze Age period), and Figure 42 was produced by the author to test the chronology of the BATs, using the data made available by Green (1980, Tables VI.8, VI.11 and VI.13). According to this diagram, Sutton points appear to be ubiquitous throughout the Early Bronze Age, whereas Green Low points may mainly be contemporary with Beaker style pottery, Conygar points with Food Vessel style pottery, and Kilmarnock points with Urn style pottery. However, it should be borne in mind that 1) the 'fancy' BAT types are very much regional forms; and 2) the data on which Figure 42 is based is 'old', and seriation of the BATs against



Figures 40-41: A selection of barbed and tanged arrowheads: 40) Common Sutton Type points from Elgin Museum in Moray – GD = 18-30mm (Ballin 2014c, Figure 2; photo: Leanne Demay); and 41) barbed-and-tanged arrowhead blanks, half-finished broken pieces, and slightly ‘wonky’ specimens from an arrowhead workshop at Dalmore on Lewis – GD = 17-53mm (Ballin 2008, Illus 27; photo: Beverley Ballin Smith); Nos 5 and 7 are defined by their triangular tangs as Kilmarnock points.

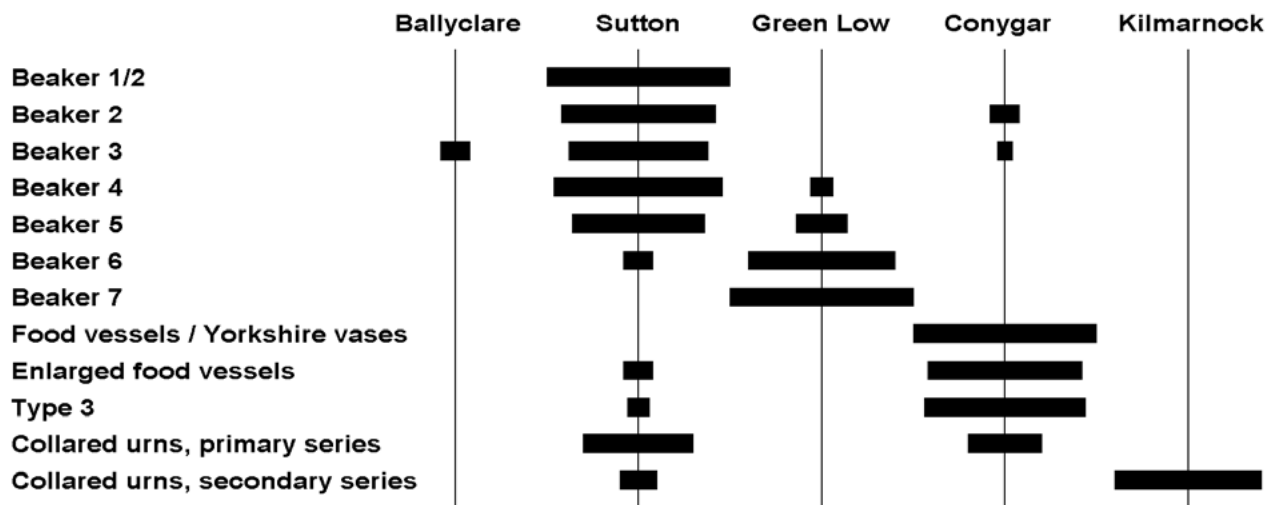


Figure 42: Seriation of BAT sub-types in relation to pottery styles (Ballin 2016b, Illus 17.10; based on information in Green 1980).

pottery styles should be repeated today, based on modern data and radiocarbon-dated evidence.

BATs are mostly based on short flake blanks, not uncommonly with the tip at the proximal end. Figure 41 shows several stages of BAT rough-outs, with the first stage apparently being an approximately leaf-shaped preform, which was then given rough barbs and a tang. Finally, the barbs and the tang would be refined to make the arrowhead properly symmetrical.

Some bifacial *triangular, hollow-based* and *tanged* points are clearly related to the BATs (see for example Evans 1897: Figures 327A, 328-332). Some triangular forms may be later Neolithic oblique arrowheads of Clark's Type G (see Figure 35). Hollow-based Early Bronze Age points are quite rare on the British mainland (Figure 43) but relatively common in Ireland (compare Green 1980: Figures 53 and 55).

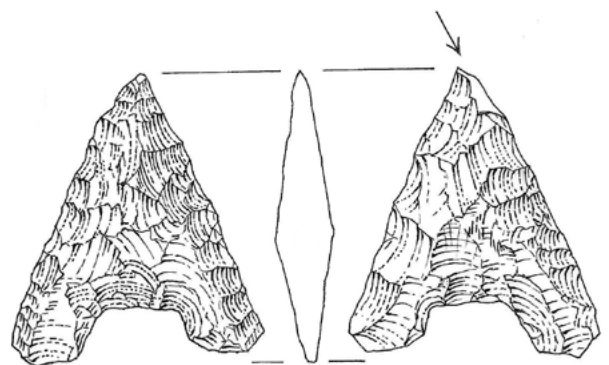


Figure 43: Hollow-based arrowhead from Stackpole, Pembrokeshire – GD = 34mm (David 1990: Figure 39; artist: Andrew David; courtesy of Andrew David).

Microoliths and microlith-related pieces

In the archaeological literature, the term ‘microlith’ is defined in a number of different ways, adding some confusion to the discussion of the category and its dating. In the present volume, ‘microlith’ is defined as in the author’s previous reports on early prehistoric assemblages (e.g., Ballin *et al.* 2018; 2017b):

Microliths are small lithic implements manufactured to form part of composite tools, either as tips or as edges/barbs, and which conform to a restricted number of well-known forms, which have had their (usually) proximal ends removed (Clark 1934a: 55). This definition secures the microlith as a diagnostic (pre Neolithic) type. Below, microliths sensu stricto (i.e., pieces which have had their usually proximal ends removed) and backed bladelets (with surviving proximal ends) are treated as a group, as these types are thought to have had the same general function, but backed bladelets are fairly undiagnostic and may be recovered from Mesolithic as well as Early Neolithic contexts.

Generally, the purpose of the microburin technique was to create a microlith preform, which had at its end an acutely pointed tip, a so-called *piquant triédre*, ‘... [with] a sharp extremity [which] cannot be obtained by simple retouch’ (de Wilde & de Bie 2011: 730).

Here, microlith typology is kept basic, and only general formal types are discussed below (cf. Saviile 1981c). The most frequently used microlith typologies, such as those of Clark (1934a) and Jacobi (1978), include numerous sub-types, characterised by various forms of fine ancillary edge-retouch (also see Butler 2005). It is the author’s view, however, that most of these forms of additional modification represent the finer shaping of

the pieces, determined by the specific original shape of the individual microlith blanks, and that this fine retouch has little relevance to the understanding of the category, the assemblage or the site. The main formal types, on the other hand, may generally represent mental templates of the flint-knapper, and their style may be chronologically or regionally diagnostic. Microliths are frequently subdivided into geometric (e.g., isosceles and scalene triangles, trapezoids and rhomboids, crescents, quadrilaterals, etc.) and non-geometric forms (e.g., obliquely blunted points, edge-blunted microliths, etc.).

The definition of *microlith preforms* is based on an understanding of how microliths were manufactured, more specifically, how the (usually) proximal ends were removed to produce the microliths. Figure 44.1-2 shows how microliths were produced using ‘standard’ microburin technique (notch-and-snap), whereas Figure 44.3 shows how they were manufactured in *lamelle a cran* technique (lateral retouch-and-snap). Occasionally, microliths were produced in other ways, such as by snapping a microblade without producing a notch or a lateral retouch, or by simply retouching diagonally through the bulbar area (cf. Ballin & Lass Jensen 1995: 72).

The most common microlith preforms are 1) unbroken microblades with a proximal lateral notch; 2) *lamelles a cran*; 3) medial-distal segments of microblades with a still unmodified sharp, oblique microburin facet; and 4) Krukowski ‘microburins’ (medial-distal segments of microblades with a still unmodified sharp, oblique microburin facet, but with one fully retouched lateral side; Figure 45). It may be difficult to identify fragments of preforms and many of these may have been defined as microlith fragments.

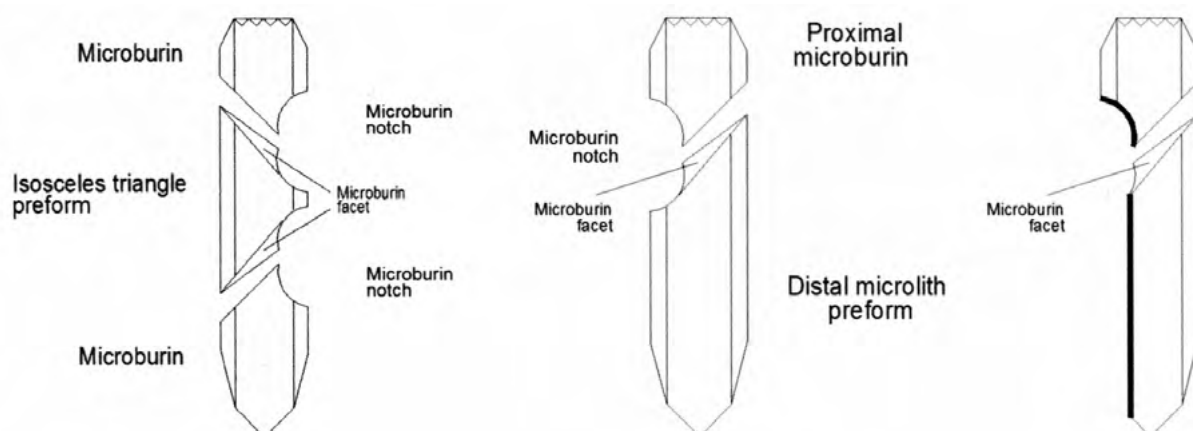


Figure 44: The production of microlith preforms by the application of microburin technique (Ballin 2017 b, Figure 7). The approach furthest right is referred to as the *lamelle a cran* approach; if the microburin facet of the distal part was not modified but left sharp, this piece would be referred to as a ‘Krukowski microburin’ (see below), but most Krukowski ‘microburins’ are either microlith preforms, pieces broken during modification or pieces used as scalene triangles without modification of the proximal microburin facet.

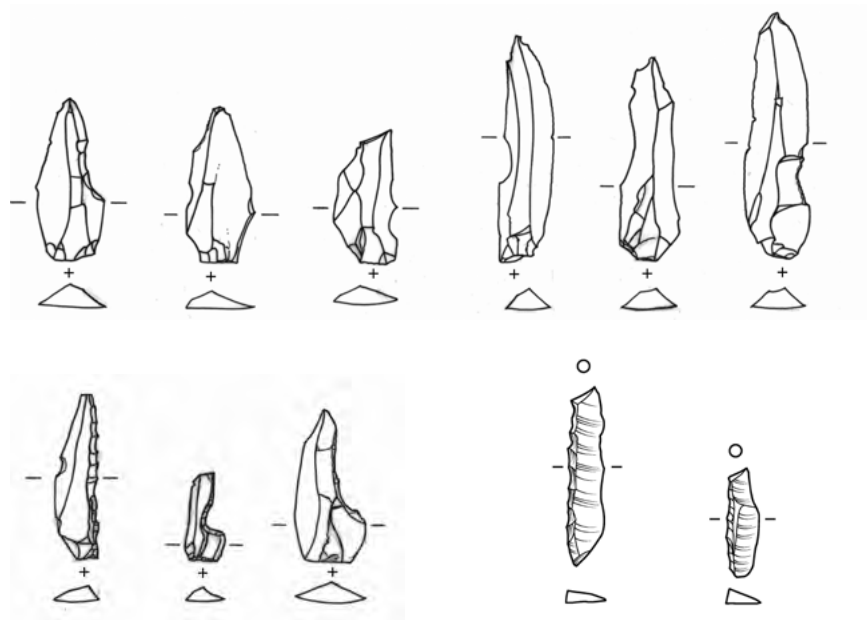


Figure 45: Microlith preforms: 1-9) Specimens from Nethermills Farm, Aberdeenshire – GD = 15-39mm (notched microblades and lamelles a cran; Wickham-Jones et al. 2017, Illus 12; artist: Marion O’Neil; courtesy of Caroline Wickham-Jones); and 10-11) from Milltimber Zone 5, Aberdeenshire – GD = 11-19mm (Krukowski microliths; Ballin 2019c, Illus 2.81; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.).

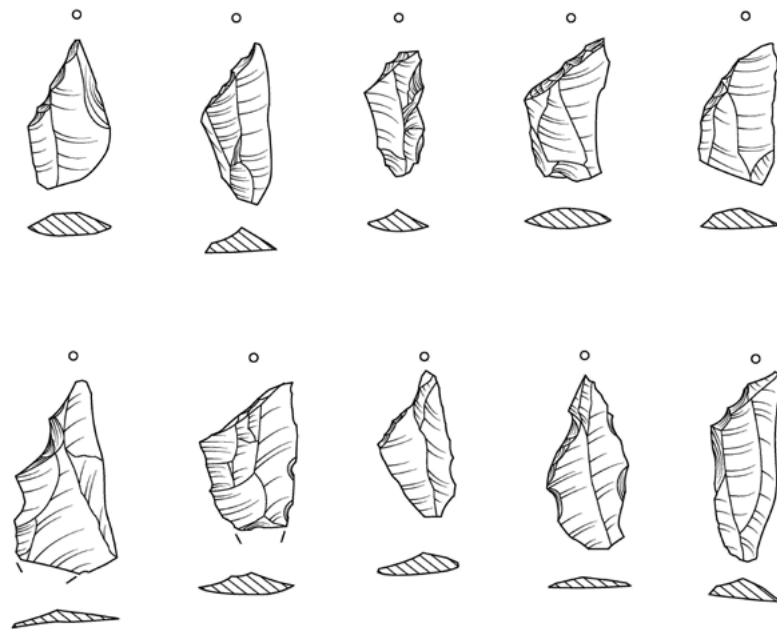


Figure 46: Obliquely blunted points from Donich Park, Argyll & Bute – GD = 14-19mm (Ballin & Ellis 2019: Figure 8; artist: Leeanne Whitelaw).

Obliquely blunted points are blades or microblades pointed by an oblique truncation usually across the proximal end (Figure 46). They were generally produced by snapping the blade or microblade by the application of microburin technique, and subsequently fully or partially retouching the sharp microburin facet. Broad forms are common in Early Mesolithic contexts,

whereas narrow (and smaller) forms occur in the later part of the Early Mesolithic period and (sporadically) into the later Mesolithic.

Isosceles triangles are broad triangular microliths, the two shortest sides of which are of roughly equal length; in most cases, one or both shortest sides were

formed by the application of microburin technique (Figure 47). Usually, the two shortest sides are fully retouched, whereas the longest side is unretouched or only covered by fine ancillary retouch. Occasionally, assemblages with isosceles triangles also include broad *trapezoid microliths*, which may either be independent forms, or misshapen isosceles triangles (Figure 48). These geometric pieces are generally associated with the Early Mesolithic period, although related forms are known from the Ahrensburgian (Zonhoven points; Schwabedissen 1954, Tafel 72; Vermeersch 2013: Figure 52), where they tend not to have been produced by the application of microburin technique (see below).

Later Mesolithic assemblages are characterised by the presence of scalene triangles, crescents and edge-blunted microliths (e.g., ‘lanceolates’, ‘convex-backed pieces’ etc.), as well as – towards the end of the period – quadrilaterals. Saville (1981a; 1981b) defines edge-blunted microliths as microliths with a stretch of straight or slightly convex lateral retouch.

‘Rods’ are an exceptionally poorly defined group which is mostly associated with the British later Mesolithic (Early Mesolithic in Ireland; Woodman 2015). As mentioned in Griffiths (2014), the definition of ‘rod

microliths’ varies significantly according to different recording approaches and authors. The category may, inter alia, include narrow backed blades and bladelets. According to the present author’s definitions, backed blades/bladelets are technically not microliths, as their bulbar end is intact. It further complicates matters that the term ‘rod’ is also used to describe large later prehistoric ‘fabricator-like implements’ (Saville 1981a: 62; 2011: 26). It is therefore suggested that the term ‘rod microlith’ is avoided.

Scalene triangles are geometric microliths, the two shortest sides of which are of different length (Figure 49). If microburin technique was applied to produce a scalene triangle, remains of a microburin facet may be encountered at the shortest side of the triangle, which would usually (but not exclusively) be at the proximal end. In most cases, both short sides are retouched, but in some cases all three are retouched; occasionally (rarely) only the shortest side is retouched.

Exceptionally small scalene triangles (scalene ‘micro-triangles’; $L < 10\text{mm}$) are sometimes recovered from later Mesolithic sites. Some appear simply to be very small versions of the ‘normal’ scalene triangles, whereas others have retouch along all three edges.

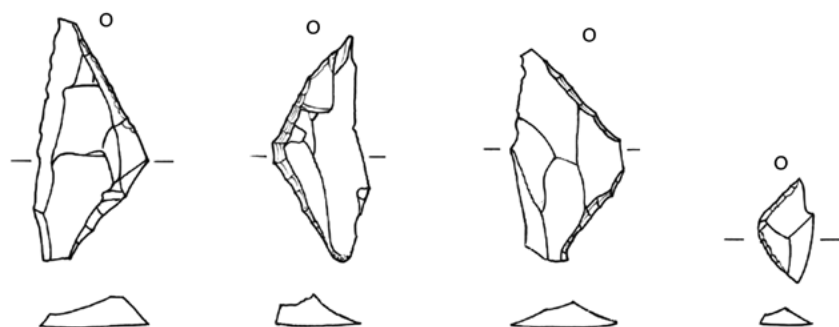


Figure 47: Isosceles triangles from Nethermills Farm, Aberdeenshire – 9.6–23mm (Wickham-Jones et al. 2017, Illus 13; artist: Marion O’Neil; courtesy of Caroline Wickham-Jones). Notice the isosceles micro-triangle furthest to the right, which may be Late Mesolithic (see scalene triangles, below).

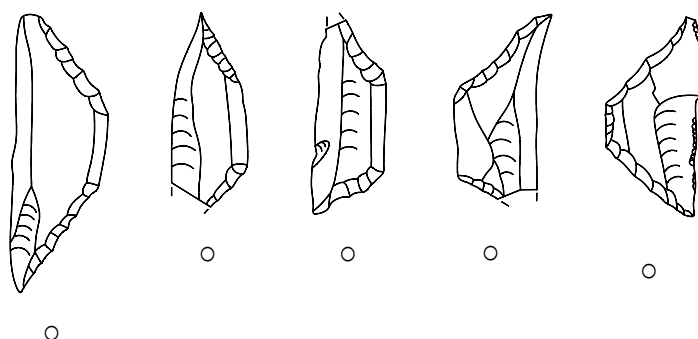


Figure 48: Trapezoid microliths from Lussa Bay, Jura, Highland – GD = 23–33mm (Mercer 1970: Figure 6; redrawn by the author).



Figure 49: Scalene triangles: 1-4) large, broad scalene triangles from Nab Head I, Pembrokeshire – GD = c. 30mm (David 2007: Figure 4.5; artist: Andrew David; courtesy of Andrew David.); 5-9) small, narrow scalene triangles from Prestatyn, Clwyd – GD = 14-18mm (David 2007: Figure 5.2; artist: Andrew David; courtesy of Andrew David.); and 10-14) small, narrow, extremely long scalene triangles from Milltimber Zone 5, Aberdeenshire – GD = 11-21mm (Ballin 2019c, illus 2.81; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.). Comparison with north-west European/Scandinavian typo-chronology suggests that the different forms of British scalene triangles may represent a chronological sequence (Figures 50-51).

Occasionally, the retouch of all three sides is steep, and in the report on the assemblage from Nethermills Farm in Aberdeenshire (Ballin 2017c) the author suggested that these pieces may be drill-bits based on recycled scalene micro-triangles (Figure 80.6). A later Mesolithic assemblage from Dunragit in Dumfries & Galloway (Ballin forthcoming b) includes a number of isosceles micro-triangles with an average length of 9.5mm (see Figure 47.4). The absolute date of this site (Site 19) is not certain, but it is possible that the presence of such diminutive isosceles micro-triangles in an assemblage otherwise entirely dominated by later Mesolithic material may indicate a date in the early part of the Late Mesolithic period.

It is the author's working hypothesis that in Britain triangular microliths developed in the same manner as in Scandinavia/northern Germany (Figure 50) as at

the time (the Early Mesolithic/the earliest part of the Late Mesolithic) Doggerland was still in place – large isosceles triangles developed into slightly smaller scalene triangles where one short side was only slightly shorter than the other short side, and finally into very small scalene triangles where one short side was considerably shorter than the other short side. That this process took place on the continent is evidenced by the radiocarbon-dated Mesolithic sites in Duvensee Moor in northern Germany (Figure 51).

Crescents

As some edge-blunted pieces do have slightly convex lateral modifications, and as some poorly executed scalene triangles may have somewhat crescentic outlines, it is suggested that crescents (Figure 52) are defined as microliths with *highly regular curvatures*, where it is obvious that the knapper deliberately aimed at producing this geometric shape (i.e., that we are talking about a mental template, rather than random morphology). Some analysts refer to pieces with a regular but extended and gentler curvature as 'convex-backed pieces', but crescents and convex-backed pieces may represent different ends of a formal spectrum. In reports on assemblages from Middle Eastern and North African lithic assemblages, crescents may be referred to as lunates.

The fact that some microlith assemblages from the earlier part of the Late Mesolithic (for example Fife Ness in Fife and Milltimber Zone 4; Wickham-Jones & Dalland 1998; Ballin 2019c) are dominated by, or consist

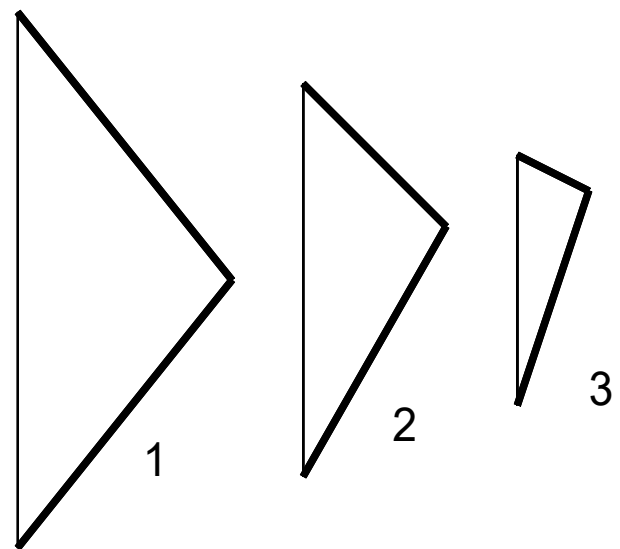


Figure 50: Chronological sequence of triangular microliths in southern Scandinavia and northern Germany (Ballin forthcoming b, Figure 27), with No. 1 dating to what in Britain is referred to as the Early Mesolithic, No. 2 to the early part of the Late Mesolithic, and No. 3 to the later part of the Late Mesolithic.

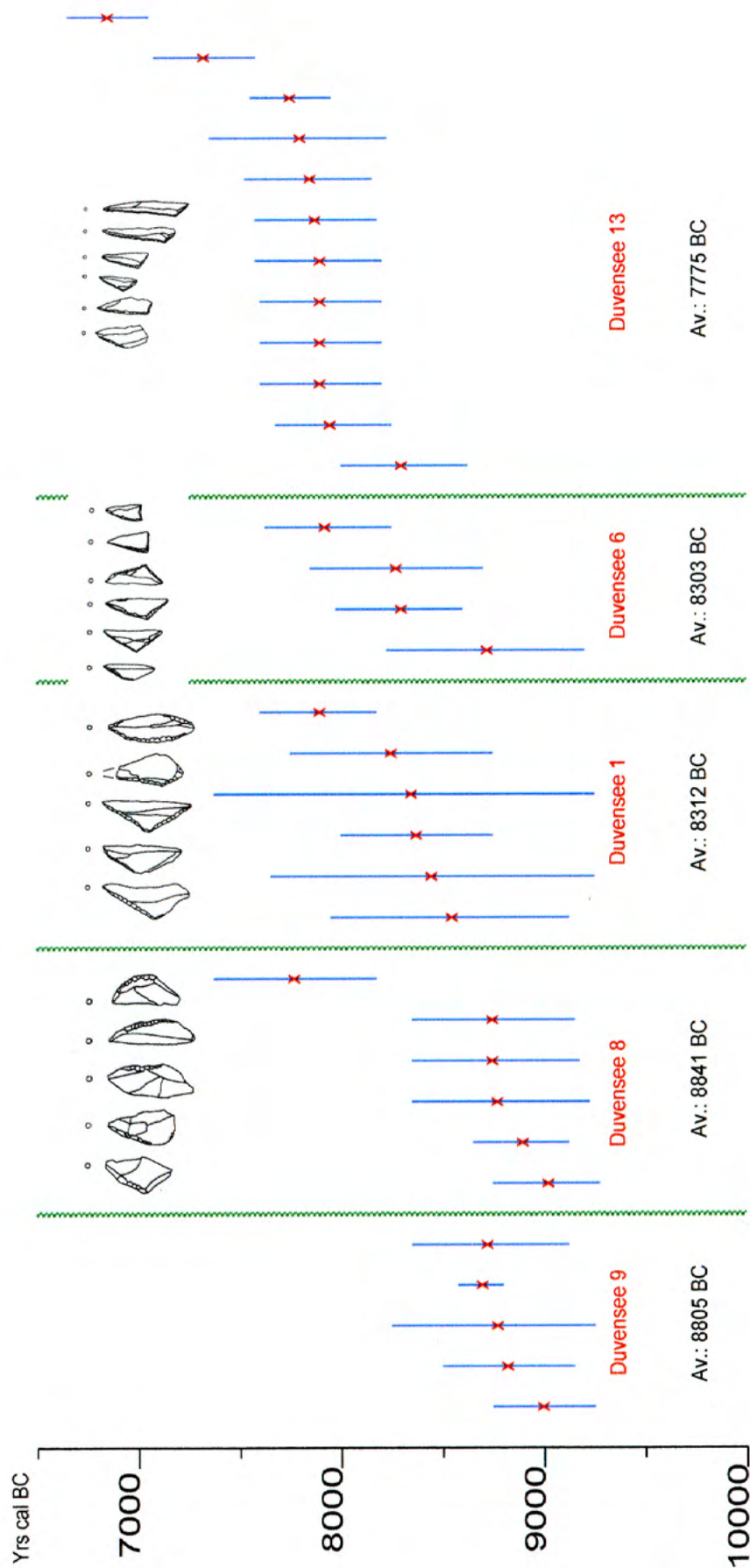


Figure 51: Early and early Late Mesolithic microlith assemblages from Duvensee Moor in Schleswig-Holstein (Duvensee 9, 8, 1, 6 and 13) (Ballin & Ellis 2019; Figures 15a-b). They were sequenced by Bokelman (1999: Figure 7) on the basis of the lithic material and analysis of the sites' context and stratigraphy. The dates, which were kindly provided by Sönke Hartz, Curator at Schloss Gottorff, Schleswig-Holstein, have been calibrated by the author by applying the OxCal 4.3 software (Bronk Ramsey 2019). The microlith illustrations were kindly provided by M. Reynier, London Higher (Reynier 2005: Figure 7.3).

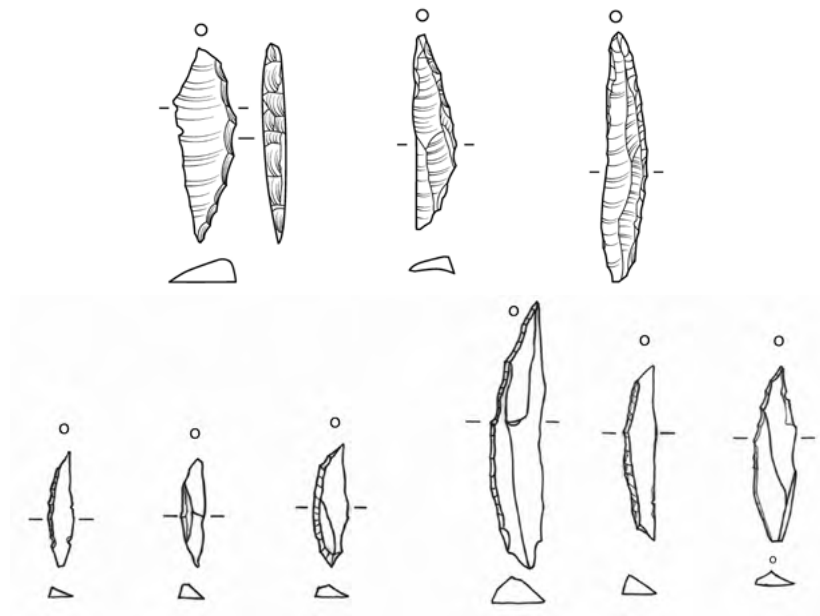


Figure 52: Crescents: 1-3) Specimens from Milltimber Zone 5, Aberdeenshire – GD = 22-28mm (Ballin 2019c, Illus 2.81; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd. – some analysts may refer to the piece furthest to the right as a 'convex-backed piece'); and 4-9) from Nethermills Farm, Aberdeenshire – GD = 14-35mm (Wickham-Jones et al. 2017, Illus 13; artist: Marion O'Neil; courtesy of Caroline Wickham-Jones).

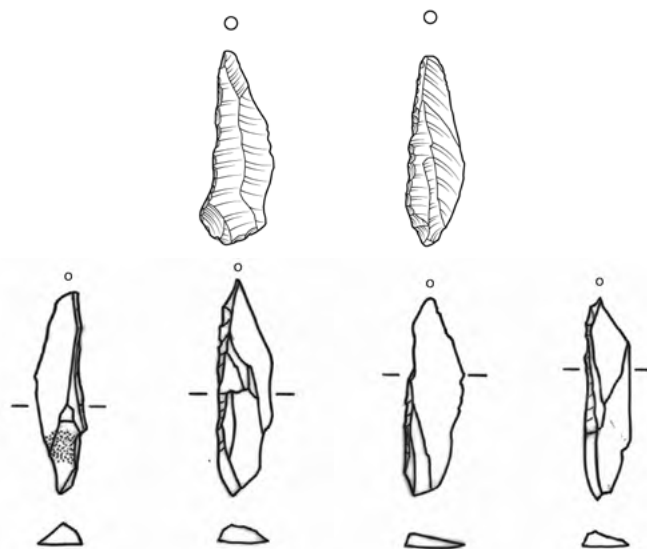


Figure 53: Edge-blunted microliths: 1-2) Specimens from Dunragit, Site 19, Dumfries & Galloway – GD = 25-26mm (Ballin forthcoming b; artist: Jordan Barbour; courtesy of GUARD Archaeology Ltd.); and 3-6) from Nethermills Farm, Aberdeenshire – GD = 22-24mm (Wickham-Jones et al. 2017, Illus 13; artist: Marion O'Neil; courtesy of Caroline Wickham-Jones).

almost entirely of, crescents indicates that this type of microlith may be diagnostic of a particular segment of the Late Mesolithic period.

Edge-blunted pieces: These pieces are generally characterised by having one fully blunted lateral side,

but where this retouch did not transform the blanks into geometric forms (Figure 53). This retouch may be straight, slightly curved or undulating. As mentioned above, some edge-blunted pieces may have almost crescentic outlines, but here only pieces with clearly deliberate and regular crescentic shapes are defined

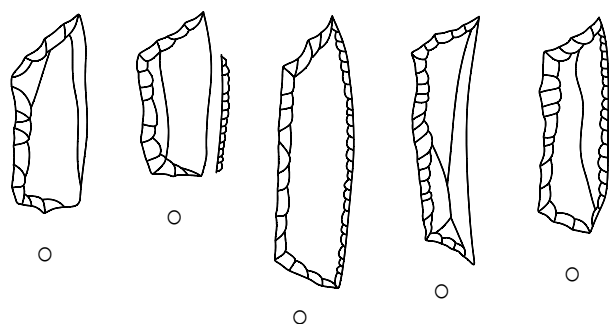


Figure 54: Quadrilateral microliths from North Carn, Jura, Highland – GD = 13-21mm (Mercer 1972: Figure 5; redrawn by the author).

as crescents. The group includes many of the pieces previously referred to as lanceolates or rods.

Quadrilaterals are four-sided narrow blade microliths with retouch of at least three sides (trapezoids or rhomboids) (Figure 54). They are found in some uncontaminated later Mesolithic assemblages from England (e.g., Hermitage Rocks in East Sussex; Jacobi & Tebbutt 1981) as well as in some mixed Mesolithic assemblages from the south (e.g., Peacock's Farm, Cambridgeshire; Clark 1955), but they are also common in some mainly Late Mesolithic assemblages from Jura, Scotland (e.g., Lealt Bay, North Carn, and Lussa Wood, all Jura; Mercer 1968: Figure 10; 1972: Figure 5; 1980: Figure 8).

Other distinct microlith forms: Other morphologically distinct microlith types include basally modified microliths like *Horsham points* (Clark 1934a) and *Honey Hill Type microliths* (Saville 1981b; 1981c). Horsham points (Figure 55.1-8) have a concave basal retouch, and Clark distinguished between a number of different forms depending on whether they are 1) symmetrical or asymmetrical; 2) modified from the ventral or dorsal face; and 3) whether their main retouched edge is along the left or right lateral side. Most likely, these different subtypes reflect the motor habits of the individual knapper. Honey Hill microliths (Figure 55.9-14) have an inversely retouched base, which may be either pointed (most common) or blunt (mostly rounded). Basally modified microliths are generally not found north of Lincolnshire (Butler 2005: 98; Waddington *et al.* 2017).

Horsham points and Honey Hill microliths have generally been perceived as Early Mesolithic forms (i.e., 9800-8400/8300 cal BC). It has been suggested (Reynier 2005: 69) that they represent the later part of the Early Mesolithic/the Early/Late Mesolithic transition (e.g., Conneller *et al.* 2016), and that they form part of the sequence: Star Carr assemblages ⇒ Deep Carr assemblages ⇒ assemblages with basally modified microliths (Horsham points and Honey Hill microliths). Assemblages are known which include both types (e.g., Beedings Wood, Sussex; Clark 1934a; Reynier 2005: 27), suggesting a degree of contemporaneity (also see this volume's chronology section).

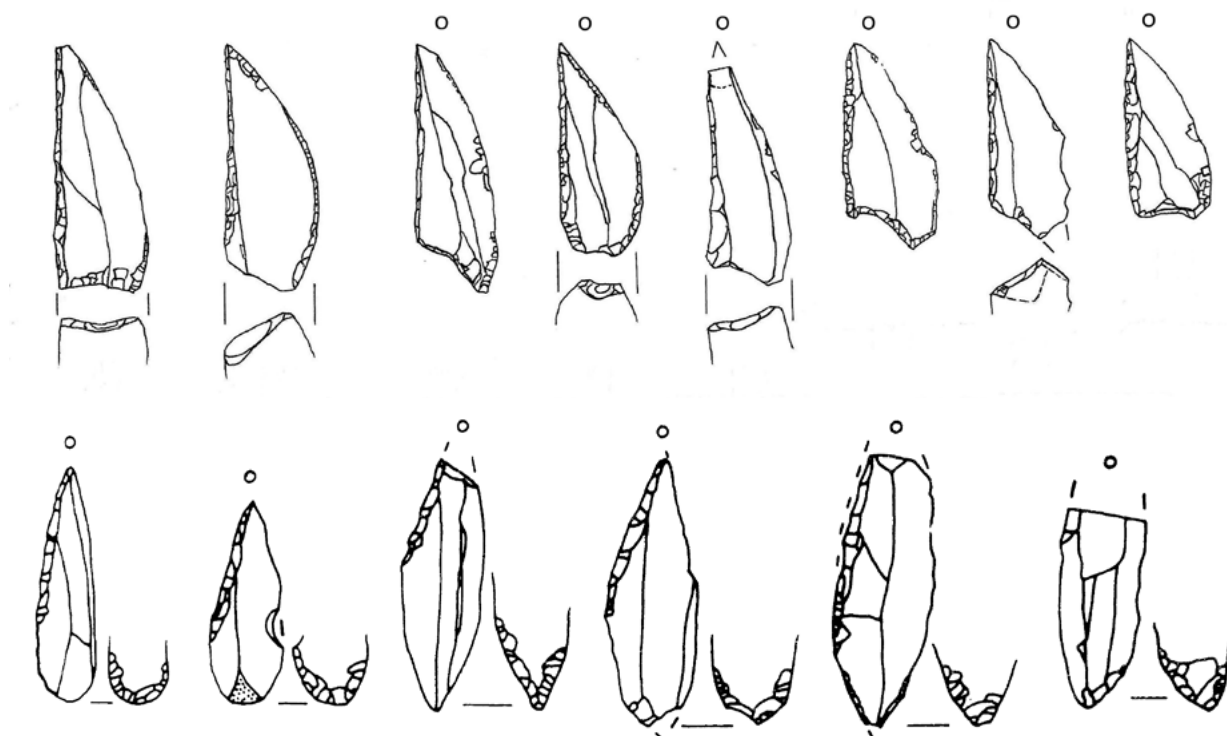


Figure 55: Basally modified microliths: 1-8) Horsham points – GD = 20-30mm (David & Kowalski 2019; artist: Andrew David; courtesy of Andrew David); and 9-14) Honey Hill points – GD = 20-28mm (Saville 1981b, Figure 1; artist: Alan Saville; courtesy Alan Saville/Annette Carruthers).

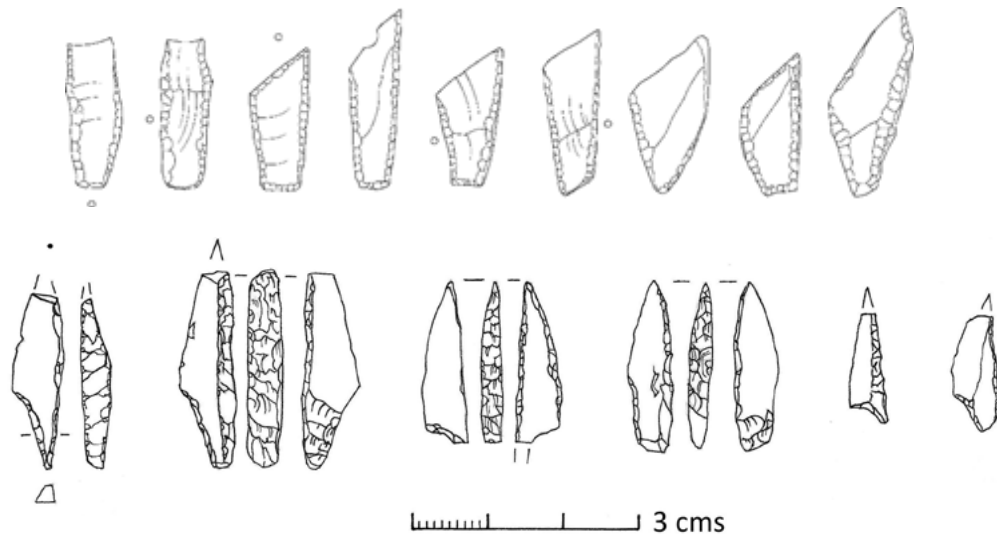


Figure 56: 1-9) Micro petiot tranchets from White Gill, Yorkshire (Radley 1969: Figure 4; redrawn by Leanne Whitelaw); and 10-15) Penpant, Pembrokeshire (David 2020: Figure 7; artist: Andrew David; courtesy of Andrew David).

There is some discussion as to whether Jacobi's (1978) Class 6a microliths, needlepoints or Sauveterrian points, are actually microliths and formed part of composite weapons, or whether they may be drill-bits. Many Scottish needlepoints have steeply retouched lateral sides (that is, they lack sharp cutting-edges) and two opposed *abraded* distal/proximal tips, and the author is inclined to believe that most may be drill-bits (discussed in connection with the presentation of piercing implements, below).

Microlithic *transverse arrowheads* (or *micro petiot tranchets*), not to be confused with the much larger *petiot tranchet derivative* chisel-shaped arrowheads of the later Neolithic, are occasionally found in Late Mesolithic assemblages throughout the British Isles. cursory examination of British *micro petiot tranchets* suggests that the category may include two different types of small transverse arrowheads (Figure 56.1-9 and Figure 56.10-14):

1. Examples such as those from White Gill in north-east Yorkshire (Figure 56.1-9; Radley 1969: Figure 4) belong to a type usually associated with the Late Mesolithic of Continental north-east Europe (e.g. the southern Scandinavian Ertebølle Culture; Vang Petersen 1993: 89). They are of trapezoidal shape; mostly based on the segmentation of blades or elongated flakes; have straight or slightly oblique leading edges; and their ventral faces tend to be unmodified. This type corresponds to Clark's Type A (Clark 1934c: Figure 1; this volume's Figure 35).

2. Pieces such as those from Pembrokeshire (Figure 56.10-15; David 2020) seem to represent a different form of *micro petiot tranchets*, and do not appear to be based on the segmentation of blade or flake blanks; many have a short, pointed basal tang, one side of which has a short retouch and the other a full retouch; they have a notably oblique cutting edge; and some pieces have invasive ventral modification of the tang (Figure 56 nos 11 and 13).

Specimens of Type 1 have been found on several sites in southern England, such as Over Whiteacre Spring, Warwickshire (Saville 1981c: Figure 9.158-159) and Farnham, Surrey (Clark & Rankine 1938: Figure 7.98); north-east Yorkshire, such as White Gill (Radley 1969: Figure 4); as well as western Scotland, such as Lealt Bay, Jura (Mercer 1968: Figure 13.256, 258).

Specimens of Type 2 have been found on several sites across west Wales, for example at Penpant (David 2007: Figure 7.6; 2020: Figure 7), and also at Waun Fignen Felen, Brecknockshire (Barton *et al.* 1995: Figure 8). They are also encountered on some English sites, for example amongst the assemblage from Farnham, Surrey (Clark & Rankine 1938: Figure 99).

Based on datings of the peat in which the White Gill microliths were found, Radley (1969: 313) suggested '... a date very late in the Mesolithic', a view since shared by Jacobi (1980: 175) and discussed further by David (2020).

In addition, idiosyncratic microlith forms are known, but most of these are probably *ad hoc* (expedient) pieces or 'sloppily shaped' versions of the more well-known microlith shapes.

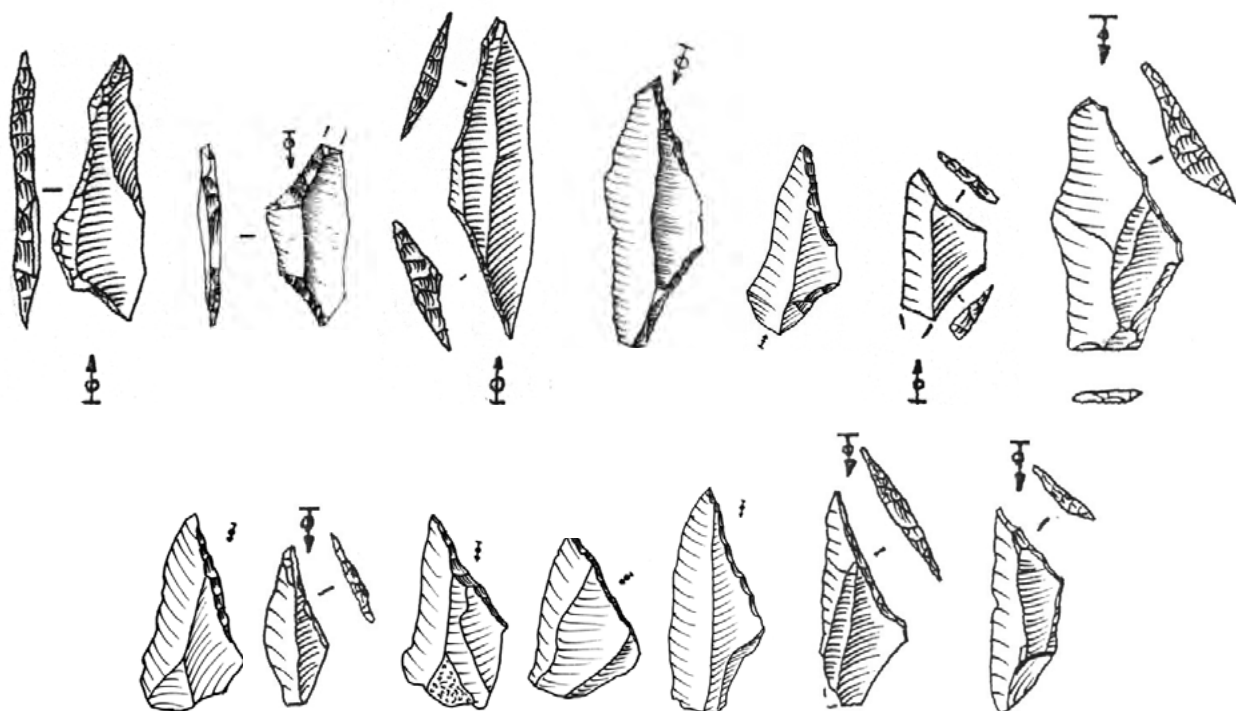


Figure 57: Zonhoven points from Zonhoven-Molenheide, Belgium – GD = 16-36mm (Vermeersch 2013: Figures 52, 53; artist: Gunther Noens; courtesy of Pierre Vermeersch).

Zonhoven points: Zonhoven points (Figure 57) are a group of broad obliquely-blunted and geometric (trapezoidal and rhomboid) points found in Ahrensburgian contexts (e.g., Schwabedissen 1954: 50), and their outlines correspond to those associated with some Early Mesolithic forms (Figures 46, 48). As noted by Vang Petersen (1993: 78), these pieces differ from the Mesolithic obliquely-blunted and geometric pieces by

not having been manufactured by the application of microburin technique (also see the assemblage from the Belgian site Zonhoven-Molenheide; Vermeersch 2013: 55). So far, few certain Zonhoven points have been recognised in Britain, with possible specimens from Three Ways Wharf, Middlesex, for example, being associated with epi-Ahrensburgian long-blade assemblages (Lewis & Rackham 2011). In this case, a small number of microburins were retrieved, possibly indicating the transitional LUP-EM nature of the finds. It is also possible that points from Rubha Port an t-Seilich on Islay (Mithen *et al.* 2015) may be Zonhoven points.

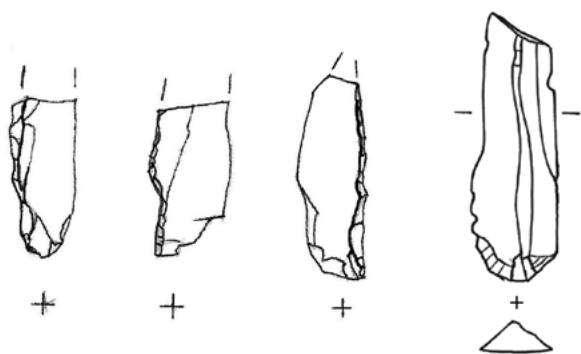


Figure 58: Backed and truncated bladelets: 1-3) Three backed bladelets from St Catherine's Bridge, Pembrokeshire – GD = 12-16mm (David & Painter 2014: Figure 8; artist: Andrew David; courtesy of Andrew David); and 4) one obliquely blunted bladelet from Nethermills Farm, Aberdeenshire – GD = 25mm (Wickham-Jones *et al.* 2017, illus 13; artist: Marion O'Neil; courtesy of Caroline Wickham-Jones).

Lewis & Rackham (2011: 53) note that some Zonhoven points differ from Early Mesolithic obliquely blunted points by having more concave frontal truncations (e.g., Figure 57.13), thereby making them slightly more pointed.

Backed and truncated bladelets: These pieces are modified microblade blanks with surviving proximal ends. Backed bladelets have one usually fully backed lateral side, whereas truncated bladelets have a (usually oblique or straight, sometimes concave) truncation at the distal end (Figure 58). These modified microblade forms may be found in assemblages relating to all microblade-producing industries, such as the Late Mesolithic and Early Neolithic periods.

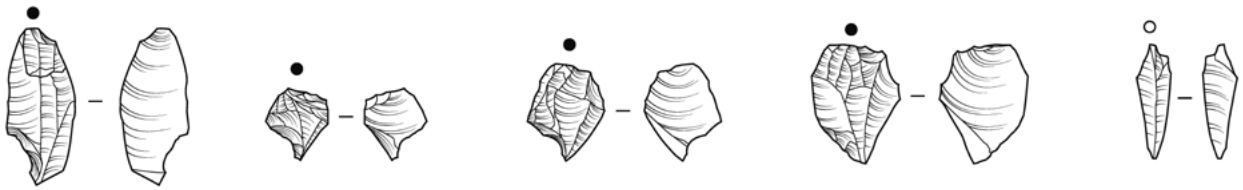


Figure 59: Four proximal and one distal microburins from Milltimber Zone 5, Aberdeenshire – GD = 8-18mm (Ballin 2019c, Illus 2.81; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.).

Fragments of microliths and microlith-related implements: These edge-modified fragments are subdivided into two groups, namely 1) fragments of microliths, and 2) fragments of microliths or backed bladelets. Proximal fragments which have clearly had their bulbar ends removed, but which cannot be formally defined as belonging to one or the other specific microlith type, are referred to the former category, whereas medial and distal fragments, which will not allow the character of their proximal ends to be defined, are referred to the latter category.

Microburins: Microburins (Figure 59) are the waste products from the production of microliths by microburin technique (Figure 44). Most are proximal, but distal forms are also known (Clark 1934a: 67), and in microlith-producing industries characterised by the manufacture of exceptionally long and slender blades/microblades, medial microburins were also produced (Inizan *et al.* 1992: Figure 24.10). There are different types of microburins, depending on whether the preforms were microblades with a lateral proximal notch (the most common form) or *lamelles a cran* (Figure 45). Although some microburins (particularly

pieces characterised by two opposed notches) may be found in Hamburgian (Weber 2012: Figure 42) and Ahrensburgian (Clausen 1995: Figure 10) contexts, most are found in Mesolithic contexts.

Scrapers

The scraper classification below is an extension and adjustment of the classification suggested by Clark (1960). Generally, a scraper-edge could be described as a convex, straight or concave modified terminal or lateral edge, which is too steep to have been functional as a cutting-edge, and which would frequently have obvious scraper use-wear, such as overhangs along the working-edges. It should, however, be borne in mind that scraper-edges may be somewhat acute as well as steep, depending on whether they were used to process skin/hide or hard materials like wood, bone or antler (Juel Jensen 1988; however, also see Klokkeness 2010: 147). Figure 60 shows the scraper-edge angles of a number of scraper assemblages; it is highly likely that the Hamburgian scrapers from Howburn in South Lanarkshire were predominantly used to process skin/hide and the scrapers from Bronze Age Bayanne harder materials.

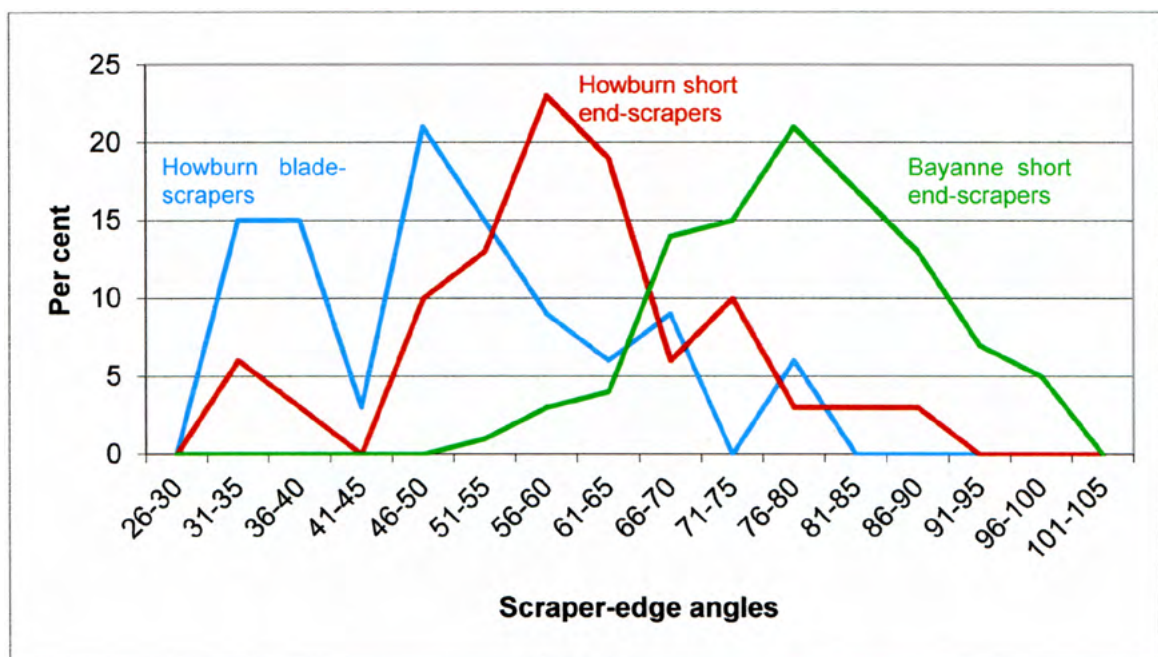


Figure 60: Scraper-edge angles – LUP blade-scrapers and short end-scrapers from Howburn compared to Middle Bronze Age short end-scrapers from Bayanne, Yell (Ballin *et al.* 2018: Figure 23).



Figure 61: Thumb-nail-scrapers: 1-5) Typical Early Bronze Age thumb-nail-scrapers from Elgin Museum, Moray; L = c. 15-20mm (Ballin 2014c, Figure 3; photo: Leanne Demay); and 6-8) from Freshwater West, Pembrokeshire – GD = 16-19mm (David 2017: Figure 11; artist: Andrew David; courtesy of Andrew David).

Thumb-nail-scrapers (Figure 61) are a category of small scrapers, often (but not always) with retouch around their entire circumference (Butler 2005: 168). Butler defined these scrapers as having a greatest dimension of less than 20mm; the author defined the small neat scrapers from the Beaker site of Dalmore on Lewis as having greatest dimensions of less than 23mm (Ballin 2002b). It has been suggested that thumb-nail-scrapers are a particular Early Bronze Age form, but in Scotland scrapers of this size (although generally not as well executed) are also common in Mesolithic contexts (Figure 62). Another problem with the definition of thumb-nail-scrapers is that the smallest scrapers in

western Scotland are smaller than contemporary pieces in eastern Scotland, simply due to flint beach pebbles being smaller in the west than in the east.

It is true that there is a certain type of small scraper which is diagnostic of the British Early Bronze Age, but these pieces form a continuum embracing tiny discoidal, end-, double- and side-scrapers, and the most characteristic element of these scrapers is the fact that their working-edges tend to be relatively acute and formed by neat pressure-flaking (e.g., Saville 2005: 108). It is suggested to use the term thumb-nail-scrapers to embrace all tiny, well-executed, pressure-

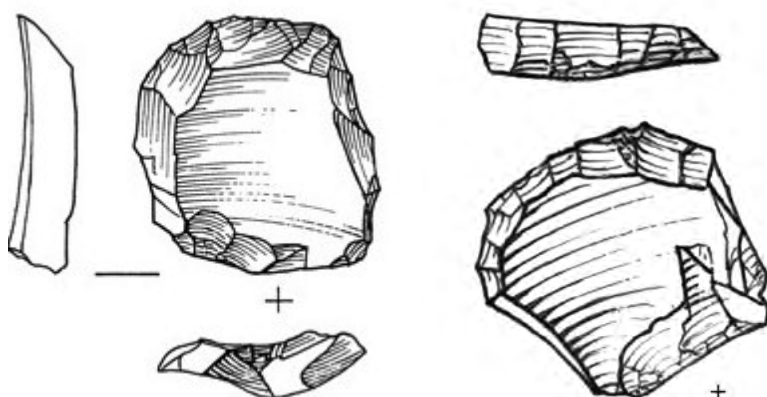


Figure 62: Typical thumb-nail-sized scrapers from Mesolithic contexts: 1) A specimen from Early Mesolithic An Corran, Highland; GD = 25mm (Saville et al. 2012, illus 32; artist: Marion O'Neil; courtesy Alan Saville/Annette Carruthers); and 2) one from Early/Late Mesolithic Nethermills Farm, Aberdeenshire; GD = 19mm (Wickham-Jones et al. 2017, illus 14; artist: Marion O'Neil; courtesy of Caroline Wickham-Jones).

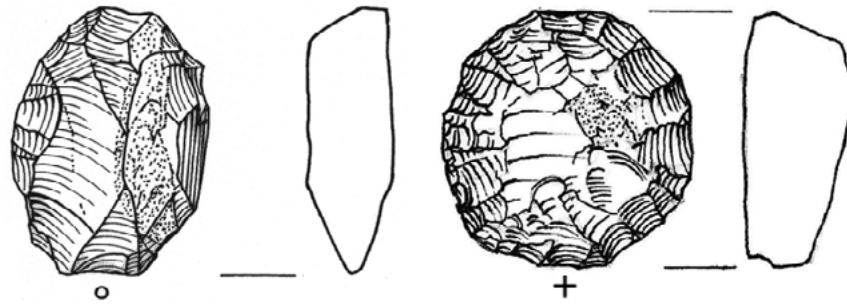


Figure 63: Discoidal scrapers: 1) Possibly LUP discoidal scraper from Kilmelfort Cave, Highland – GD = 20mm (Saville & Ballin 2009, illus 8; artist: Marion O’Neil); and 2) EBA discoidal thumbnail-scraper from Bryn-y-Mor, Pembrokeshire – GD = 19mm (David 2017: Figure 8; artist: Andrew David; courtesy of Andrew David).

flaked EBA scrapers with relatively acute working-edges. Thumbnail-scrapers from western and northern coastal areas of the British Isles are frequently based on split pebble debitage (bipolar technique) or abandoned bipolar cores (see Figure 67; David 2017).

Discoidal scrapers: These scrapers are defined by being round or oval, and their working-edge extends along the entire circumference (Figure 63). Many, but not

all, thumbnail-scrapers are discoidal (see immediately above).

End-scrapers: This category of scrapers is defined by having a convex, more rarely straight, working-edge at one end. Most end-scrapers have their working-edge at the distal end. The category includes two main types, namely *short end-scrapers* (usually on flakes, but some pieces may be based on indeterminate pieces or

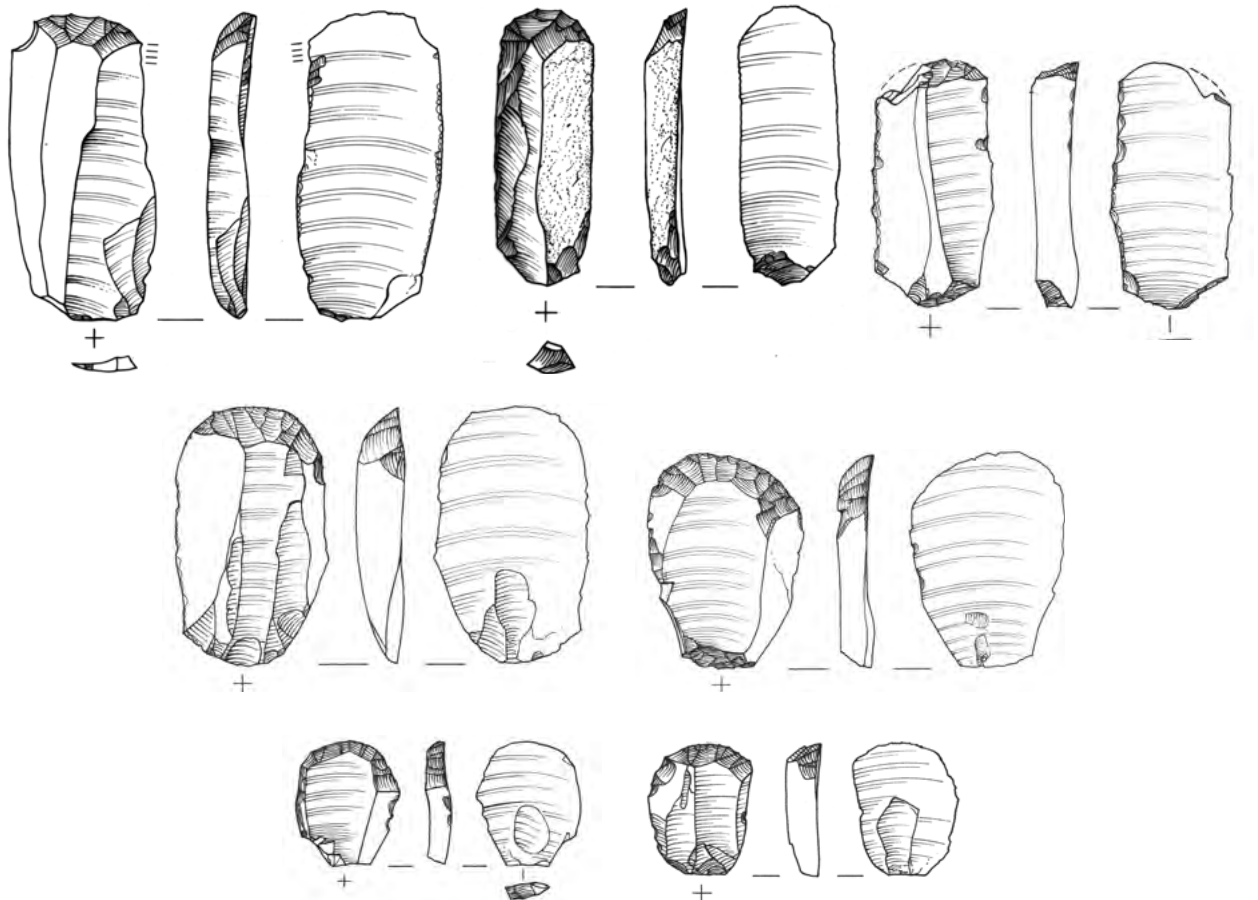


Figure 64: A selection of Hamburgian short end-scrapers and blade-scrapers from Howburn, South Lanarkshire – GD = 21-46mm (Ballin et al. 2018, Plates 9 and 11; artist: Marion O’Neil); note that the blanks of the blade-scrapers are Levallois-like blades.

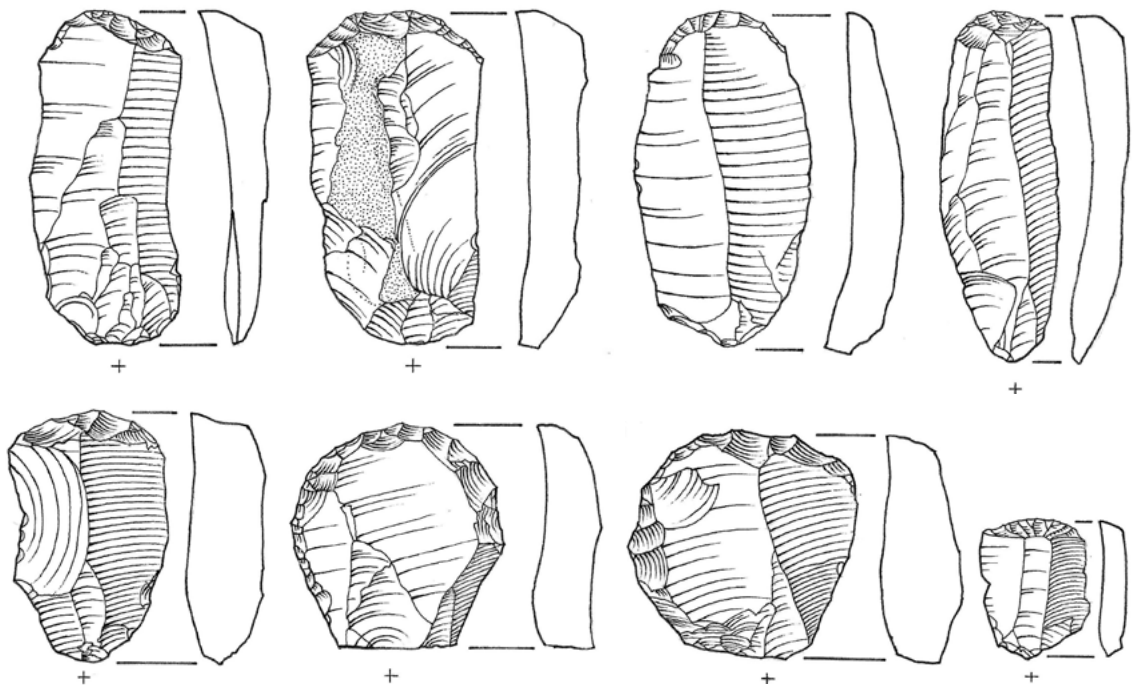


Figure 65: A selection of Mesolithic short end-scrapers and blade-scrapers from Nab Head, Site I, Pembrokeshire – GD = 21-47mm (David 2007: Figure 4.7; artist: Andrew David; courtesy of Andrew David).

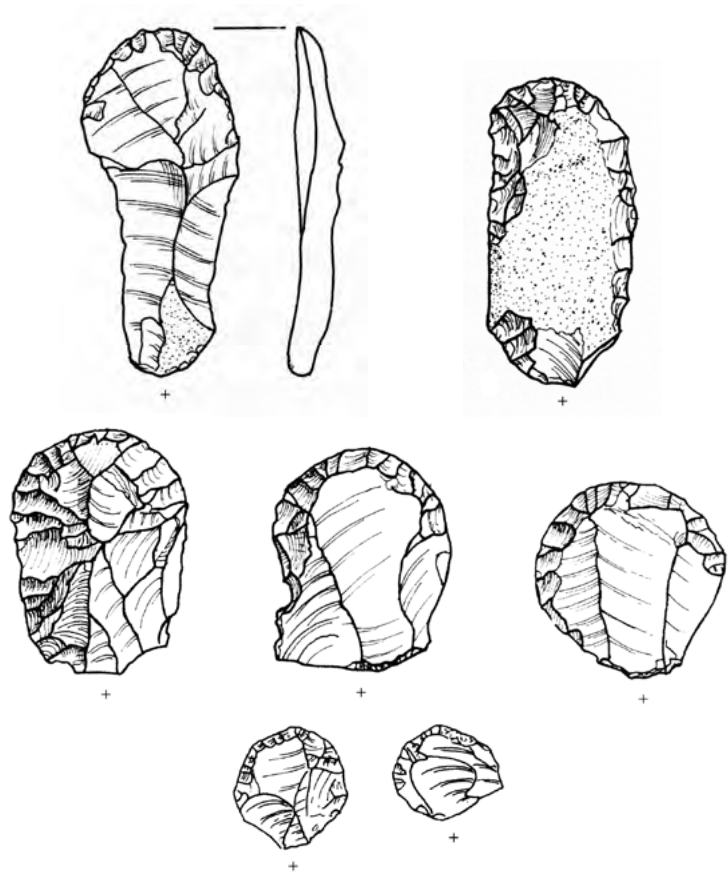


Figure 66: A selection of scrapers from North Carnaby Temple Site 9, Carnaby Top Site 12 and Flamborough Site 3, Yorkshire – GD = 26-74mm (Manby 1974: Figures 10, 24 and 31; artist: T.G. Manby; courtesy of T.G. Manby).

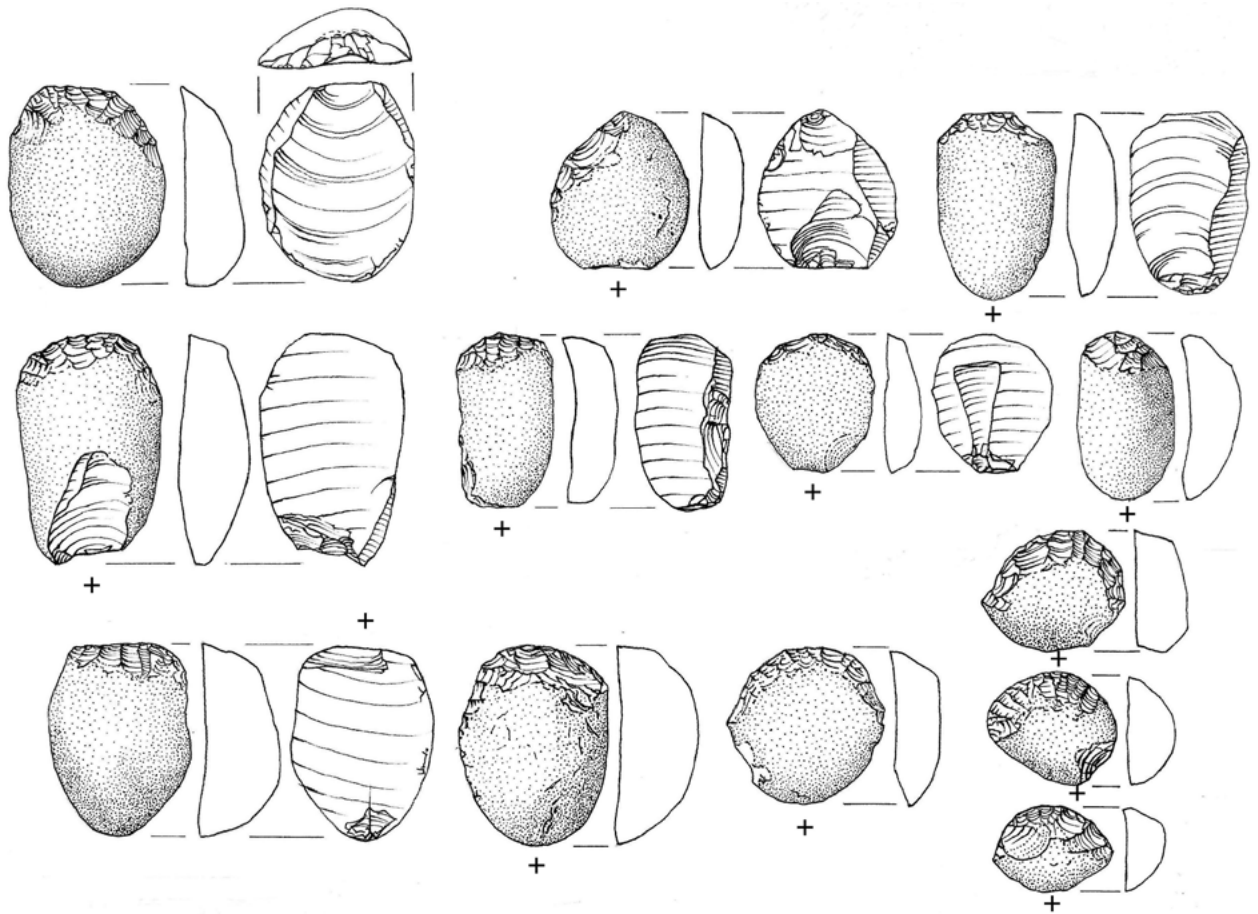


Figure 67: A selection of Early Bronze Age short end-scrapers from Freshwater West, Pembrokeshire – GD = 16-30mm (David 2017: Figure 11; artist: Andrew David; courtesy of Andrew David); most of these scrapers appear to be based on bipolar flakes or abandoned bipolar cores.

recycled cores) and *blade-scrapers*, where the former is defined by $L < 2W$ and the latter by $L \geq 2B$. The working-edges of end-scrapers are distinguished from the lateral sides in a number of ways – in some cases, the working-edges curve into the lateral sides; in other cases they are distinguished from the lateral sides by slight or notable angles; and in yet other cases they have a concave-convex-concave delineation forming a ‘nose’.

End-scrapers may be found throughout the LUP, Mesolithic, Neolithic and Bronze Age periods, but the execution of the individual pieces may reveal their specific dates (Figures 64-67). Blade-scrapers are not found in contexts post-dating the Neolithic period.

Double-scrapers: This term is used exclusively to describe end-scrapers with two opposed working-edges (Figure 68). Generally, side-scrapers with two opposed working-edges are simply referred to as side-scrapers. Like single-edged end-scrapers, double-scrapers occur in two forms, namely a short form (usually flake-based) and a long form (blade-based).

Side-scrapers: In general terms, this scraper type is defined by having a scraper-edge along one or both of its long edges (Figure 69). There is, though, some confusion amongst specialists and lay lithic enthusiasts as to how the type is defined in detail, and many believe that ‘side’ means ‘lateral side’ in relation to the position of the tool blank’s bulb-of-percussion. However, it is highly unlikely that the prehistoric tool-maker spent time locating the bulb-of-percussion before he formed a scraper’s working-edge – it is much more likely that he made an executive decision as to whether a short or a long working-edge would be useful in terms of executing a specific task, irrespective of the position of the bulb-of-percussion. The following (somewhat mathematical) definition is therefore offered (see Figure 70).

An *end-scraper* is defined by having a working-edge approximately perpendicular to the longest of the two dimensions L and W (L being the dimension proximal end to distal end), whereas a *side-scraper* has its edge on the longest of the two dimensions. If $L > W$ (elongated blank) the working-edge of the end-scraper will be distal (sometimes proximal) and the edge of the side-scraper will be lateral. If $W > L$ (broad blank) the working-edge

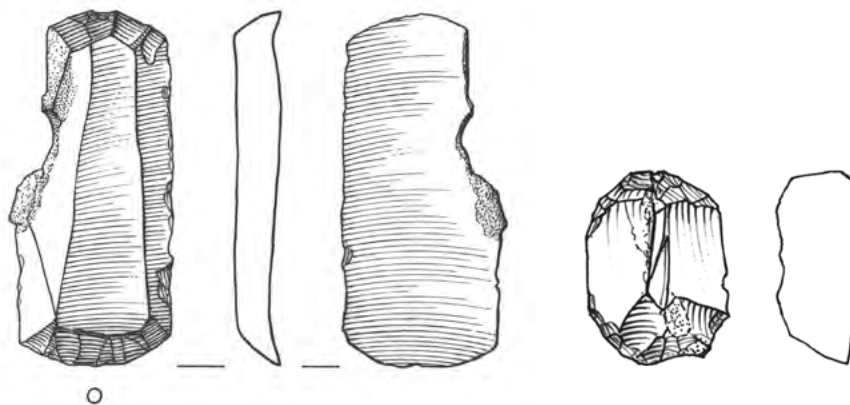


Figure 68: Double-scrapers: 1) A specimen from Howburn, South Lanarkshire – GD = 39mm (Ballin et al. 2018, Plate 10; artist: Marion O’Neil); and 2) one from Nethermills Farm, Aberdeenshire – GD = 25mm (Wickham-Jones et al. 2017, Illus 14; artist: Marion O’Neil; courtesy of Caroline Wickham-Jones).

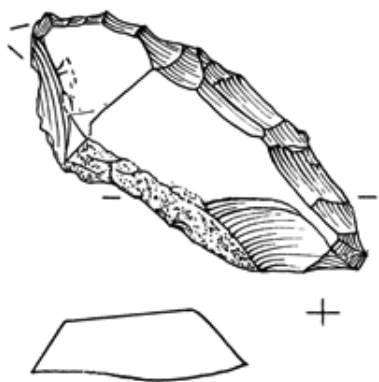


Figure 69: Side-scraper from An Corran, Skye – GD = 50mm (Saville et al. 2012, Illus 32; artist: Marion O’Neil).

of the end-scraper will be lateral and the edge of the side-scraper will be either proximal or distal. Following this definition, Bille Henriksen (1980: 11) operated with three sub-types of side-scrapers, namely ‘lateral side-scrapers’, ‘transverse side-scrapers’, and ‘oblique side-scrapers’.

A scraper with a working-edge along one short edge as well as along one or both of its longer edges is referred to as an *end-/side-scraper*.

Hollow and concave scrapers: Scrapers with concave scraper-edges are subdivided into two sub-types, namely the sophisticated hollow scrapers, and the more expedient concave scrapers.

The *hollow scraper* (Figure 71) is an exclusively Irish (predominantly Northern Irish) later Neolithic form, and these scrapers are based on specialised flake-blanks. These flakes are relatively large and thin pieces with a trapezoidal outline, and with the broadest part being at the distal end. They have a well-executed

concave scraper-edge at the (usually) distal end, and the working-edge is occasionally serrated, and not uncommonly associated with *gloss*. The blanks were usually struck from flat uniplanar cores which have superficial similarities to Later Neolithic Levallois-like cores (see above), but the Northern Irish cores rarely have faceted platforms (*‘In fact, only one flake has a strictly faceted platform’*; Woodman et al. 1992: 19). Hollow scrapers have been discussed by Flanagan (1966b), Woodman et al. (1992), and Woodman et al. (2006: 163). The *concave scraper* is a scraper with a usually expedient concave working-edge. These pieces are based on whichever blank was available, and they are neither diagnostic nor common. Also see ‘notched pieces’ below.

Denticulated scrapers: See denticulates, below.

Other scrapers: Scraper forms which do not conform to any of the above types are called *atypical scrapers*. Fragments, which are definable as fragments of scrapers – usually due to the survival of parts of a scraper-edge – but which are too fragmented to allow classification to a specific scraper-type, are referred to as *scraper-edge fragments*.

Piercing implements

These pieces are defined by having a relatively narrow projection used for piercing or drilling into, or through, soft or hard materials. Moreover, piercer tips are defined by having no less than two laterally modified edges which meet to form the (more or less) acutely pointed working-part of these tools. No matter how much an implement may appear to have been suited for drilling, due to the presence of a pointed end or corner, if the point only has retouch along one lateral side, it is *not* a formal piercer. Although piercers with normal retouch (see definition above) are common, propeller retouch is

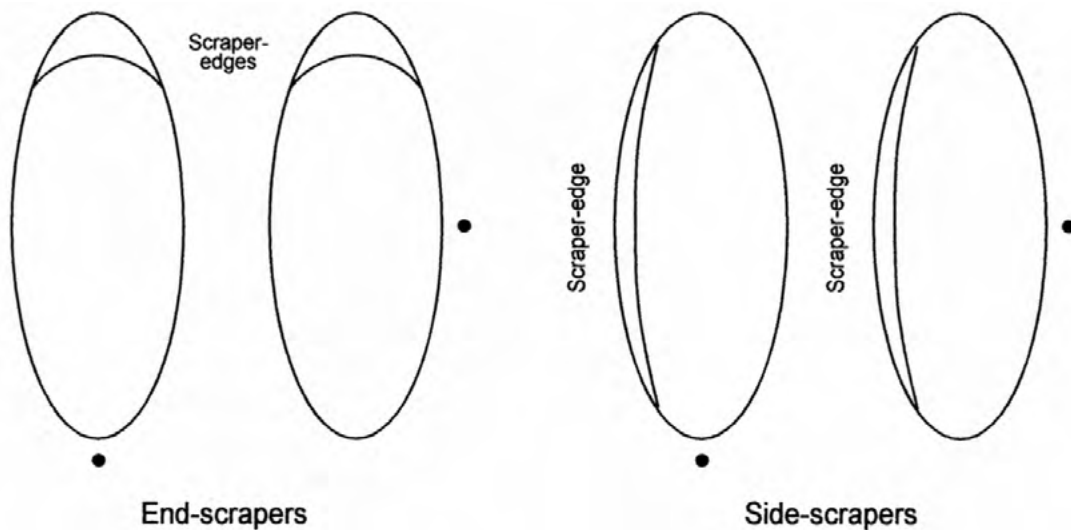


Figure 70: The formal distinction between end- and side-scrapers.
The dots mark the position of the bulb-of-percussion.

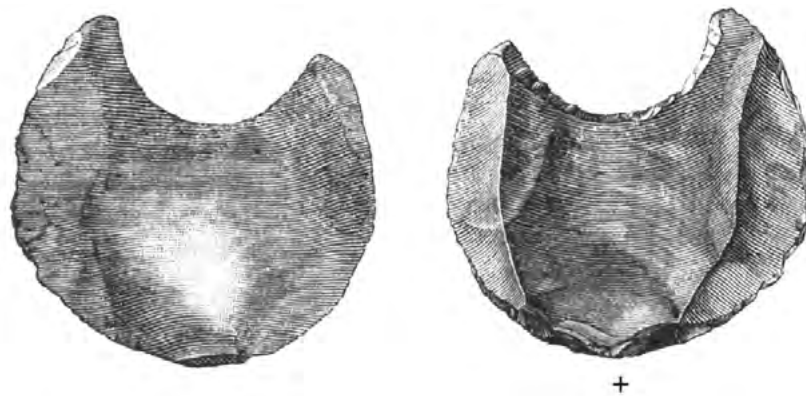


Figure 71: Northern Irish hollow scraper – GD = 38mm
(Evans 1897: Figure 226A; artist: J. Swain).

frequently used to form the tip of a piercer, as this form of retouch enhances the function of the tool, which was used in a twisting manner. The author generally refers to these pieces as piercers, but they are also commonly called awls, borers or perforators.

Flake- or blade-based plain piercers (Figure 72) are flake or blade blanks with a pointed working-part at the (usually) distal end, and which are not covered by terms describing other formal piercers (below). Flake-based piercers were produced by all prehistoric industries, and blade-based ones by all pre-Bronze Age industries.

Robust piercers are piercers shaped by coarse flaking and not generally based on flake or blade blanks, and may therefore have no ventral face (although some may be based on thick flakes; e.g., Figure 73). Pieces without a ventral face are called core piercers (Gehlen 2012: 584). They tend to be large, and they commonly have a 'lumpy' handle end, and a robust piercer tip. The tip of a robust piercer would frequently have three

or more knapping seams ('crests') running along the tip's lateral sides, towards the tip-end. Occasionally, robust piercers are referred to as points, and some of these pieces overlap formally with some denticulates or nosed pieces (see notched pieces). They are generally undiagnostic.

Spurred implements (Figure 74) are flakes which at one end have a short, robust piercer tip formed by two large adjacent retouched notches (see for example the assemblage from Barrow 1, Raunds, Northamptonshire; Ballin 2011c: 463, Figure 167; also Smith 1965: 105). They are mostly found in later Neolithic and Bronze Age assemblages. These pieces differ from nosed pieces (see notched pieces below) by generally being somewhat thinner, and their tip-defining notches tend to be smaller.

Continental piercer terms: A number of Continental European piercer terms have been adopted by British lithics specialists, namely *Zinken*, *becs* and *mèches de*

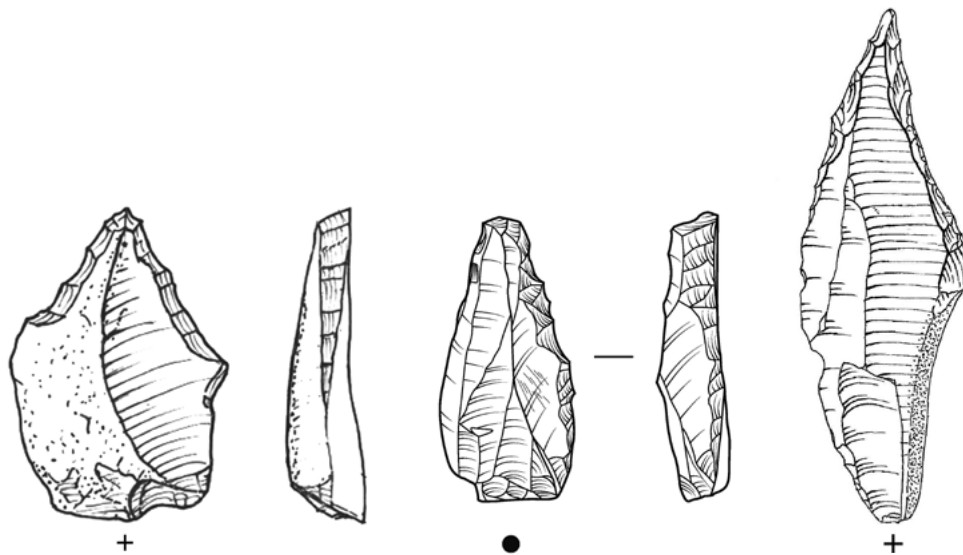


Figure 72: Flake- or blade-based plain piercers: 1) Flake-based piercer from Nethermills Farm, Aberdeenshire – GD = 29mm (Wickham-Jones et al. 2017, Illus 15; artist: Marion O’Neil; courtesy of Caroline Wickham-Jones); 2) short blade-based piercer from Milltimber Zone 3, Aberdeenshire – GD = 24mm (Ballin 2019c, Illus 2.65; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.); and 3) longer blade-based piercer from Gough’s (New) Cave, Somerset – GD = 59mm (David 2007: Figure 2.7; artist: Andrew David; courtesy of Andrew David).

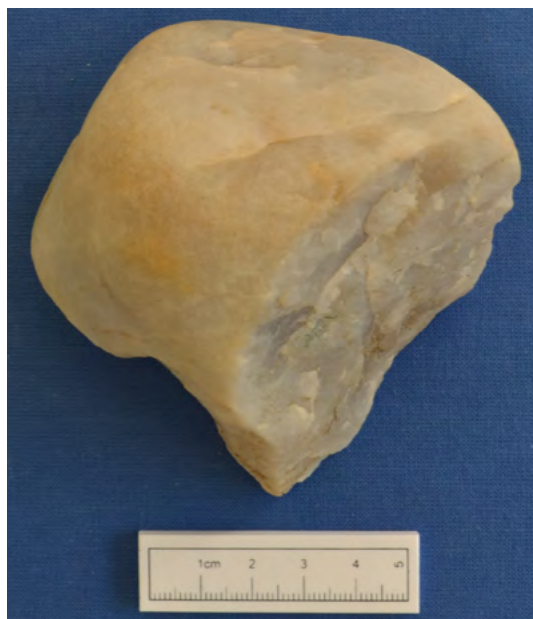


Figure 73: Robust piercer from Barabhas (Elliott Collection), Isle of Lewis, Western Isles (Ballin 2018a, Illus. 58; photo: Beverley Ballin Smith).

foret. Unfortunately, each of these terms is defined differently by different specialists – creating some confusion – and below, these three piercer forms are therefore described and discussed in detail. To clarify the terms, a number of European colleagues were consulted, such as Dr Mara Weber (Zentrum für Baltische und Skandinavische Archäologie, Schleswig-

Holsteinische Landesmuseen, Germany) and Professor Marcel Otte (Prehistory at the Université de Liège, Belgium) who offered their views and suggested relevant literature.

Zinken: This is a highly diagnostic form of piercer associated with Hamburgian industries (Figure 75). Although some Continental analysts suggest that *Zinken* form a sub-group of *becs*, German/Dutch expert knowledge is followed here, as this type is associated with, and diagnostic of, the north-west European Hamburgian complex which was centred on northern Germany, Holland and southern Denmark (e.g., Weber 2012).

Zinken occur as two sub-types, namely single *Zinken* and double *Zinken*. They tend to be based on robust blades, and they are characterised by one or two strong curved tips. Bohmers & Wouters (1956: 11) distinguishes between two sub-types, the common form having a ‘rather long and curved [tip]’, whereas the tips of atypical pieces ‘may be more or less straight, and [are] sometimes so worn down by use that no curvature remains’. The tips are ‘appropriately large and thick, with a triangular or plano-convex cross-section’, and they tend to be orientated towards the right. Double *Zinken* always have the two tips pointing in opposite directions, giving the pieces an appearance not dissimilar to a paragraph sign (§ – e.g., Figure 75.2). Alfred Rust (1937: 82) suggested that *Zinken* may have been used to cut grooves into bits of reindeer antler, or to carve out strips of antler, for example for harpoon points, but the character of

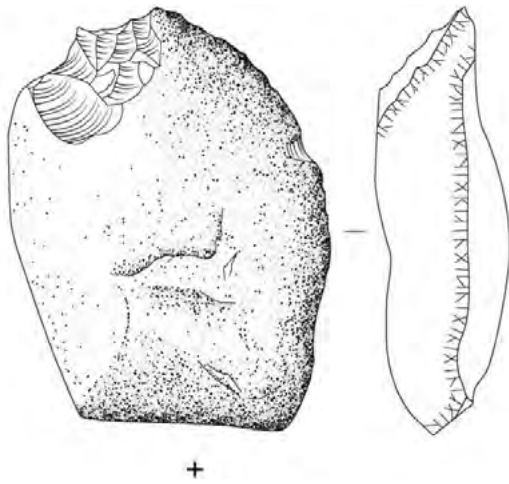


Figure 74: Spurred implement from Raunds, Northamptonshire – GD = 36mm (Ballin 2011c, Figure SS3.56; redrawn by LeeAnne Whitelaw).

the working-ends of these implements indicates use possibly as specialised piercers.

At the present time, only one certain Hamburgian site has been discovered in Britain (Howburn in South Lanarkshire; Ballin *et al.* 2018), and on this site only a small number of slender single *Zinken* were recovered (Figure 75.4). A solitary equally slender single *Zinken* (Figure 75.5) has recently been discovered at Dunragit in Dumfries & Galloway (Ballin forthcoming b).

Becs: The French term '*bec*' means 'beak' or 'nose', and the definition of *becs* vary considerably from one archaeological tradition to another. In papers on the Magdalenian in the Paris Basin, Schmider (1971; 1979; 1988) included pieces with straight as well as curved 'beaks' in the *bec* category, describing the latter as resembling *Zinken*. A later paper (Beyries *et al.* 2005) on the *becs* from the Magdalenian site Verberie, also in the

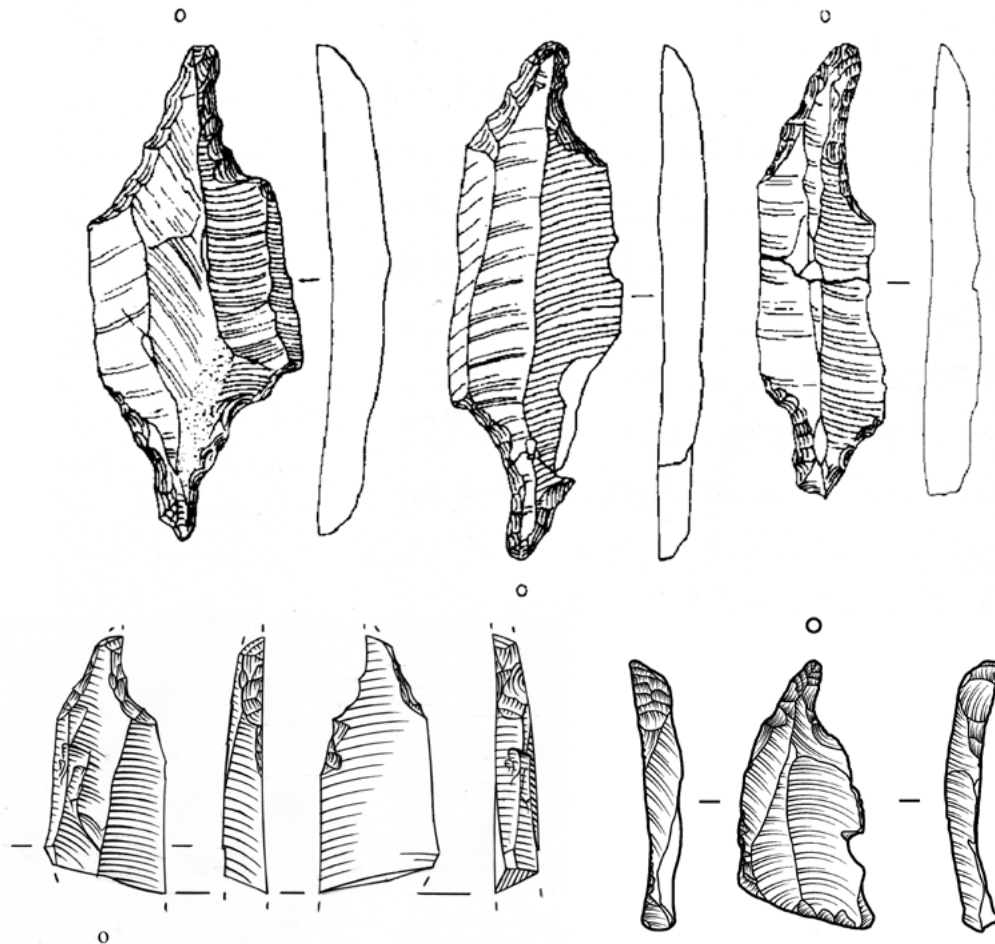


Figure 75: Examples of *Zinken*: 1-3) Classic NW European double-*Zinken* from Jels, southern Jutland, Denmark – GD = 57-66mm (Holm & Rieck 1992: Figure 24; artist: Jørgen Holm; courtesy of Jørgen Holm); and 4-5) slender forms recovered at Howburn, South Lanarkshire – 29mm (Ballin *et al.* 2018, Plate 13; artist: Hazel Martingell), and Dunragit, Site 19, Dumfries & Galloway – GD = 37mm (Ballin forthcoming b; artist: Jordan Barbour; courtesy of GUARD Archaeology Ltd.).

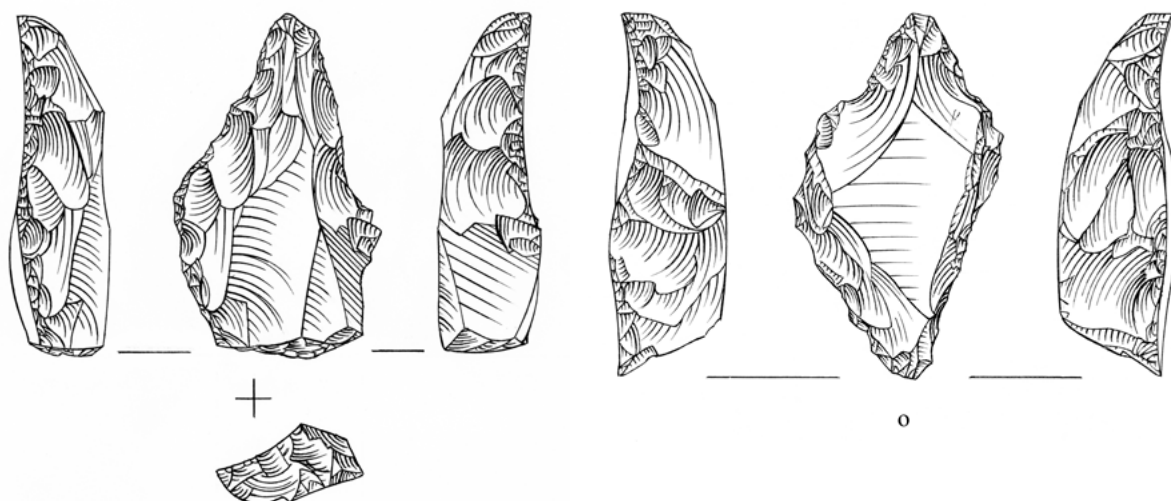


Figure 76: Robust Hamburgian single-bec from Howburn, South Lanarkshire – GD = 36mm, and robust Hamburgian double-bec from the same site – GD = 41mm (Ballin et al. 2018, Plate 14; artist: Hazel Martingell); note the finely faceted platform remnant of the bec towards the left, defining the blank as a flake from a Levallois-like core.

Paris Basin, includes pieces with quite long and narrow modified tips in the category, that is, pieces which in Germany would be referred to as ‘*Langbohrer*’ (LUP piercers with a very long, stem-formed tip located on the long-axis of the pieces). Or, in short, the French term *bec* had become so broad that it is almost unworkable, meaning little more than ‘*slender LUP piercers with straight as well as curved tips*’.

In Germany and the Low Countries, the term took on a different meaning. Although some north-west European colleagues adopted the very broad French definition of the term, many archaeologists in Germany and the Low Countries defined *becs* as robust piercers. In his *Artefaktmorphologie*, Hahn (1991) describes these pieces as ‘*Grobbohrer*’ (i.e., coarse piercers) with a short, robust tip. However, there is some disagreement as to the specific shape of the working-end of a *bec*. In her communication with the author, Dr Mara Weber (Germany) defines *becs* as robust piercers with a ‘*nose-formed, straight and thick tip located in the longitudinal axis of the blank*’, whereas Professor Marcel Otte defines them as ‘*heavy borers [which]... most of the time are asymmetrical*’ – that is, in north-western Europe *becs* are defined as robust LUP piercers which are either symmetrical or asymmetrical, with either straight or curved ‘beaks’.

In Britain, *becs* have been defined in a number of different ways: In their presentation of *becs* from the Hamburgian assemblage from Howburn in South Lanarkshire, the authors (Ballin et al. 2018, Plates 13–14) adopted the definition from Germany/the Low Countries, and the *becs* from this site are generally robust, thick, snub-nosed piercers with extensive, correspondingly robust bilateral modification, some of which are symmetrical and some slightly asymmetrical

(Figure 76). In their paper on Late Mesolithic hunter-gatherer sites in Pembrokeshire, Wales, David & Painter (2014: 60) define relatively small and fine flakes, blades and bladelets ‘... with a clearly defined and retouched asymmetrical tip or ‘beak’ as *becs*’ (Figure 77) and such pieces seem to be typical of the Welsh Late Mesolithic.

The distinction between *becs* and piercers is not very clear. According to Jacobi (2004: 26): ‘Both are tools usually formed by converging retouch, but Sonnevile-Bordes and Perrot (1955: 78) suggest that a *bec* is a piercer in that the worked end is thicker and broader’.

In short, the definition of *becs* is highly confusing, and it should not be applied in any paper without a clear definition.

Mèches de forêt: *Mèche de forêt* is French and simply means ‘drill-bit’, that is, the working point of a bow drill (Figure 78). In Britain, the term became a household concept following Clark (1975) and the publication of Jacobi’s paper on the Early Holocene Settlements of Wales (1980: 154), in which he discussed and defined this type. However, Jacobi focused on one particular subtype of drill-bit (Figure 79), and in David (2007: 101) this type was defined in the following way: They ‘... are usually blades and bladelets narrowed by abrupt bilateral modification to a rod-like, or awl-shaped, outline with a near cylindrical section at their distal ends. Their tips are frequently somewhat rounded, as if by abrasion, and a rotational movement during use is indicated both by this and the presence of invasive micro-scaling damage to the ventral surface’. According to Gehlen (Gehlen 2012: 584), this type of drill-bit is diagnostic of the Early Mesolithic of large parts of the British Isles and Continental Europe, but Gerken (2001: 34) suggests that they may have been in use from the Early Mesolithic and

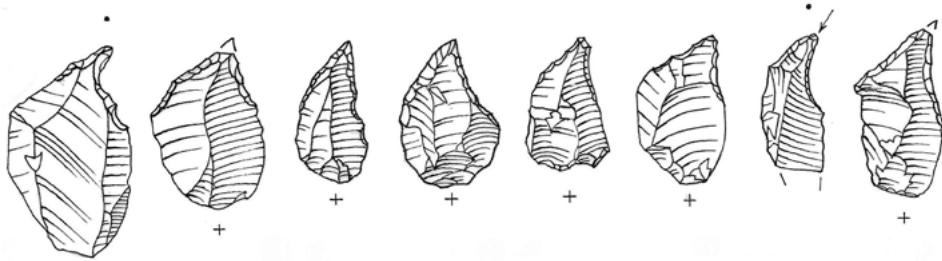


Figure 77: Delicate Mesolithic becs from Llanunwas, Pembrokeshire – GD = 17-27mm
(David 2007: Figure 7.7; artist: Andrew David; courtesy of Andrew David).

possibly into the Neolithic period. Some drill-bits have been linked to the manufacture of stone beads (David 2007: Figure 4.8; Nash 2012).

However, as mentioned above, the term *mèche de forêt* simply means 'drill-bit', and other forms of drill-bits may exist. Gehlen (2012: 584), for example draws attention to the more delicate double-pointed variants of such pieces. She writes: 'In the French and Danish literature, such fine double-pointed pieces are frequently

considered microlithic double-points and listed with other microliths [i.e., Sauveterrian points or needle-points]' (the author's translation and insert). She clearly perceives Sauveterrian points/needle-points as drill-bits.

Gerken (2001: 34) defines *meches de forêt* as small drill-bits which on average measure 12-35 x 4-8 x 3-6mm, that is, pieces considerably smaller than those illustrated in Figure 79. In the past, the present author has defined pieces as drill-bits/*mèche de forêt* if they had one or two pointed ends, if these ends displayed rounding/abrasion, and if the modification of the two mostly fully retouched lateral sides was steep, as microliths (i.e., the tips, edges and barbs of composite weaponry/hunting gear) generally tend to have at least one relatively sharp lateral cutting edge. The pieces experienced by the author in Scotland include the distinctive Late Mesolithic 'needle-points' which in these parts tend to have two steeply retouched lateral sides and one or more abraded tips (Figure 80).

To conclude, there is some disagreement as to the specific definition of several types of piercing implements – particularly the *becs* and the *mèches de forêt* – and it is therefore recommended that analysts, in any lithics report on assemblages with such pieces, include unequivocal definitions of how they define the individual types.

Knives

Knives occur as four fundamentally different types, namely 1) pieces with a cutting-edge formed by the original unmodified acute edge of the tool blank (backed knives and pieces with [usually] oblique truncations); 2) pieces with a cutting-edge formed by acute invasive lateral retouch (scale-flaked and plano-convex knives; Clark 1932a); 3) bifacial knives (laurel leaves, foliate knives, and curved knives; Clark 1960; Ballin 2005b; 2012a) and 4) pieces with a cutting-edge formed by grinding/polish (polished-edge flake and blade knives and discoidal knives; Clark 1932b; Manby 1974: 88).

Backed knives: These pieces are generally based on elongated flakes or blades, one lateral side of which is



Figure 78: The bow drill has a spatially and temporally extensive distribution. It was used for a variety of purposes, from making fire to drilling holes in hard materials (wood, antler, bone, amber, stone, etc.). This photo shows the hunter Miteq at Cape York 1909, north-western Greenland. The bow drill is a composite tool, which in this case includes a shaft with a lithic tip, a bow to make the drill shaft spin, and a stabilising piece with a depression for the shaft, which is held in the mouth (Vang Petersen 1993; photo: Thomas Thomsen; courtesy of Peter Vang Petersen/the National Museum of Denmark).

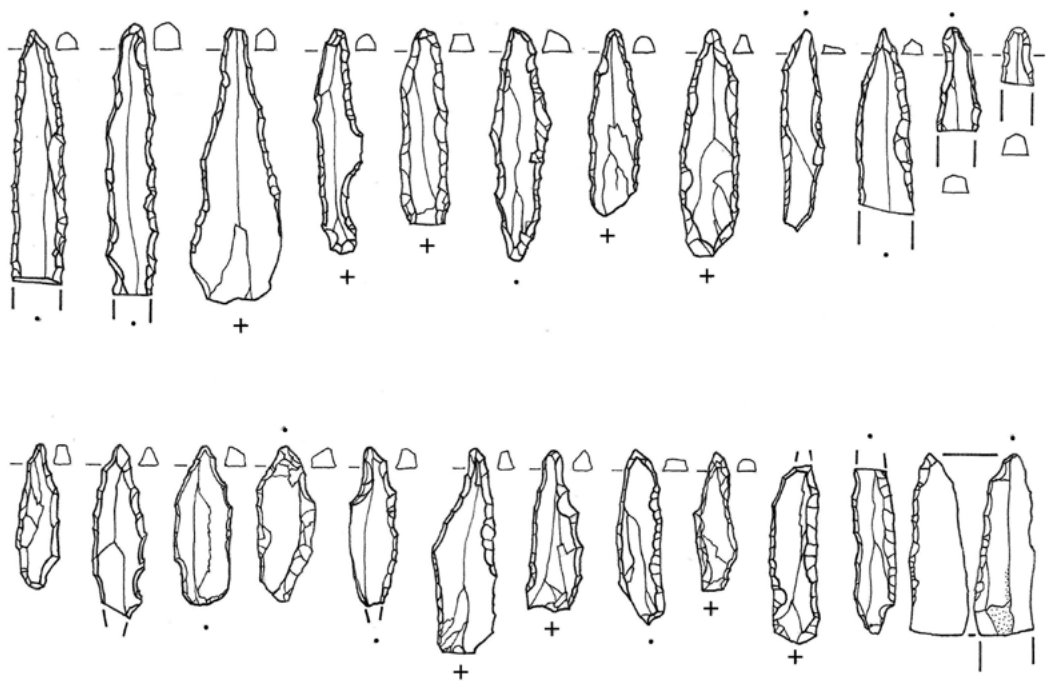


Figure 79: Mèches de forêt (sensu stricto), as defined by Jacobi (1980) and David (2007), from Nab Head I, Pembrokeshire – GD = 2.2-4.4mm (David 2007: Figure 4.8; artist: Andrew David; courtesy of Andrew David).

blunted by abrupt retouch (Figure 81). The blunting retouch is in most cases more or less convex or straight, whereas the opposed cutting-edge tends to be either slightly concave or straight. Some LUP curve-backed points may be difficult to distinguish from backed knives, and the classification of some curve-backed LUP pieces (for example associated with Creswellian and Federmesser industries) as points rather than knives may mostly be a matter of consensus due to the assumed dates of these pieces

Truncated pieces: This category does not include pieces with convex truncation, as such pieces are usually classified as end-scrapers (above). Pieces with oblique truncations (Figure 82) were in most cases used as cutting tools, where the purpose of the truncation was to protect the user's index finger, which would rest on the (usually oblique) truncation. The longest lateral side of the tool would be the cutting-edge of the piece, particularly the distal end, and occasionally the larger hand-held truncated knives might have been blunted unilaterally at the proximal end to protect the user's other fingers, which would have been 'wrapped' around

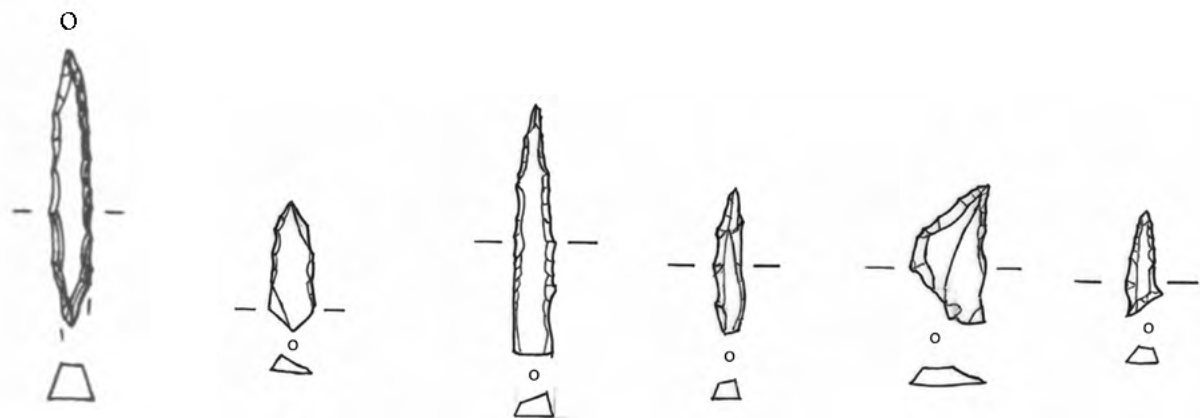


Figure 80: Mèches de forêt (sensu lato): 1) Double-pointed drill-bit ('needle-point') from Shieldaig, Highland – GD = 16mm (Saville 2004: Figure 10.2; artist: Marion O'Neil; courtesy of Alan Saville/Annette Carruthers); and 2-6) a series of drill-bits from Nethermills Farm, Aberdeenshire – GD = 8.6-20mm (Wickham-Jones et al. 2017, illus 15; artist: Marion O'Neil; courtesy of Caroline Wickham-Jones). Note the scalene form furthest to the right, which has steep retouch along the entire circumference and a slightly abraded tip.

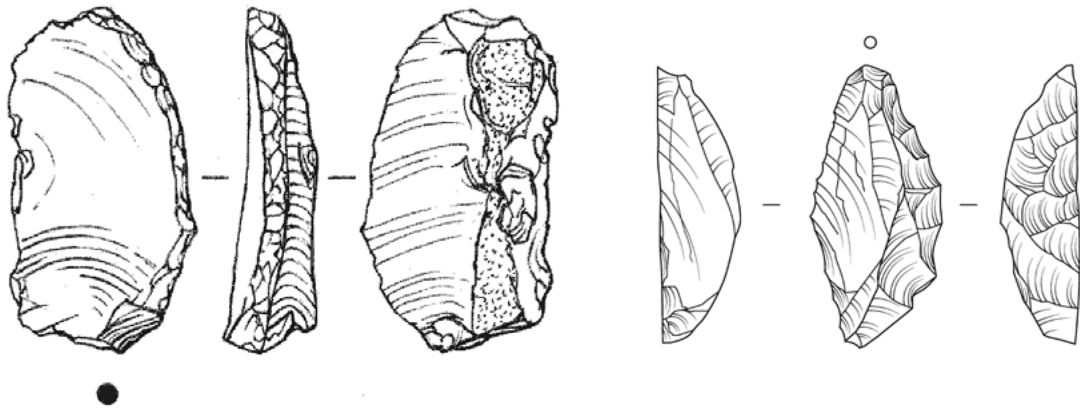


Figure 81: Backed knives: 1) A specimen of flint from Wester Clerkhill, Aberdeenshire – GD = 36mm (Cameron & Ballin 2018: Figure 16; artist: Jan Dunbar); and 2) a specimen of carnelian from Freeland Farm, Fife – GD = 31mm (Nicol & Ballin 2019; artist: Leeanne Whitelaw).

the piece to hold it. If these pieces were inserted into a haft, the proximal end might have been blunted bilaterally to avoid damaging the haft.

It cannot be ruled out that some pieces with straight and concave truncations may have served other functions than cutting, such as the Mesolithic ‘end-tools’ (Figure 83) so common in the Pembrokeshire Cleddau Valley, Wales, and described by David & Painter (2014: 53). They are defined in the following manner: ‘[They] are usually blades, bladelets or flakes which have one or both ends modified by retouch into a straight or slightly concave (notched) outline. [...] they differ from ‘truncations’ only in that the latter are oblique to the long axis of the support’. They suggest that these pieces (along with notched pieces; see below) represent ‘... some sort of specific craft or processing activities’. However, ‘end-tools’ and notches are not particularly common in northern Britain, such as

in Scotland. These pieces are also occasionally referred to as pieces with straight and concave truncations.

It is possible that some Neolithic blades with a truncation at either end (and occasionally blunting of the lateral edge opposite the cutting-edge) were used as inserts in composite sickles (Butler 2005: 132).

Scale-flaked and plano-convex knives: These two types form a continuum, both having had one or both lateral sides transformed into cutting-edges by invasive retouch. This retouch tends to be unifacial, but it may occasionally have been formed by bifacial modification. Pieces with one lateral cutting-edge may have steep backing along the opposite lateral side.

As pointed out by Clark (1932a: 158), the term ‘plano-convex knife’ ‘... accurately describes the section of the

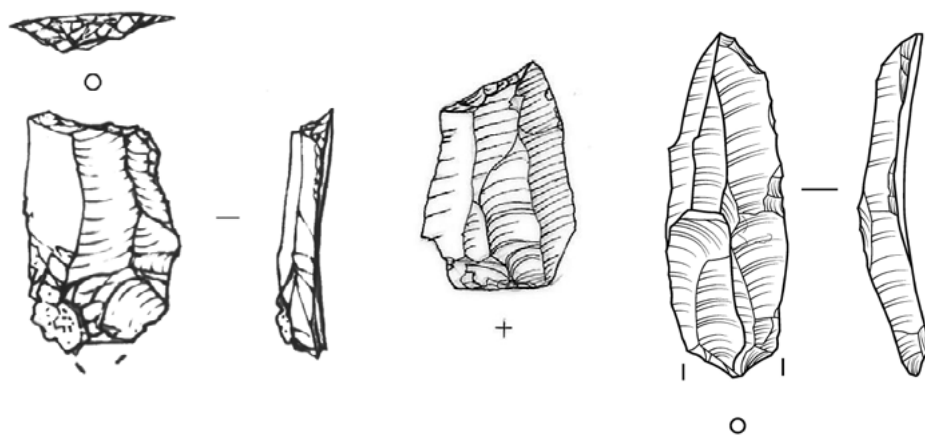


Figure 82: Truncations: 1) A piece with an oblique truncation from Garthdee Road, Aberdeen – GD = 22mm (Ballin 2014b, illus 19; artist: Jan Dunbar; courtesy of Murray Archaeological Services Ltd.); 2) a piece with an oblique truncation from Cutty Bridge, Pembrokeshire – GD = 23mm (David & Painter 2014: Figure 12; artist: Andrew David; courtesy: Andrew David); and 3) a piece with an oblique truncation from Milltimber Zone 5, Aberdeenshire – GD = 31mm (Ballin 2019c, illus 2.75; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.).

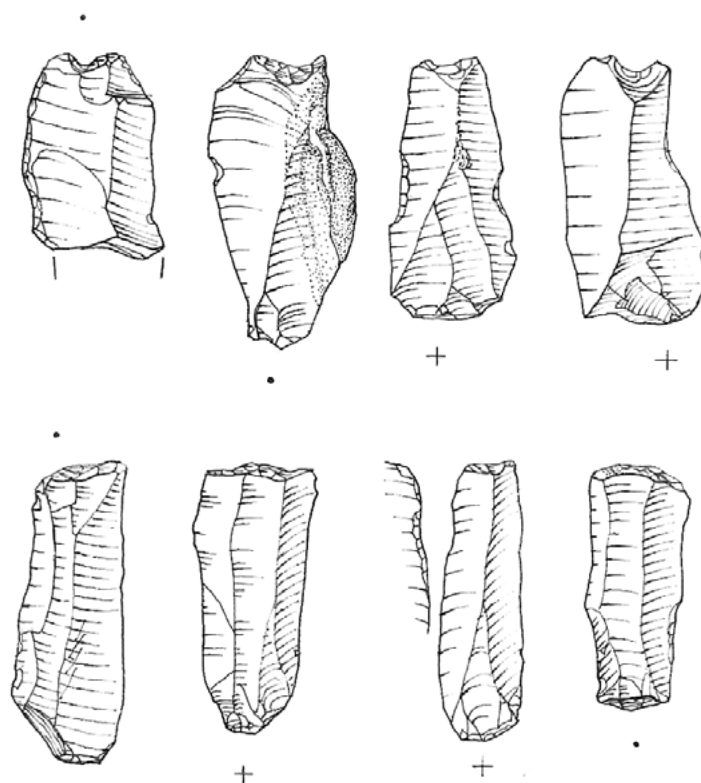


Figure 83: 'End-tools' from Cutty Bridge, Pembrokeshire – GD = 28-33mm
(David & Painter 2014; artist: Andrew David; courtesy of Andrew David).

implement', and '*... the point is normally obtuse, if not rounded...*'. It is easy to understand why the term 'slug-knife' was adopted by earlier generations of archaeologists for certain small Early Bronze Age knives, but this term should be avoided as not all plano-convex knives (and particularly not the later Neolithic ones) are small and slug-shaped (ibid. Pl. XXXII).

The important point when considering plano-convex knives (Figure 84.3-4) against scale-flaked knives, is that their plano-convex shape must have been formed by invasive retouch, and not simply by the incidental shape of the original blank. Usually, their entire dorsal face is covered by invasive retouch, although on occasion small areas of untouched original surface remain along the top of the dorsal face of the knife.

In contrast, scale-flaked knives (Figure 84.1-2) were shaped by invasive retouch ('scale-flaking') of their cutting-edge(s) only, commonly in association with abrupt retouch of the lateral side opposite the cutting-edge. Where plano-convex and scale-flaked knives tend to be associated with later Neolithic and Early Bronze Age industries (although some have been found in Early Neolithic contexts), backed knives may be found in most prehistoric contexts (e.g., Butler 2005: 112, 129, 170).

Laurel leaves: These pieces are relatively large, bifacially flaked implements (Figure 85), commonly with a length

of approximately 50-80mm (cf. Hurst Fen; Clark 1960: Figure 14), and they are usually found in Early Neolithic contexts. Although some laurel leaves may show similarities to the larger leaf-shaped arrowheads (for which they may perhaps have been preparatory blanks), many are notably asymmetrical and thicker, ruling them out as points. Most likely, these pieces were used as knives. For a more detailed discussion of the operational schema behind their manufacture, see Butler (2005: 130). They are relatively more common in parts of England (e.g., Hurst Fen in Suffolk) than for example in Scotland (one piece was recovered from Stoneyhill Farm in Aberdeenshire; Suddaby & Ballin 2010).

Foliate knives: These bifacial implements are yet another form of knives, and as the name suggests, they are morphologically related to laurel leaves, although they are considerably more regular, symmetrical and more carefully flaked (Figure 86). However, where the laurel leaves tend to date to the Early Neolithic, the foliate knives are associated with the Early Bronze Age (Ballin 2012a). They are relatively rare, and several of the known pieces have been recovered from burial contexts – the pieces from Skilmafilly in Aberdeenshire, Grandtully in Perthshire, as well as the specimen from Raunds in Northamptonshire, were all retrieved from Early Bronze Age urns (Ballin 2012a: 25).

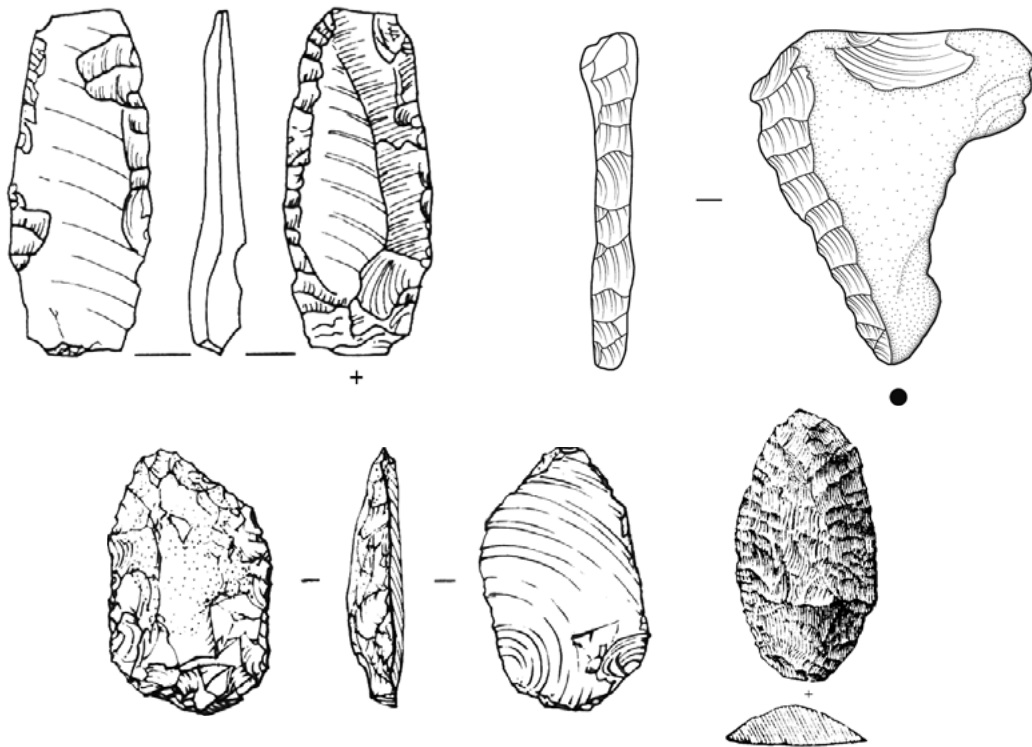


Figure 84: Scale-flaked and plano-convex knives: 1-2) Scale-flaked knives from Low Caythorpe, Yorkshire – GD = 58mm (Manby 1974: Figure 28; artist: T.G. Manby; courtesy of T.G. Manby); and Dunragit Site 8, Dumfries & Galloway – GD = 38mm (Ballin forthcoming b; artist: Jordan Barbour; courtesy of GUARD Archaeology Ltd.); and 3-4) plano-convex knives from Garthdee Road, Aberdeen – GD = 34mm (Ballin 2014b, illus 19; artist: Jan Dunbar; courtesy of Murray Archaeological Services Ltd.); and Bridlington, Yorkshire – GD = 45mm (Evans 1897: Figure 238; artist: J. Swain).

As shown in Figure 87, the foliate knives tend to be bi-pointed, and in his report on the finds from the Raunds Area project (Ballin 2011c: 450) the author referred to a foliate knife from Barrow 5 as ‘dagger-shaped’ (Figure 87, centre). The reason for calling this piece a foliate knife was its relatively small size (90 x 30 x 7mm), but the term ‘miniature dagger’ may be equally justified.

Curved knives: The term ‘curved knives’ was suggested by Whittle *et al.* (1986: 66-72) in the original presentation of the Early Neolithic finds from Scord of Brouster, Shetland, and, considering the general morphology of the pieces, the term is apt (Figure 88). Although solitary pieces of curved knives have been found elsewhere (e.g., Davidson & Henshall 1991, illus 21), Scord of Brouster is presently the only British site where these pieces are common (12 specimens), and the type may be limited to Shetland and northern Scotland. They are mainly characterised by one lateral side being convex and one concave, with varying shapes of base and tip. The pieces either have a flat base, which in most cases represents the blank’s platform remnant, or a bifacially shaped ridge (a ‘knapping seam’) connecting the two lateral sides. The tips are either pointed, or rounded, and the curvature of either lateral side is more or less pronounced. The marked lack of symmetry rules out

the possibility that these pieces may be leaf-shaped arrowheads or rough-outs for arrowheads.

Discoidal knives: Two knife forms are associated exclusively with the later Neolithic period, namely discoidal knives and polished-edge knives. The former is a group of related knife forms, some of which may be of discoidal shape, but several of which are not. They were characterised by Clark (1932b), who suggested the following forms (Figure 89):

- I. This form retains the general outline of the scraper, from which Clark (erroneously) assumed they descended. These pieces may be semi-circular or circular.
- II. Triangular knives, which may be sub-divided into acutely-angled and obtusely-angled variants.
- III. Lozenge-shaped or leaf-shaped knives.
- IV. Rectangular knives, which are frequently shaped like super-ellipsoids (Vestergård 2005). It is possible that the so-called Shetland knives (which are of felsite and not flint) represent exaggerated variants of this form (cf. Ballin

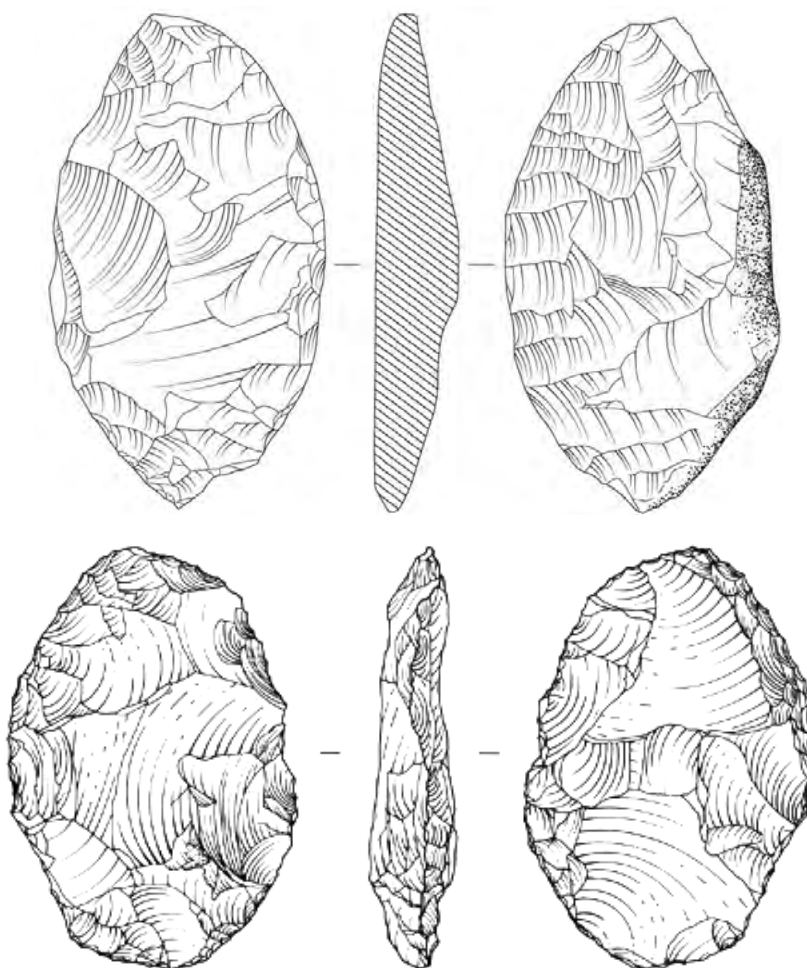


Figure 85: Laurel leaves: 1) A specimen from Hurst Fen, Suffolk – GD = 86mm (Clark 1960: Figure 14; redrawn by Leeanne Whitelaw); and 2) one from Stoneyhill Farm, Aberdeenshire – GD = 77mm (Suddaby & Ballin 2010, Illus 15; artist: Leeanne Whitelaw; courtesy of CFA Archaeology Ltd.).

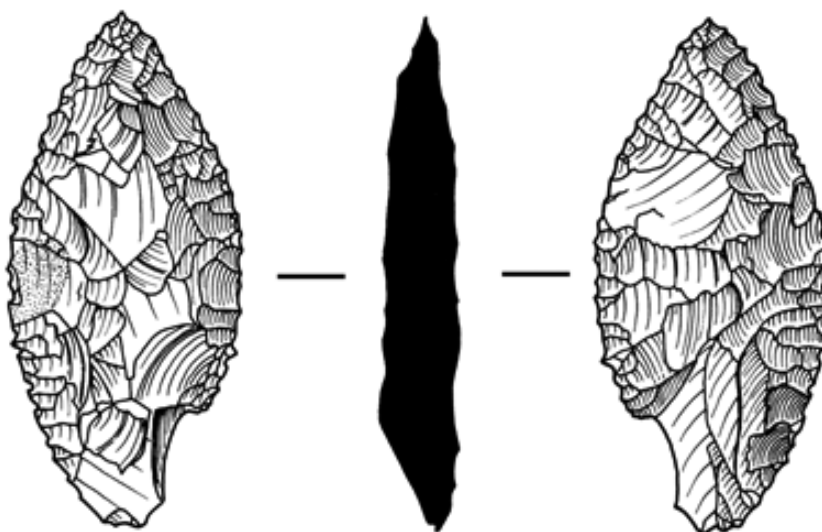


Figure 86: The foliate knife from the Skilmafilly cremation cemetery in Aberdeenshire – GD = 79mm (Ballin 2012a, Illus 14; artist: Alan Braby; courtesy of CFA Archaeology Ltd.).

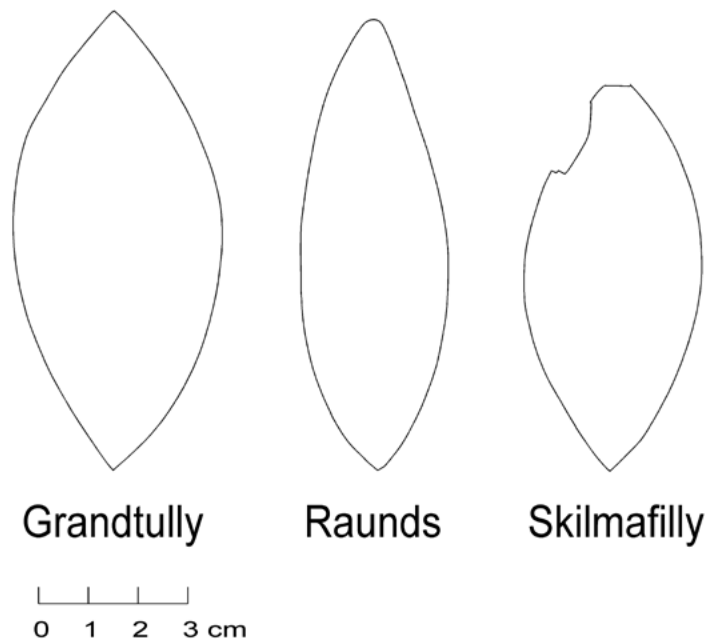


Figure 87: Comparison between the Skilmafilly knife and other foliate knives from the British Early Bronze Age.



Figure 88: Curved knives of quartz from Scord of Brouster, Shetland (Ballin 2005b, Illus 14; photo: Beverley Ballin Smith). The scorched surfaces of some of these pieces suggest that the blanks may have been heat-treated to allow the detachment of long and thin flakes by invasive retouch.

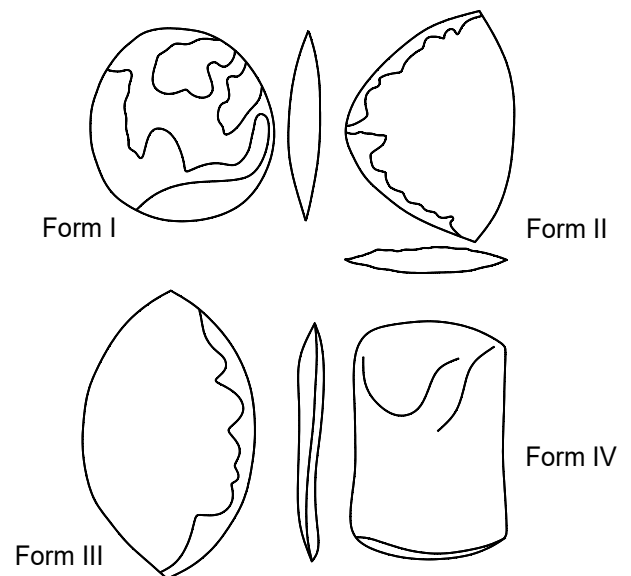


Figure 89: Clark's main types of discoidal knives (Clark 1932b, Figures 2, 3, 6, 7) (redrawn by the author); the examples are all partially or completely (Form IV) polished.

2015), but they might just as well represent an independent type.

Generally, the discoidal knives are based on flint flakes and shaped by a combination of bifacial flaking and grinding/polish of both faces (Figure 90). Considering

the fact that several of the category's sub-forms are not discoidal, this term is used here only loosely.

Polished-edge knives: The polished-edge knives (Figure 91) were discussed by Manby (1974: 86) in his volume on the Grooved Ware sites of Yorkshire. They appear

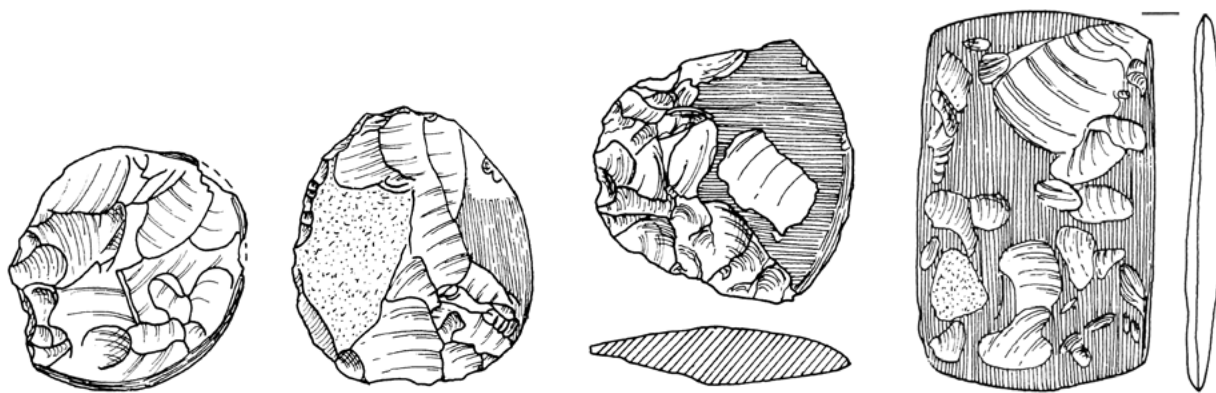


Figure 90: A selection of discoidal knives from North Dale, Callis Wold, Newark and Arbor Low, all Yorkshire – GD = 66-92mm (Manby 1974: Figure 34; artist: T.G. Manby; courtesy of T.G. Manby).

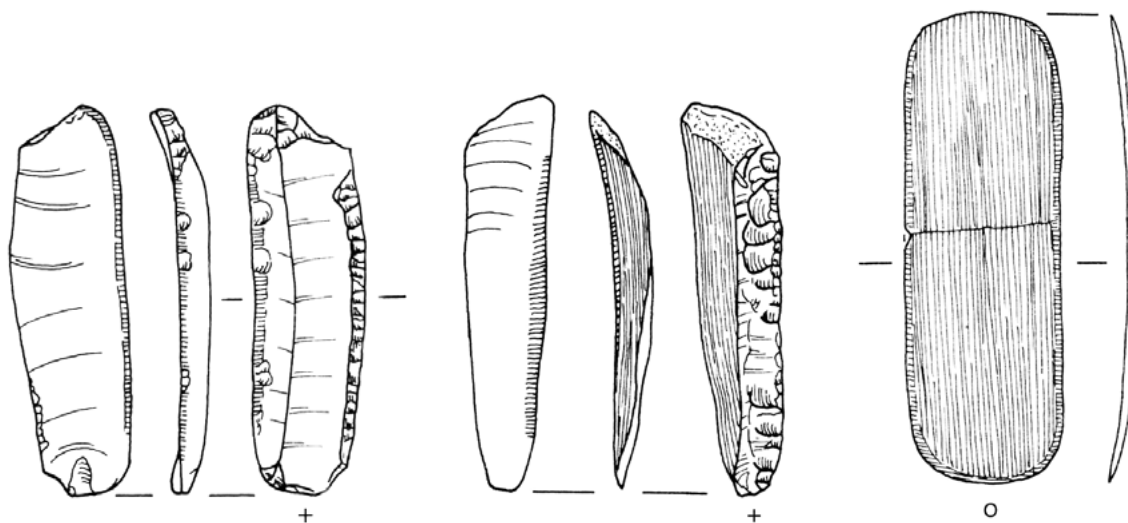


Figure 91. Three polished-edge knives from Charleston, Yorkshire (Type 1) – GD = 84mm; Linton Mires, Yorkshire (Type 2) – GD = 82mm; and Aldro Barrow, Yorkshire (Type 3) – GD = 106mm (Manby 1974: Figure 36; artist: T.G. Manby; courtesy of T.G. Manby).

largely to have been based on regular elongated flakes or, more commonly, stout macroblades. Following their level of sophistication, it is possible to subdivide these knives into three main forms (although also see Manby 1974: 113), namely:

1. Simple elongated flakes or blades with unifacial or bifacial polish of one or more edges and possibly parts of one or both faces (e.g., *ibid.* Figure 37.10, 12);
2. Well-executed scale-flaked or plano-convex knives with polished edges and, occasionally, parts of one or more faces (e.g., *ibid.* Figure 37.17, 18);
3. Pieces with fully polished faces (e.g., *ibid.* Figure 36.1-7).

The polished-edge knives may be slightly earlier than the discoidal knives possibly dating primarily to the Impressed Ware period, whereas the more sophisticated discoidal knives largely date to the Grooved Ware period (*ibid.* 86; also Butler 2005: 170).

As indicated above, British Neolithic and Early Bronze Age knives represent a spectrum of different forms, and the terms used to describe them are based partly on research dating to the 1930s (e.g., Clark 1932b; 1932b; 1934b; but also Manby 1974; Loveday 2011). Many forms represent continuums, and consideration should probably be given to replacing the presently applied nomenclature, or the descriptive terminology should at least be made more precise.

Bruised blades: So-called long-blade (*Riessenklingen*) assemblages (dating to the Ahrensburgian period; Lewis



Figure 92: Bruised blades: 1-3) Specimens from Gatehampton Farm, Oxfordshire – GD = 150-170mm (Barton 1998, Figure 21.1; artist: Jeff Wallis; courtesy of Nick Barton); and 4) bruised flake from Sroughton, near Ipswich, Suffolk – GD = 143mm (Barton 1986; photo: Nick Barton; courtesy of Nick Barton).

1991; Barton *et al.* 1998) commonly include so-called ‘bruised’ blades or *lames mâchurée* (Figure 92). These are defined as blades, some of which are longer than 12 cm, displaying distinct invasive scalar use-wear and battering-damage (‘bruising’) along one or both edges. It has been suggested (Barton 1998) that the wear was formed by chopping through hardwood, bone or antler or by honing/shaping soft sandstone hammers (e.g., Fagnard & Plisson 1997).

Skaill knives: This type of knife was defined by Childe (Childe & Paterson 1929: 242) in connection with his excavations at the later Neolithic village of Skara Brae on the shores of the Bay of Skaill, Mainland Orkney, and subsequently investigated further by Clarke (1989; 2006). A Skaill knife (Figure 93) is a mostly fully cortical flake of micaceous sandstone or related stone (quartz, quartzite, amphibolite) which was formed by throwing a beach cobble against another cobble or boulder. These flakes are characterised by having a powdery crushed scar at the point of impact, rather than the usual cone-shaped bulb of percussion, and only approximately 7% of the flakes have secondary modification. They are primarily defined through use-wear analysis and mostly display macroscopic edge-damage.

Bruised blades as well as Skaill knives are characterised primarily by their distinct macroscopic use-wear and they are therefore not formal implement types *sensu stricto*. Other blanks at Ahrensburgian long-blade sites and Scottish later Neolithic sites could have been used in similar ways, but less extensively so, without forming the use-wear defining the two types. This means that at these sites, the number of pieces defined

as bruised blades and Skaill knives, respectively, very much depends on the analyst and his/her perception of the wear.

Other bifacial cutting implements

British *curved single-piece sickle blades* (Figure 94) were characterised and discussed by Evans (1897: 355) and Clark (1934b): They are well-executed, bifacially retouched, usually asymmetrical pieces, with the longer lateral edge being convex and the opposite edge concave. The former edge tends to be relatively thick, and the latter relatively acute. It is thought that the convex edge would have been inserted into a wooden handle, whereas the concave edge was the cutting-edge. One end is generally pointed, and the other either slightly less pointed or rounded. These implements are generally associated with the Early Bronze Age, although it has also been suggested that some may date to the later Neolithic (Clark 1934b: 79; Butler 2005: 173).

Practically all known curved flint sickles have been found along the east-coast of England, from the English Channel to Yorkshire (Clark 1934b: Figure 6). One solitary piece has been found north of Yorkshire, near Balvenie Castle in Banff (Mitchell 1889: 18). In connection with the author’s investigation of later Neolithic lithic assemblages from sites near the Overhowden Henge in the Scottish Borders (Ballin 2011b), three scale-flaked or plano-convex knives (see above) were presented to use-wear specialist Dr Randy Donahue, University of Bradford, who concluded that they had been used for cutting/sickling grasses or cereals. Most likely, the Scottish scale-flaked and plano-convex knives (or some



Figure 93: Skaill knives from Skaill Bay, Mainland, Orkney
(Clarke 2015, Illus 6; photo: Woody Musgrove; courtesy of Ann Clarke).

of them) are also sickles, and they probably carried out the same work as the curved sickles of southern Britain.

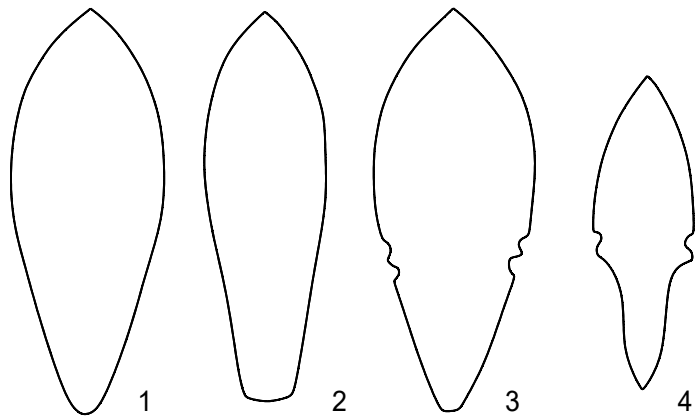
Daggers: These bifacial implements are the most sophisticated lithic cutting/piercing implements of British prehistory, and they are generally associated with the Beaker period (Smith 1919; Grimes 1932; Field 1984; Frieman 2014). Most have been recovered from graves and ritual contexts. Pieces were included in Frieman's catalogue of daggers if they:

1. were fully bifacially knapped;
2. were largely flat in profile, lacking a tendency towards marked plano-convexity or full convexity in profile;
3. were at least 100mm long when complete and unresharpened;
4. had a distinct double-edged cutting part with a reasonably pointed tip and a distinct tang or hafting end with several different possible base morphologies;
5. may belong to recognised types of flint daggers better known in other parts of Europe, specifically the Nordic area.



Figure 94: Bifacial crescent-shaped sickle from Fimber, Yorkshire – GD = 172mm
(Evans 1897: Figure 268); artist: J. Swain).

Figure 95: Grimes' (1932) four main dagger types; re-drawn by the author from Grimes (1932) and Field (1984).



They are generally up to 180mm long and 60mm wide. Both lateral sides are convex, and most (but not all) British daggers have the broadest point near the tip. Some daggers have, at the narrower end, one or more notches in their lateral edges, indicating that they were lashed into a haft. A Danish dagger found recently in connection with the construction of the bridge between Denmark and northern Germany had its handle-end wrapped in birch bark (Fischer Mortensen *et al.* 2015), and the dagger from Ffair Rhos in Cardiganshire, Wales (Green *et al.* 1982), had surviving mastic on the handle indicating the presence of binding.

Grimes (1932) subdivided British daggers into four groups, namely (Figure 95):

1. Simple leaf-shaped pieces with the widest part in the middle.
2. Pieces where the lower part is elongated and thicker; they occasionally have ground edges.
3. Notched pieces.
4. Tanged pieces.

However, based on recent research, Frieman (2014) suggests a classification of British daggers into six types

(Figure 96) as: 'A cursory examination of Grimes's (1932) typology and discussion makes clear that the categories he used to identify specific types of flint daggers are rather broad and do not easily lend themselves to archaeological analysis'. One important difference between her classification schema and that of Grimes is her inclusion of Scandinavian type daggers. Frieman's research shows that these daggers are not all uncontexted/poorly contexted pieces possibly resulting from recent (Victorian era?) trade in antiquities – a dagger from Ramsgate in Kent, for example (ibid. 38), was found on a cliff with two Scandinavian square-butted axeheads and may represent a hoard.

Frieman (2014) distinguishes between three distinct dagger types, namely hilted Scandinavian daggers (Figure 96.A), short-tanged British daggers (Figure 96.B), and long-tanged British daggers which can be divided into four morphological classes (Figure 96.C-F). These classes form a morphological continuum and overlap considerably. There are few metrical distinctions between the dagger types, and the classification of a specific object relies on three main observations, namely the morphology of the tang, specifically its edges; the shape of the blade, particularly regarding the point of its maximum width; and the transition

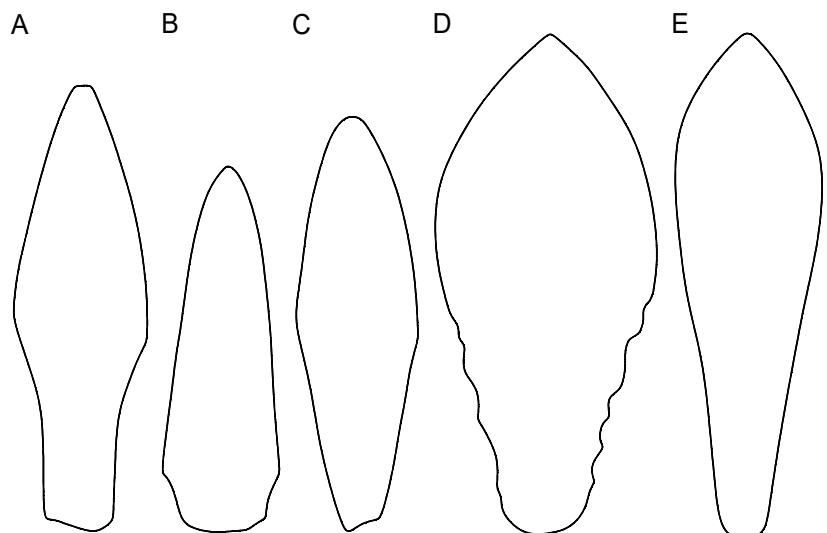


Figure 96: Frieman's six dagger types; re-drawn by the author from Frieman (2014).

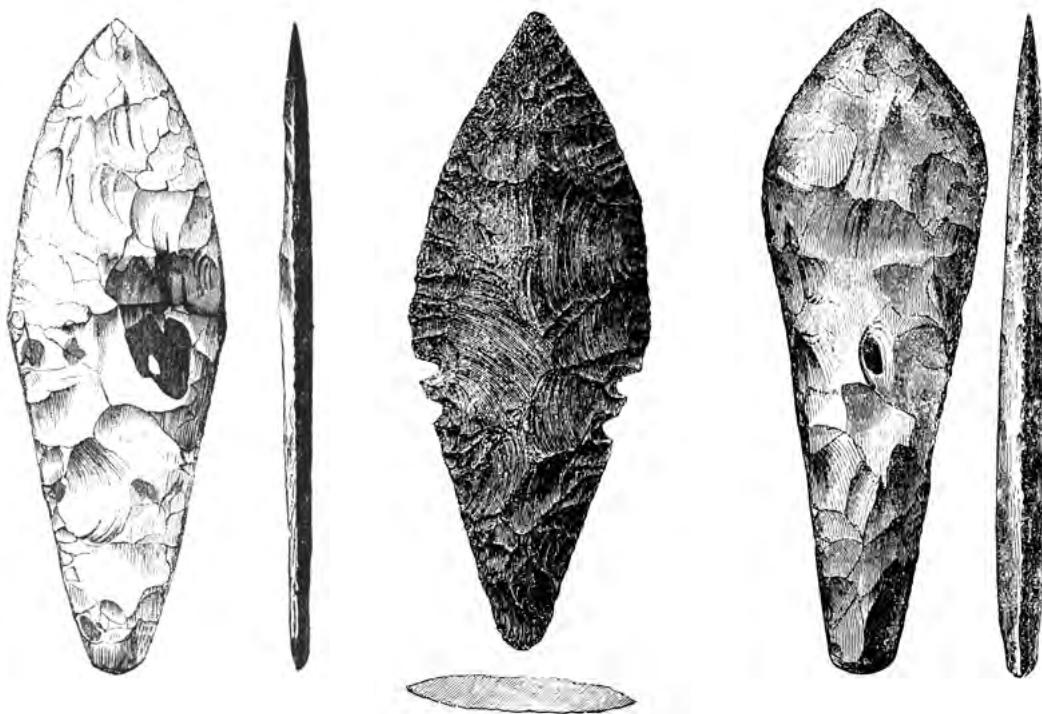


Figure 97: Daggers: 1) dagger of Frieman's Type C from Lambourn Down, Berkshire – GD = 170mm (Evans 1897: Figure 264; artist: J. Swain); 2) dagger of Frieman's Type D from Burnt Fen, Norfolk – GD = 168mm (Evans 1897: Figure 266; artist: J. Swain); and 3) dagger of Frieman's Type E from the Thames – GD = 176mm (Evans 1897: Figure 265; artist: J. Swain).

between tang and blade (the so-called 'junction'). Figure 97 shows leaf-shaped daggers of Frieman's Types C, D and E.

British as well as Danish daggers occasionally have partially polished faces, but it appears that the polish was applied for different reasons. The polish of Danish daggers (only Lomborg's Type 1C with parallel invasive retouch/ripple-flaking; Lomborg 1973: Figure 16b) was applied to give the piece totally smooth and regular faces which would allow the *subsequent* application of parallel retouch (Vang Petersen 1993: Figure 51), whereas the polish of British daggers was applied *on top* of the invasive retouch, along the edges, to produce a sharp cutting-edge (see polished-edge knives, above).

In his paper on British single-piece sickles, Clark (1934b) suggested that the British sickles could represent influence from Scandinavia, and the same has been suggested for the British flint daggers (Smith 1919). However, it is possible that the influence 'went the other way', or was mutual. It is a well-known fact that Danish flint daggers generally have a distinctively shaped, occasionally splayed handle, in some cases giving the pieces the shape of a fish ('fish-tail daggers'). The only exceptions are the *very earliest* Danish daggers which, like many British daggers, have no marked handle and they have their broadest point near the tip (Lomborg 1973: Figure 9: Types 1A and 1B).

Burins

In older archaeological literature, burins (Figure 98) were referred to as 'gravers', and it is thought that the main function of these Palaeolithic and Mesolithic implements (on rare occasions, burins have been recovered from Neolithic contexts; e.g., Bishop *et al.* 2019: 23) was to cut grooves in bone, antler and wood, for example in connection with the production of slotted bone points. However, use-wear analysis of burins suggests that although the main burin-edge was used in this fashion, the lateral sides of the scar left by the removal of the burin spall may have been used as working-edges when these tools were used as spoke-shaves. As burins were used to modify hard materials, their working-parts had to be strong, and the blanks are in most (but not all) cases relatively robust pieces, either flakes, blades, or chunky indeterminate pieces, or broken recycled tools. Generally, burins are poorly understood, even by specialists, and people find them difficult to identify, for which reason they tend to be either under- or over-represented in assemblages from hunter-gatherer sites.

Burins were produced by removing a burin spall, usually from the lateral side of a blank, by using a relatively flat area as a platform for the burin-strike. In many cases, a platform was produced by snapping a robust flake or blade, or an end of a blank could be truncated, with this

retouch then forming the platform. However, a burin-strike could also be directed towards a natural end of a piece, a lateral side, or a scar left from a previously detached burin spall.

In Scotland, the vast majority of Mesolithic burins are burins on breaks with more sophisticated burins practically being absent, whereas many LUP specimens are burins on truncations (approximately one-third of the 40 burins from the Hamburgian site Howburn in South Lanarkshire are burins of this type; Ballin *et al.* 2018) or combination tools (below). South of the Anglo-Scottish border the situation is somewhat different, and in England and Wales Mesolithic assemblages also include burins on truncations (see for example Conneller *et al.* 2018: 507; David 2007: 182).

The most common burins are burins on breaks, dihedral burins and burins on truncations, but there are many

other forms. The common *burin on a break* (Figure 98.1) is a flake or blade which has been deliberately broken, or which broke accidentally in connection with use, and which then had a thin burin spall detached along one lateral side by hitting the corner of the break facet. This produced a couple of strong 'horns' at the corner of the break facet, which were then used for engraving antler, bone or wood. A *dihedral burin* (Figure 98.2) had a burin-edge formed, usually at the centre of the blank's long axis, by detaching two or more burin spalls, with the scar from the first spall forming the platform of the next burin-strike. And a *burin on a truncation* (Figure 98.3) was in most cases formed by first giving the blank a straight, oblique, or concave end-retouch (truncation), which then formed the platform for the burin-strike; some burins on truncations may – like burins on breaks or dihedral burins – have their burin-edges either at a corner or on the long axis of the burins. However, as these pieces, in a British context, are highly diagnostic

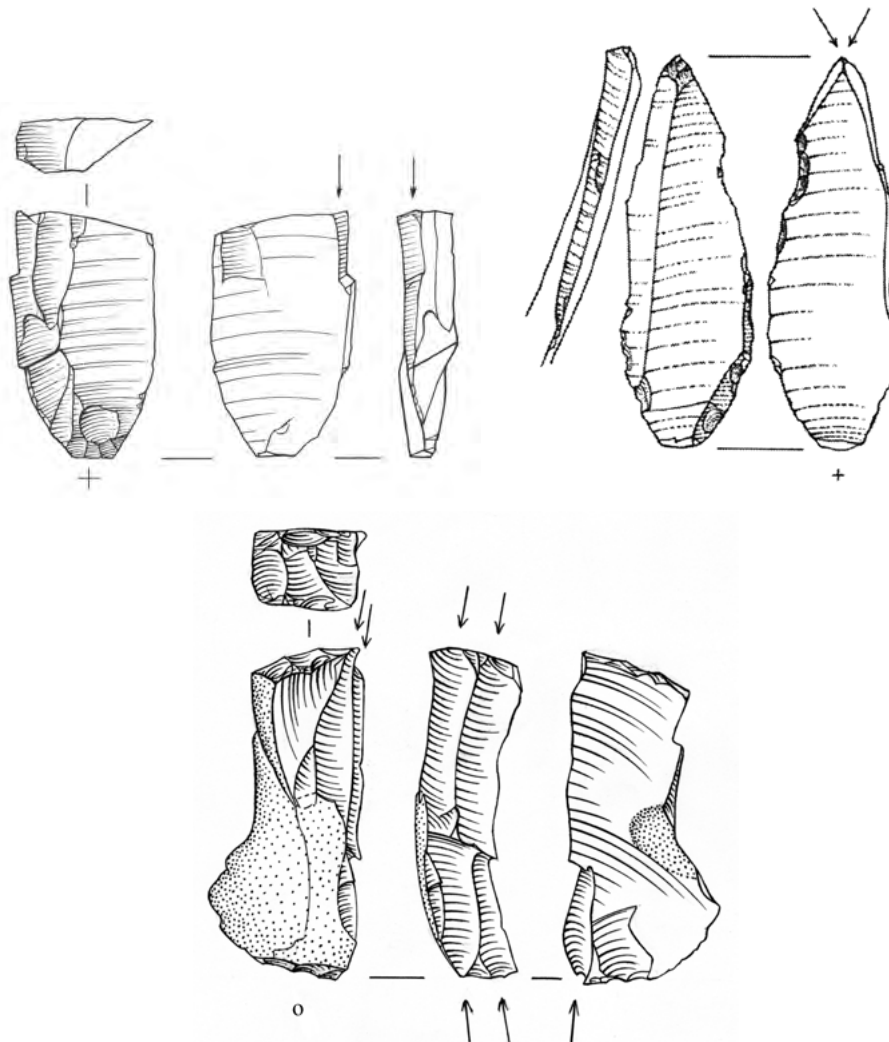


Figure 98: Burins: 1) Burin on a break from Howburn, S. Lanarkshire – GD = 34mm (Ballin *et al.* 2018, 14; artist: Marion O'Neil); 2) dihedral burin from Hoyle's Mouth, Pembrokeshire – GD = 41mm (David 2007: Figure 2.19; artist: Andrew David; courtesy of Andrew David); and 3) burin on a truncation from Howburn, S. Lanarkshire – GD = 38mm (Ballin *et al.* 2018, 15; artist: Hazel Martingell).

(at least in a Scottish context), they are usually classified as burins on truncations. Burins with more than one working-edge may be referred to as double-, triple or multi-burins. There are many other rarer burin types, which are characterised and discussed by Inizan *et al.* (1992). Figure 99 shows a selection of burins from the Mesolithic site Cwm Bach I in Pembrokeshire.

Due to the fact that burins were used to process hard materials, many of these pieces display macroscopic use-wear either at the actual burin-edges (the 'horns') or along the edges of the scar left by the burin spall. This use-wear may be picked up by a specialist with 20-20 eye-sight without magnification, or with the use of an ordinary magnifying glass (x8 magnification), and it is a useful attribute in terms of identifying these pieces.

Burin spalls (Figure 100) may be of any shape or size, but the most common ones are long and slender, with a notably triangular cross-section. They are easiest to identify if they were detached from the distal ends

of flakes or blades, as a spall like this would have two ventral faces with ripples going in opposite directions. However, burin-edges were occasionally made by detaching several burin spalls, or burin-edges may have been rejuvenated by the detachment of further spalls, and the secondary burin spalls tend to have trapezoidal cross-sections (see Inizan *et al.* 1992 for further detail). Another sign that a piece may be a burin spall is the survival of crushing along the original lateral edge; such preparatory edge-blunting or 'strengthening' helped detach longer/better spalls.

Occasionally, burin spalls overshot and removed one end of the original blank, which produced a distinctive curved spall and re-usable blank (Figure 98.3). One burin from the probably LUP site of Lunanhead, Angus (Ballin forthcoming c) was made on such a failed burin spall (Figure 101), where an attempt had been made to produce a burin on a truncated blade. The 'burin spall' was identified as having been used as a burin by very fine macroscopic use-wear at its distal left

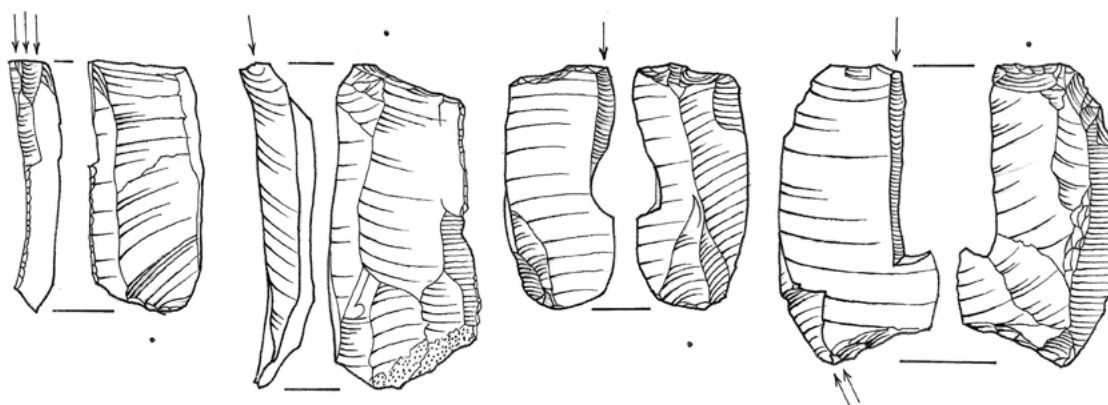


Figure 99: Selected burins from Cwm Bach I, Pembrokeshire – GD = 35-46mm (David 2007: Figure 7.14; artist: Andrew David; courtesy of Andrew David).

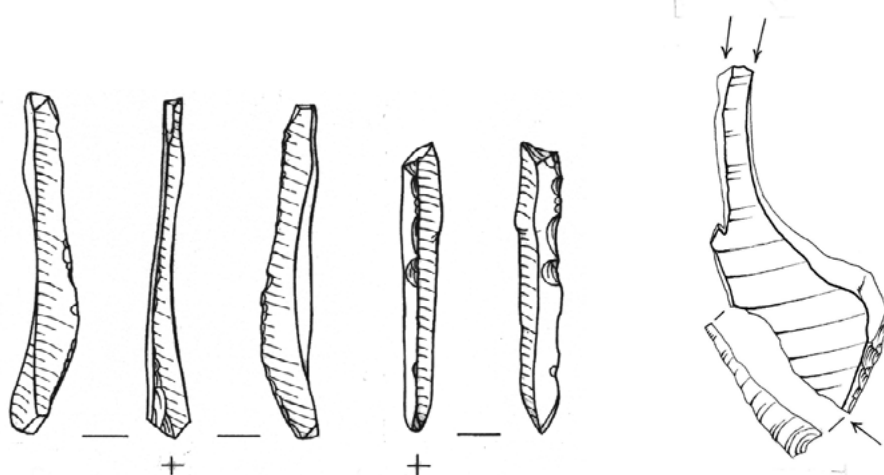


Figure 100: Burin spalls: 1-2) Specimens from Kilmelfort Cave, Highland – GD = 23-27mm (Saville & Ballin 2009, Illus 10; artist: Marion O'Neil); and 3) overpassed burin spall from Nanna's Cave, Caldey Island, Pembrokeshire – GD = 31mm (David 2007: Figure 2.13; artist: Andrew David; courtesy of Andrew David).

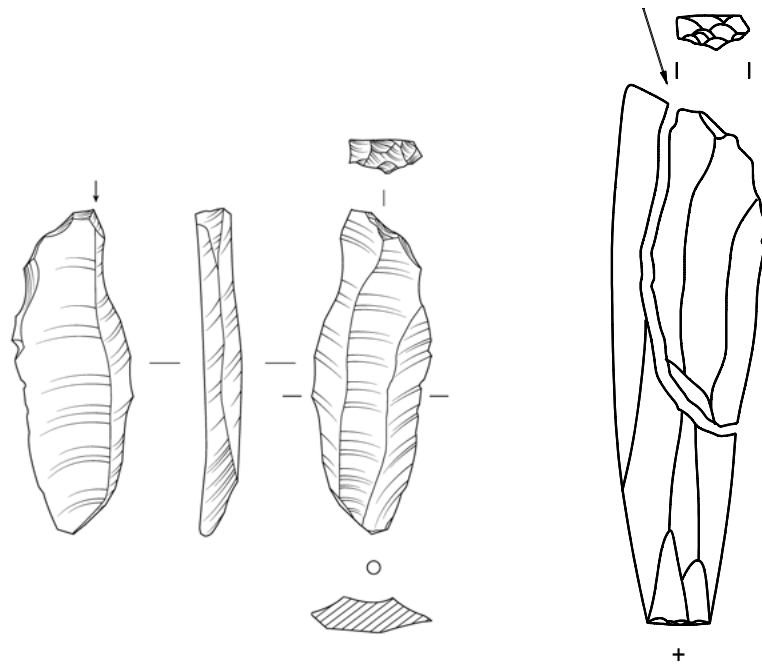


Figure 101: Burin on overpassed truncated 'burin spall' from Lunanhead, Angus – GD = 41mm (Ballin forthcoming c; artist: Leeanne Whitelaw): 1) Burin/burin spall; and 2) schema showing how this piece was formed.

corner (barely visible at x10 magnification), but it also has use-wear at its unmodified proximal right corner, showing that this piece – like the other two burins from Lunanhead – was used as a double-burin.

Fire-making implements

This category includes two main groups of artefacts, namely flint *strike-a-lights* and *fire-flints*. Most so-called 'fabricators' in older reports and papers are probably strike-a-lights.

In prehistory and post-Bronze Age times (Iron Age to the post medieval period), several different techniques were applied to produce fire, with the main prehistoric manner of fire-making involving a flint and a piece of pyrite (or other forms of sulfuric iron), whereas the main later manner of fire-making involved a flint and a mostly bullhorn-shaped steel implement (Ballin 2005a). The identification of flints formerly termed 'fabricators' as strike-a-lights is supported by use-wear analysis (Sorenson *et al.* 2014; Coutouly *et al.* 2015).

It is suggested that the use of the term 'strike-a-light' (Figure 102) is limited to the implements doing the actual striking (subject), and not the material which is being struck (object). This means that, in prehistoric fire-making, the flint is the strike-a-light (as it *strikes* the pyrite), whereas, in later fire-making, it is not (as it is being *struck* by the steel strike-a-light). It is suggested that the struck post-Bronze Age lithics are referred to as 'fire-flints' (Figure 103). The fact that the

prehistoric and later fire-making flints are subjects and objects, respectively, results in notably different wear-patterns, with the former developing smooth abraded points (as seen on most 'fabricators'), whereas the latter develop chipped and crushed, frequently concave edges. Although strike-a-lights occur in all pre-Bronze Age periods, they are particularly common in later Neolithic contexts (cf. Ballin 2011b).

As part of the attempt to characterise a number of assemblages including fire-flints, the author devised a typology to present the observed morphological variation (Ballin 2005a). Three main categories were defined, namely 1) fire-flints based on raw nodules, 2) 'shaped' fire-flints, and 3) fire-flints based on flakes, thermal flakes and flake fragments.

Gunflints: Although gunflints are not prehistoric implements they need to be mentioned in a typological guide of prehistoric lithic artefacts, as some gunflint types are occasionally mistaken for prehistoric tools, such as scrapers.

When gunflints are characterised, a number of formal elements are focused upon, as shown in Figure 104. In Britain, only a small number of formal gunflint types are found, some of which are diagnostic of nationality, whereas others are chronologically diagnostic. The three main types are early flake-based gunflints and British and French blade-based gunflints.

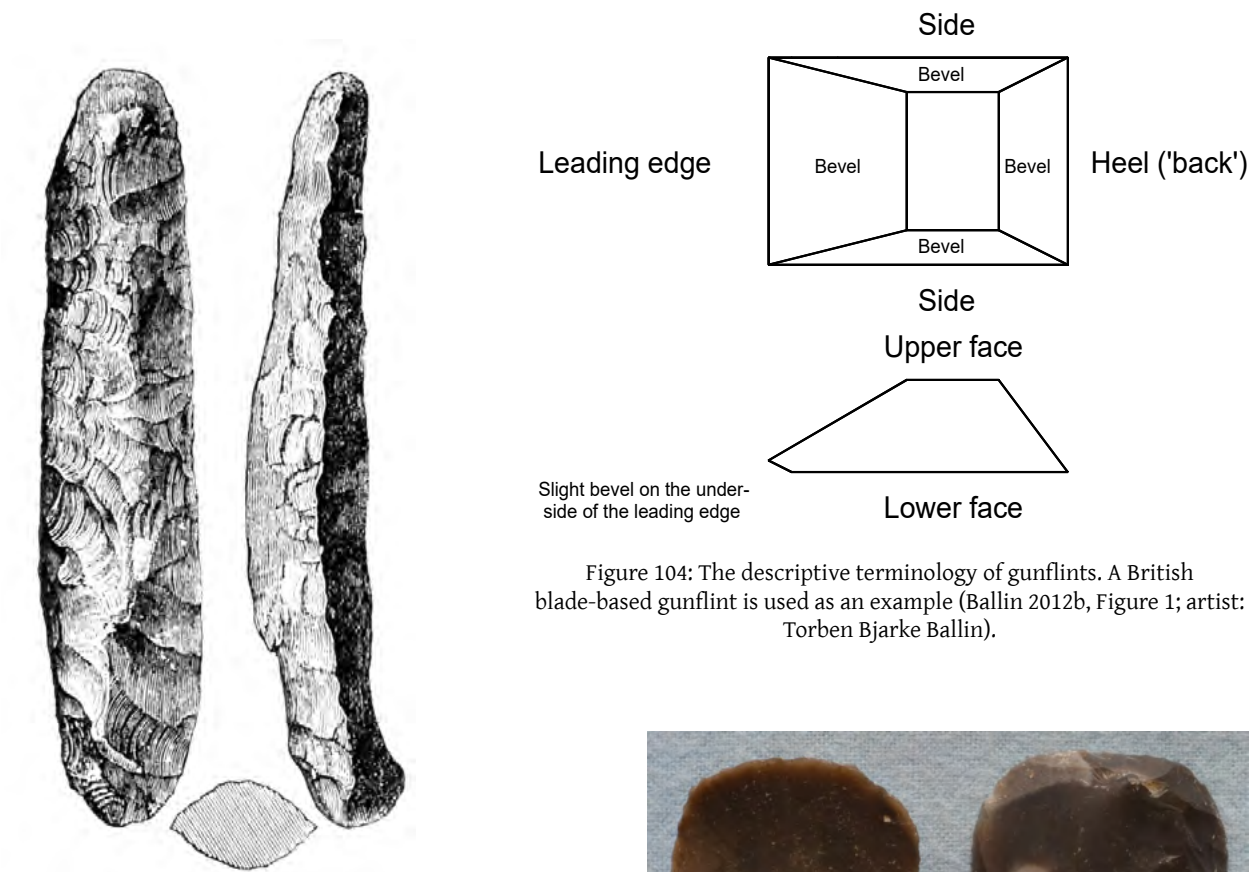


Figure 102: Strike-a-light from the Yorkshire Wolds – GD = 77mm (Evans 1897: Figure 346; artist: J. Swain).

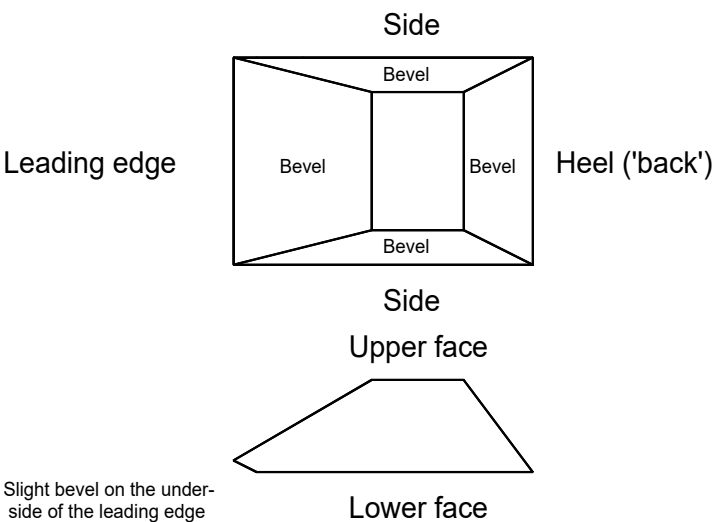


Figure 104: The descriptive terminology of gunflints. A British blade-based gunflint is used as an example (Ballin 2012b, Figure 1; artist: Torben Bjarke Ballin).

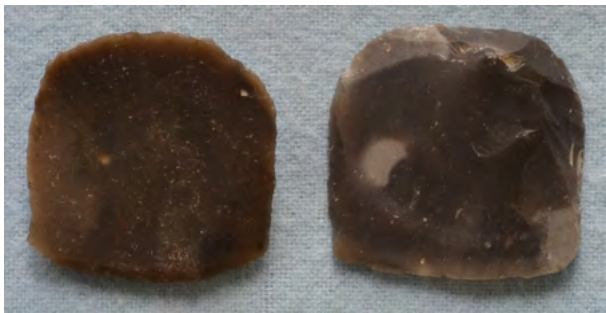


Figure 105: Early flake-based gunflints (gun-spalls). Upper (1) and lower (2) faces of gunflints from the British ship The Invincible (wrecked 1758) – GD = 42mm (Gartley & Ballin 2015: Figure 5; photo: Beverley Ballin Smith).

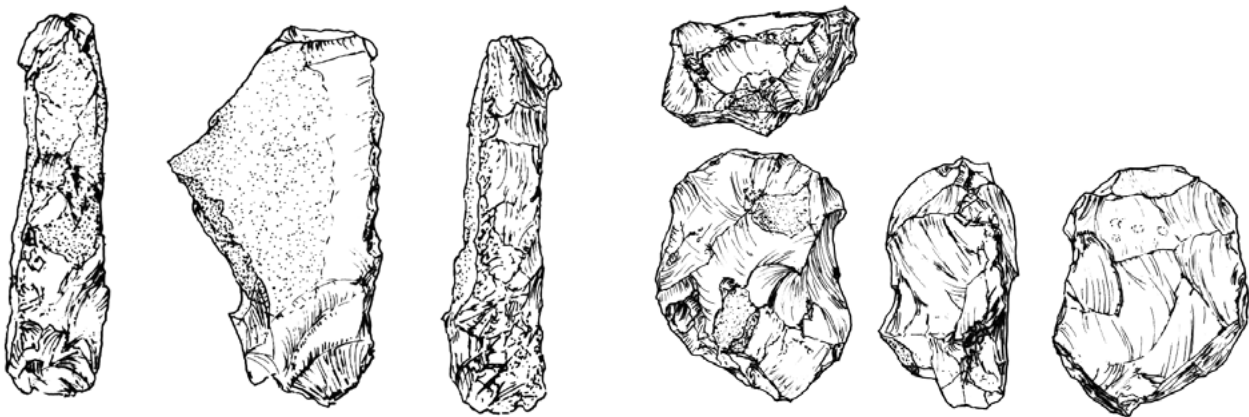
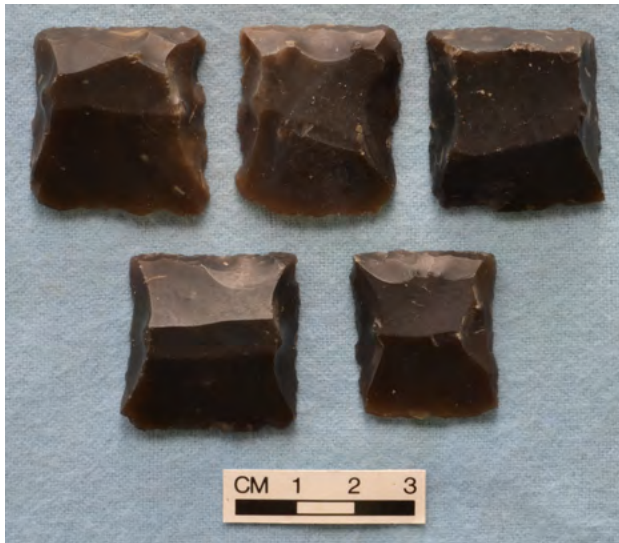


Figure 103: Fire-flints: 1) Fire-flint on thermal flake; and 2) shaped fire-flint from a later Neolithic site at Townparks, Antrim town, Northern Ireland – GD = 65mm and 56mm, respectively (Ballin 2005a, Figures 8-9; artist: Alexandra Speir; courtesy of GUARD, University of Glasgow).



Figures 106-107: Blade-based gunflints: 1) British later blade-based gunflints, manufactured in Brandon, Suffolk; and 2) French later blade-based gunflints, manufactured in the Meusnes area, central France; (Ballin 2013: Figures 2-3; photos: Beverley Ballin Smith).

Figure 105 shows typical early flake-based gunflints (gun-spalls) with a convex heel. Pieces like these are known from Britain as well as France, but their dates differ: in Britain, flake-based gunflint production was replaced by the more economical/productive method of producing gunflints by segmenting long blades just prior to 1800. In France, this change occurred approximately 100 years earlier.

Figure 106 shows examples of typical late British blade-based gunflints, whereas Figure 107 shows examples of typical late French blade-based gunflints. In terms of colour, British blade-based gunflints tend to be black, whereas the French ones tend to be either honey-coloured/amber (from Meusnes) or light-grey (Provence) (Emy 1978; Weiner 2016). In terms of general shape, the British ones tend to be rectangular (although variants occur; Ballin 2016d), whereas the French ones tend to be D-shaped or have rounded corners. However, as shown in Figure 107, other French forms also occur, such as square, rectangular and trapezoid ones.

Rods (LN and BA)

The term 'rod' is somewhat confusing, as in the past this term has also been used to describe a particular type of microlith (although see above). However, the term as applied in this section describes a robust elongated type of implement (Figure 108), which has been associated with British flint mining locations, such as Den of Boddam in Aberdeenshire (Saville 2011: 26) and Grimes Graves in Norfolk (Saville 1981a: 62). At these two locations, rods appear to be associated with later Neolithic and Middle Bronze Age contexts, respectively.

They tend to be 80-90mm long, up to 20mm wide, and c. 15-25mm thick, and they are based on modified thick flakes or flake fragments. Saville suggests (1981a: 63) that, although mostly displaying no or little use-wear, it is most likely that the pointed ends, not the lateral sides, were used, and that they may have been hafted. Their specific use is presently unknown.

Polished-edge implements

Like the rods, this category is poorly understood. The author defined this type of implement in connection with his characterisation and discussion of later Neolithic assemblages (Airhouse and Overhowden) near the Overhowden Henge in the Scottish Borders (Ballin 2011b), as they clearly did not fit into any commonly used standard tool typologies.

Although most of the 21 polished-edge implements from the surroundings of the henge are in their original scrapers, it was chosen to define them as a separate tool type, as the function of the implements at the end of their use-life was clearly not scraping in the traditional sense. The difference between polished-edge implements and polished-edge knives (above) is that the former have notably rounded, blunt working-edges (Figure 109), apparently formed on top of mostly convex scraper-edges, whereas the latter have sharp cutting-edges formed by polishing edges prepared by invasive retouch (cf. Manby 1974: 36-37).

Seventeen pieces from Airhouse and Overhowden are end-scrapers, which have had their convex distal working-edges transformed by abrasion. In some cases, the entire working-edge has been rounded completely by polish, and in other cases only points along the

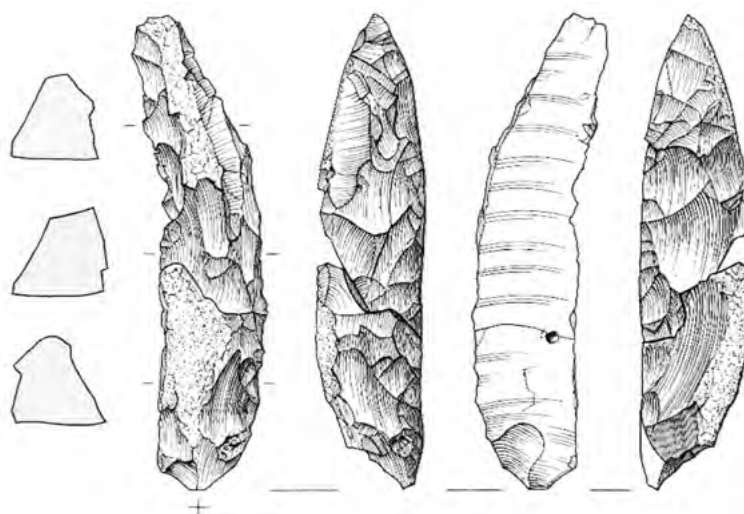


Figure 108: Rod from the flint mines at Den of Boddam, Aberdeenshire – GD = 89mm (Saville 2011: Figure 14; artist: Marion O’Neil; courtesy of Alan Saville/Annette Carruthers).

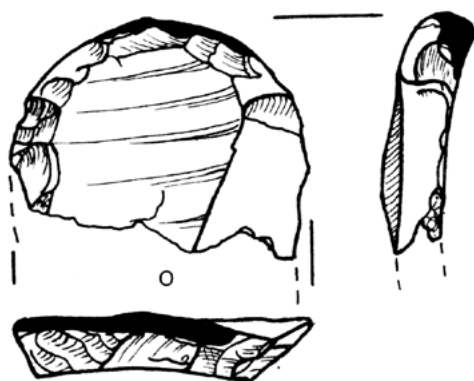


Figure 109: Later Neolithic polished-edge implement from East Reservoir Site 3, Yorkshire – GD = 46mm (Manby 1974: Figure 7; artist: T.G. Manby; courtesy of T.G. Manby).

working-edge, or possibly the corners of the working-edge, were rounded. The polished areas are usually almost mirror-like, whereas in some cases the polish shows light striations. The category also includes side-scrapers with polished working-edges, as well as edge-retouched pieces with polished edges. Some simple flakes and blades also displayed polish, either along the edges, or at corners, and dorsal arrises may have been abraded. As several of the blanks of the polished-edge implements from these sites were Levallois-like flakes or blades, they clearly date to the later Neolithic (Ballin 2011a).

Three later Neolithic end-scrapers with extensive edge-polish were examined for use-wear by Dr Randy Donahue, University of Bradford (Ballin 2011b: 29). He determined that they had been used for intensive

processing of dry hide, although the exact function of this activity is presently uncertain. The rounded edges cannot have been used for scraping in the traditional sense, as scraping (whether on skin/hides, or harder materials) requires sharp edges.

At the Milltimber site on the route of the Aberdeen Ring Road, a large assemblage of pieces with polished edges or points (159 of 415 tools or 38%; see Figure 110) have been interpreted as most likely Mesolithic pieces (Ballin 2019c). Four of these pieces have lateral use-wear from cutting, and one seems to have a degree of gloss, possibly indicating the processing of vegetable matter. They appear to have been used either slightly less, or in a slightly different way, than the well-known later Neolithic pieces (Ballin 2011b), as they did not develop the mirror-like polished surfaces of these objects.

Pieces with one or more notches

These tools were formed by shaping one or more single notches in an edge, or by joining up notches to form serrated and denticulated pieces.

Notched pieces are flakes or blades with one or more single notches, which do not join up to form spurs or teeth. As single-detachment notches may on occasion have been formed in connection with prehistoric activity (use or trampling) or post-depositional damage, the notch of a notched piece must have been created by retouch and not by the detachment of a single chip or small flake. Some small blades and microblades with a lateral notch may be microlith preforms, not yet snapped by microburin technique (Figures 44-45), and some small single or opposed notches at the proximal ends of flakes or blades may be hafting devices (Figure 111.1).

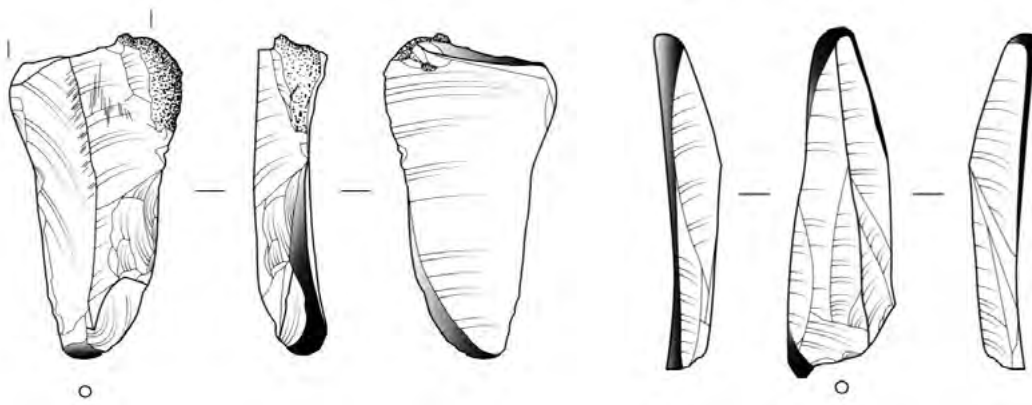


Figure 110: Two probably Mesolithic polished-edge implements from Milltimber Zone 5, Aberdeenshire – GD = 36-37mm (Ballin 2019c, Illus 2.89; artist: Leeanne Whitelaw; courtesy of Headland Archaeology Ltd.).

Although notches are relatively rare in many parts of the country (e.g., Scotland), they are numerous on some Late Mesolithic sites in the Pembrokeshire Cleddau Valley, Wales (Figure 111.2-5) (David & Painter 2014) where they dominate (with the so-called ‘end-tools’; see section on truncations above) some assemblages. The authors defined them in the following manner (ibid. 52): ‘... notched pieces [are] flakes or blades (‘supports’) where an edge appears to have been deliberately and distinctly indented by retouch. Such indentations have widths as great as 180mm and as deep as 6mm, the outline varying within these limits from small and abrupt to wide and shallow’. They suggest that these pieces (along with ‘end-tools’; see above) represent ‘... some sort of specific craft or processing activities’ (ibid. 88).

Butler (2005: 54) suggests that the concavities of notches should not have chords of more than 10mm and be more than 2-7mm deep, and the Late Mesolithic

Welsh ‘notches’ should possibly be defined as concave scrapers or spokeshaves.

Serrated pieces (or micro-denticulates) are flakes or blades with fine lateral serration, and the notches were usually formed by cutting an edge with the edge of another sharp flint flake (Figure 112). Some of these pieces are characterised by having 6-8 teeth per cm, whereas others may have up to 20 teeth per cm. In Britain, these pieces are common in Early Neolithic contexts (Saville 2006), but they are also found on sites from other periods, such as some Early Mesolithic sites (e.g., Star Carr, North Yorkshire [Conneller *et al.* 2018: 526]; Thatcham [Wymer & King 1962: 348] and Hengistbury Head [Barton 1992: 217]) and later Neolithic sites (Overhowden, Scottish Borders; Ballin 2011a: 43). Coarser serrated pieces are also known (‘saws’), with the notches between the teeth having

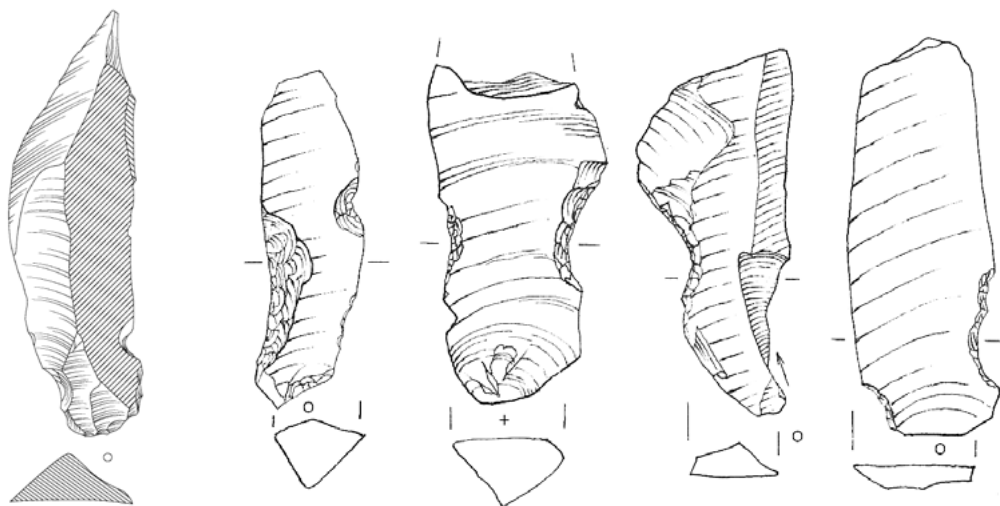


Figure 111: Notched pieces: 1) a piece with opposed proximal (hafting?) notches from Woodend Loch, North Lanarkshire – GD = 57mm (Davidson *et al.* 1949: Figure 3; redrawn by Leeanne Whitelaw); and 2-5) specimens from Cutty Bridge, Pembrokeshire – GD = 38-45mm (David & Painter 2014: Figure 11; artist: Andrew David; courtesy of David);.

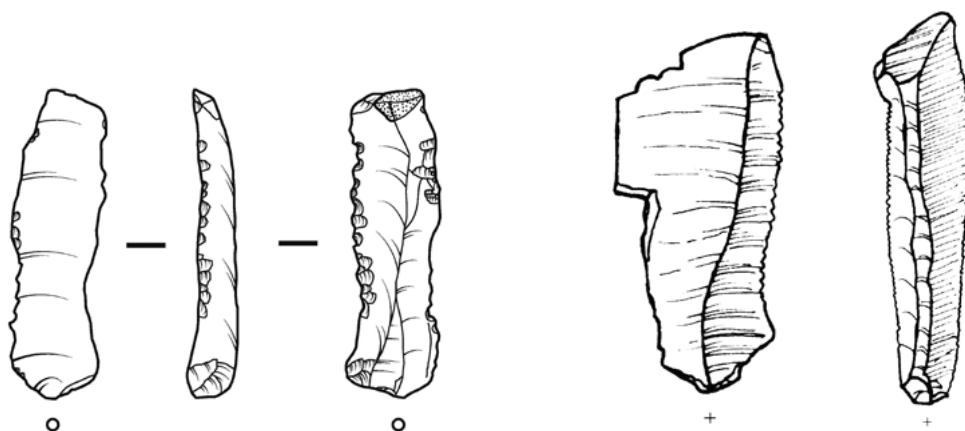


Figure 112: Serrated pieces: 1) Specimen from Carnoustie, Angus – GD = 44mm (Ballin forthcoming a; artist: Jordan Barbour; courtesy of GUARD Archaeology Ltd.); and 2-3) from Flamborough, Yorkshire – GD = 50-66mm (Manby 1974: Figure 31; artist: T.G. Manby; courtesy of T.G. Manby).

been formed by the removal of two or three small chips (Healey & Robertson-Mackay 1983: 8).

Denticulated pieces or denticulates (Figure 113) are relatively crude implements based on pebbles, thick flakes or indeterminate pieces, and they are characterised by having a number of large protruding teeth, shaped by the detachment of large chips or small squat flakes. Some denticulated pieces are likely to be simple cores and others crude scrapers. They are especially characteristic of Late Mesolithic assemblages from western coastal areas (David 2007), but can occur elsewhere in Middle or Late Bronze Age contexts (Ballin

2002a). At the Later Mesolithic site of Cwm Bach I in Pembrokeshire denticulates comprise 28% of all tools (227 out of 801 pieces; David 2007: Figure 7.12.5-13). At this and other such sites denticulates can grade into ‘nosed pieces’ (i.e., pieces with just two denticulations isolating a single ‘tooth’) which may be a form of piercer (a coarser form of the spurred implements or robust piercers mentioned above).

Combined tools

During prehistory, it was common practice to equip tools with more than one working-edge (Figure 114).

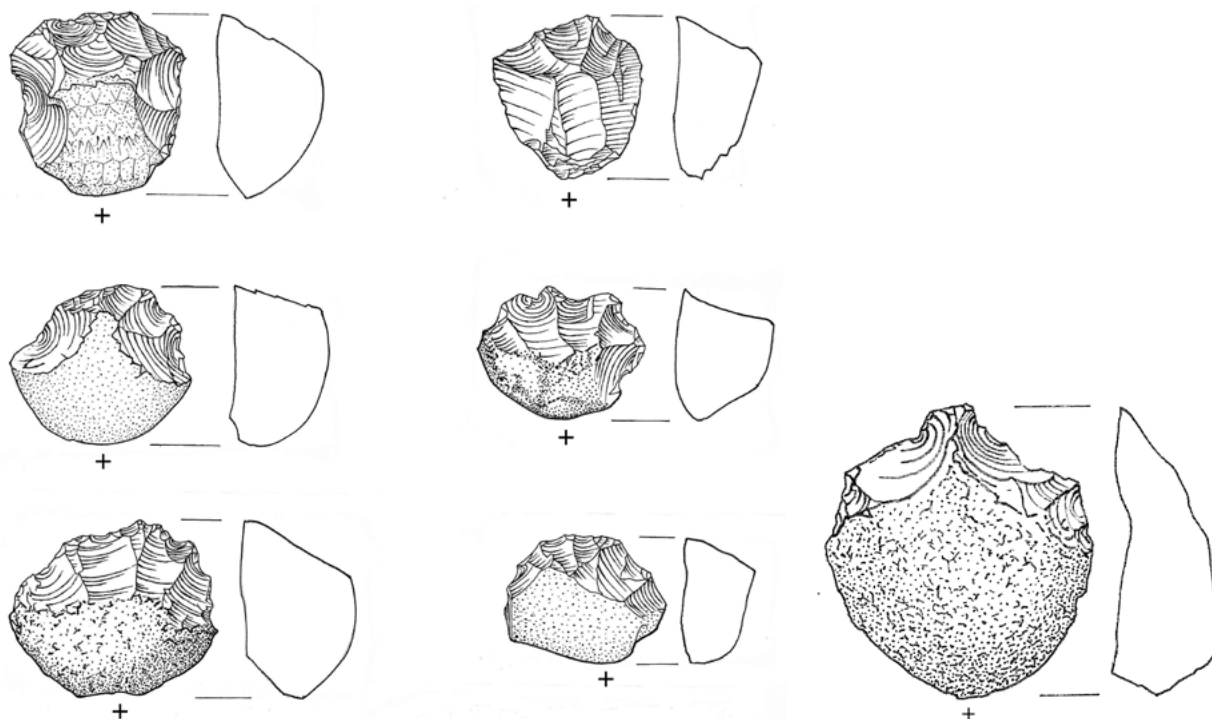


Figure 113: Denticulated and nosed pieces: 1-6) Denticulated pieces from Llanunwas, Pembrokeshire (GD = 30-38mm); and 7) a nosed piece from Penpant, Pembrokeshire (GD = 31mm) (David 2007: Figure 7.8 and David 2020: Figure 8; artist: Andrew David; courtesy of Andrew David).

If a piece has two working-edges of the same kind, it would be referred to as, for example, a double-scaper, whereas a piece with two working-edges of different function would be referred to as a combination tool or combi-tool (for example a scaper-burin). Combination tools were produced throughout prehistory, but they are more common during some periods than others. Implements with multiple functions are for example quite common on British LUP sites (e.g., Howburn in South Lanarkshire; Plate 16; Ballin *et al.* 2018) as well as on later Neolithic sites (e.g., Airhouse and Overhowden, Scottish Borders; Figure 27; Ballin 2011b).

Pieces with other retouch

This category includes intact as well as fragments of pieces with *simple edge-retouch* and fragments of pieces with *invasive retouch*, which did not fit into any of the formal categories above. It is not always easy to distinguish between retouch and continuous lateral use-wear without the use of a microscope (and in some cases, not even then), and it may occasionally be necessary to add a category of 'utilised pieces' or 'pieces with macroscopic use-wear' to a lithics report.

Flint axeheads

This category includes two main groups of implements, namely Mesolithic axeheads and adzes (including

picks), and Neolithic ones. Mesolithic flint axeheads are generally absent in northernmost England and Scotland. Many analysts distinguish between axeheads and adzes, based on whether a piece was used with its cutting- or chopping-edge parallel to the axe-shaft or at a perpendicular angle to it. The former tend to have a symmetrical, usually pointed-oval cross-section and a straight profile, whereas the later tend to have an asymmetrical, either sub-triangular, rhomboid or trapezoidal cross-section, and a curved profile. However, it is frequently difficult to define a piece as having been used in a specific manner, and it is recommended to use the term 'axehead' as the generic term for both types, and only apply the term 'adze' when it is obvious that it must have been inserted into the axe-shaft at a perpendicular angle to the shaft.

The most common Mesolithic flint axehead is the *core axehead*, most of which are *tranchet axeheads* (Figure 115). These pieces are called core axeheads (manufactured by removing flakes across both main faces) to allow them to be distinguished from flake axeheads (based on flake blanks). The core axeheads are generally characterised by a blunt butt, which would be inserted into a shaft, a sharp cutting-edge, two lateral sides each defined by a knapping seam, and a pointed-oval, sub-triangular, rhomboid or trapezoidal cross-section. Wymer (1977, xii) subdivided core axeheads into three size categories,

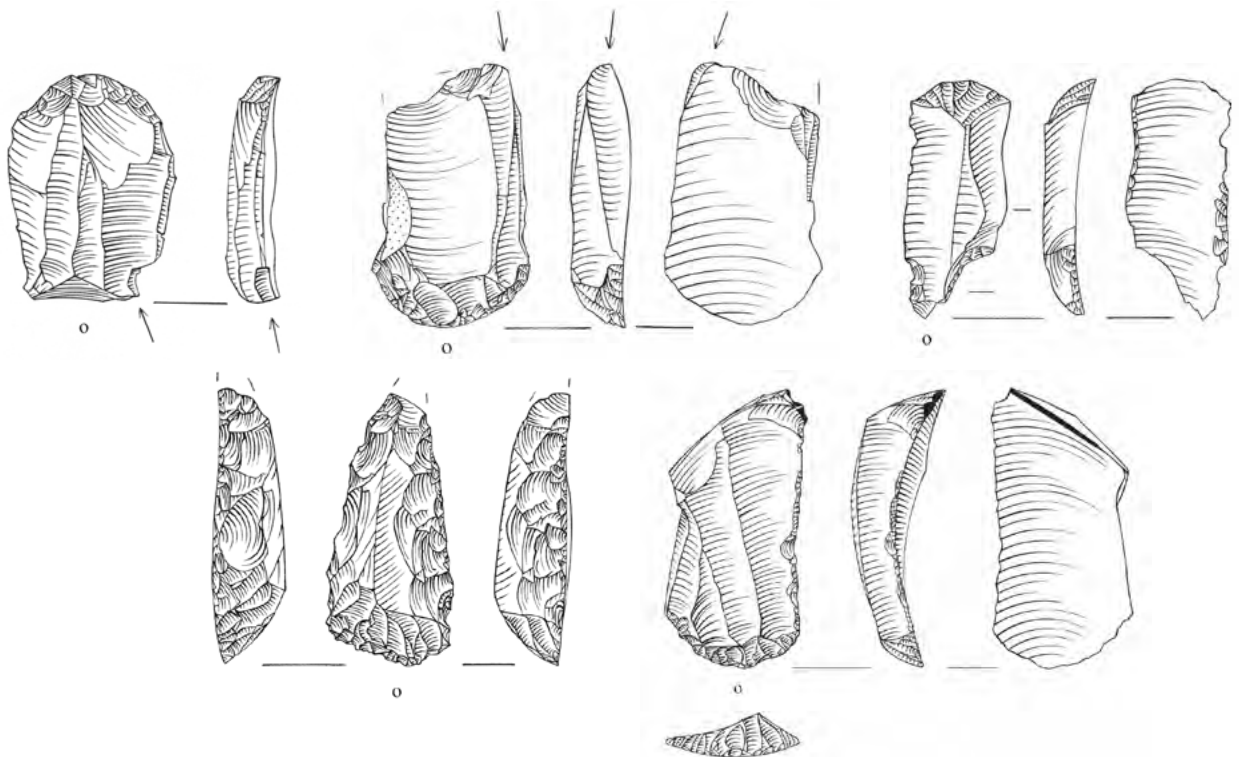


Figure 114: Examples of combi-tools from the Hamburgian site Howburn, South Lanarkshire – GD = 31-46mm (Ballin *et al.* 2018, Plate 16; artist: Hazel Martingell): Two scraper/burins (1-2); one scraper/Zinken (3); one scraper/bec (4); and one scraper/polished-edge implement (5).

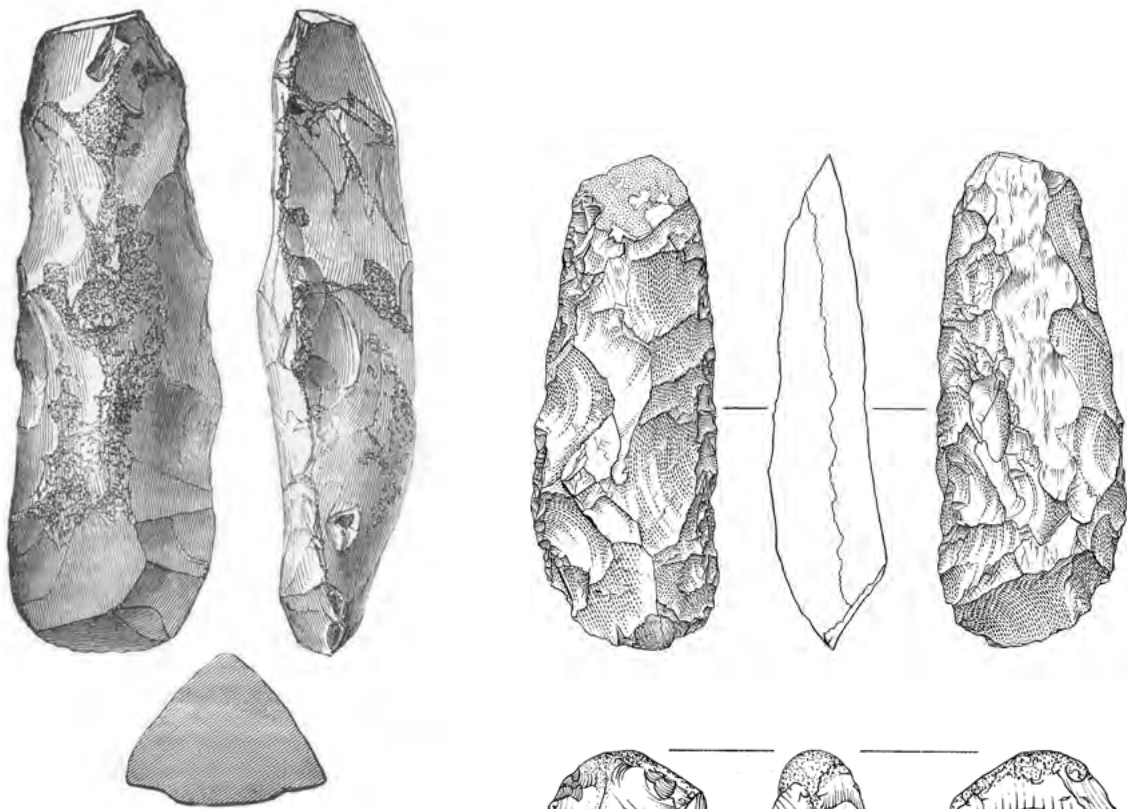


Figure 115: Transversely sharpened core axeheads: 1) Specimen from Oving near Chichester, West Sussex – GD = 168mm (Evans 1897: Figure 15; artist: J. Swain); 2) from Newport, Pembrokeshire – GD = 124mm (David & Walker 2004: Figure 17.8; artist: Hazel Martingell; courtesy of Amgueddfa Cymru - National Museum Wales); and 3) from Nab Head I, Pembrokeshire – GD = 98mm (David 2007: Figure 4.11; artist: Andrew David; courtesy of Andrew David).

namely 1) small ($L < 100\text{mm}$); medium ($L = 100\text{--}200\text{mm}$); and large ($L > 200\text{mm}$).

In Wales and northern England core axeheads date to the earlier Mesolithic; in south-east England they are also found in later Mesolithic contexts; and in Scotland they are entirely absent (Healey 2005). The production of Mesolithic core axeheads was discussed by Troels-Smith (1937) who suggested a number of subdivisions on the basis of 1) manufacturing technique; 2) shape (of relevance to how the piece was hafted and used); and 3) the character and position of the edge.

Tranchet axeheads are defined by the way their cutting-edge was produced, namely by the removal of a final flake transversely across the working face of the tool. In some instances, the tranchet blow was associated with the initial production of the piece, but it is also thought that, in many cases, edge rejuvenation was carried out in this manner. This process left easily identifiable

tranchet flakes (or *axe-sharpening flakes*; Figure 116), where the location of these pieces on a settlement site informs us as to where on the site the production or renewal of axeheads might have taken place. Some axeheads had their edges shaped by the removal of small flakes along the edge – it can be very difficult to distinguish between more well-executed specimens of this type and unpolished Neolithic axeheads. It has been suggested that tranchet axeheads were all adzes (Butler 2005: 99), but whether the individual piece was an axehead or adze depends – as mentioned above (Troels-Smith 1937) – on the specific shape of the piece, as well as its cross-section and position of the edge.

Flake axeheads (Figure 117) are generally absent in Britain (apart from the odd solitary piece), although their presence should not be ruled out in northernmost Scotland, where they could form part of the tool-kit of hunter-gatherers associated with the Scandinavian Fosna-Hensbacka Complex (Ballin & Bjerck 2016) or

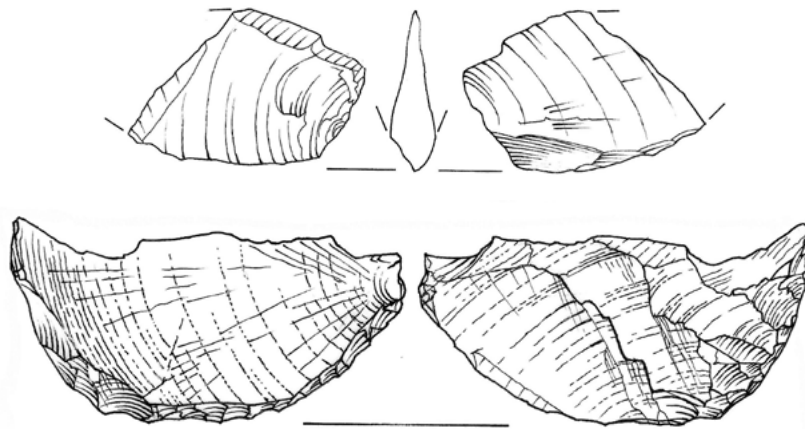


Figure 116: Axe-sharpening flakes: 1) Specimen from Daylight Rock, Caldey Island, Pembrokeshire – GD = 36mm (David 2007: Figure 3.8; artist: Andrew David; courtesy of Andrew David); and 2) from Nab Head I, Pembrokeshire – GD = 37mm (David 2007: Figure 4.10; artist: Andrew David; courtesy of Andrew David).

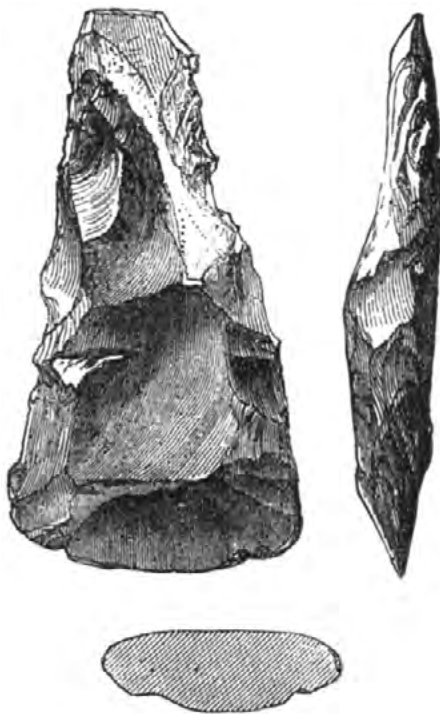


Figure 117: Flake axehead from Thetford, Norfolk – GD = 94mm (Evans 1897: Figure 14; artist: J. Swain).

other Scandinavian/northern German groups with which northern British groups may have had contact across Doggerland (Ballin 2016c).

Picks: Some core axeheads do not have a transverse (tranchet) cutting-edge, but instead a pointed working-end. Many are shaped roughly like core axeheads and they may have been hafted in a similar manner, but it is possible

that other picks were hand-held implements. Picks showing similarities to core axeheads are occasionally referred to as Portland picks (Figure 118), and Palmer (1977: 25) defined these pieces as core tools, one end of which tapers to a point, and which have a triangular, quadrilateral or sub-oval cross-section. She suggested that they have a maximum length of 120mm but longer pieces may exist. Picks may be recovered not only from Mesolithic sites on the south-coast ('Portland') but from all British Mesolithic sites from which core axeheads have been recovered (e.g., Honey Hill, Northamptonshire; Saville 1981b: Figure 5.193). The term Thames Pick, used in the past for any axehead, adze or pick found in or near the River Thames (Butler 2005: 104) is obsolete.

Neolithic flint axeheads: It is important at this point to emphasize that the present section only deals with Neolithic *flint* axeheads, as this is a guide concerned with the formal classification of *lithic* flintwork. *Stone* axeheads have been recovered in large numbers throughout Britain (including pieces of Cumbrian tuff, Northern Irish porcellanite, riebeckite felsite, Creag na Caillich hornfels, Welsh granophyre and dolerite, imported jadeitite, etc.; see list of petrology groups in Clough 1988), but this topic has been dealt with in detail elsewhere (e.g., the three Stone Axe Studies volumes: Clough & Cummings 1979; 1988; Davis & Edmonds 2011).

Like the Mesolithic axeheads, Neolithic flint axeheads may also be subdivided into axeheads and adzes. The same forms occur as polished (or ground) and unpolished pieces. Although some unpolished specimens may be preforms which have not yet been polished, some Neolithic axeheads may have been used without having been polished.⁵

⁵ 'However, in New Guinea, Strathern (1965: 184) found that

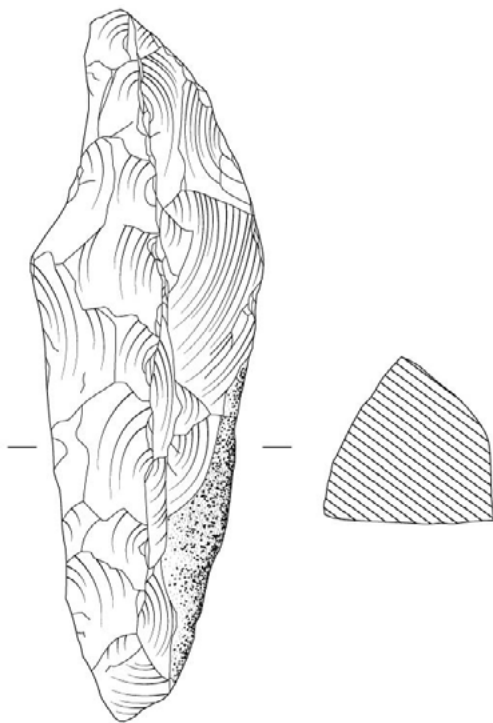


Figure 118: Portland pick – GD = 134mm
(Palmer 1977, p26; redrawn by Leeanne Whitelaw).

In contrast to Scandinavian Neolithic flint axeheads, nearly all of which have a four-sided cross-section (see for example Vang Petersen 1993), almost all British Neolithic flint axeheads have a pointed-oval cross-section, possibly with a narrow side facet (see for example Evans 1897; Clough & Cummins 1979; Pitts 1996).

Several attempts have been made to typologically define British Neolithic axeheads, either nationally or regionally. Pitts (1996) carried out attribute analysis of a national sample of 1,638 flint and stone axeheads (*k*-means clustering of principal components scores). As shown in Evans (1897), numerous British flint axehead types exist, but many are relatively rare. Pitts was able to define seven distinct clusters (i.e., broad axehead types) on the basis of the selected attributes (Figure 119), and apart from the almost cylindrical or barrel-shaped Type 7, all are either short or elongated ovate forms. The problem (in this context) with Pitts' analysis is that it includes stone as well as flint axeheads – where some types almost entirely embrace specimens in flint (Types 6 and 7), and others stone, some types include flint as well as stone specimens.

Manby (1979) undertook attribute analysis of 2,409 flint and stone axeheads from Yorkshire, and in his paper he suggested classifying Neolithic flint axeheads mainly

by manufacturing technique and shape. *Manufacturing techniques* of flint axeheads include: 1) flaking; 2) complete grinding (although with deeper flake scars commonly remaining); 3) flaking, with grinding confined to the cutting-edge; and 4) reworking by coarse flaking. *Axehead shapes* include: A) pebbles and nodules with a cutting-edge produced by flaking or grinding; B) broad-butted axeheads with a thin profile: a/ faceted sides; b/ oval, rounded sides; c/elliptical; and d/ rectangular; C) narrow-butted axeheads with a thin profile: a/ faceted sides; b/ oval, rounded sides; and c/elliptical; D) rounded thick-butted axeheads: a/ oval; b/ round; and c/ rectangular; E) Thick tapering butted axeheads: a/ oval; and b/ round; F) pointed-butted axeheads with elliptical sections; and G) adzes with blades of asymmetrical section: a/ triangular; b/ D-shaped; c/ elliptical; and d/ elliptical, curved profile.

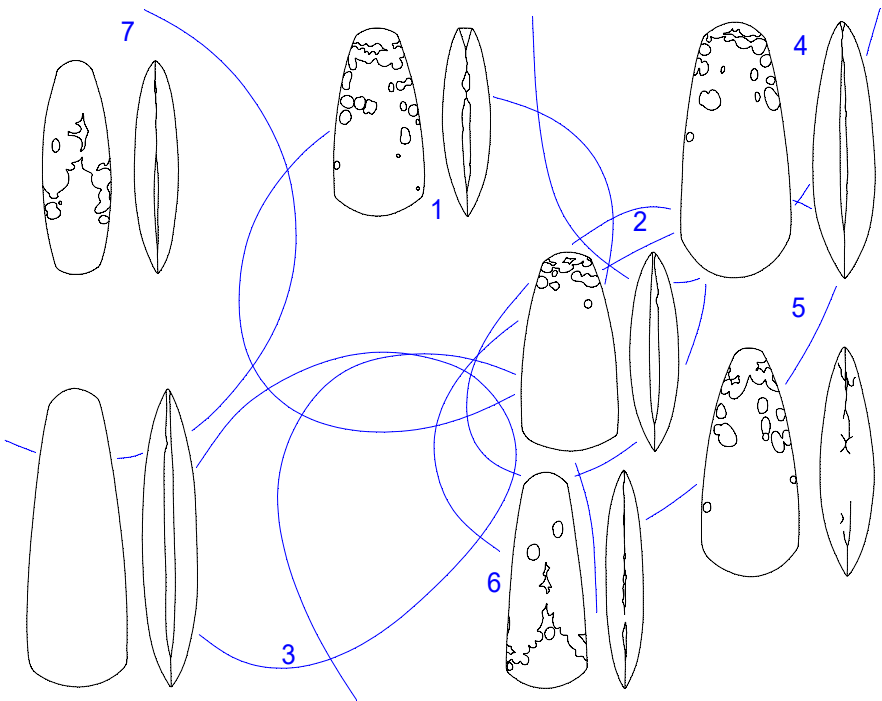
On the basis of his analysis, Manby produced two diagrams showing the most common types of stone axeheads (his Figure 1) and flint axeheads (his Figure 2) in Yorkshire (Manby's diagram of flint axehead types is reproduced as Figure 120). Several of his earlier Neolithic flint axehead types correspond to those defined by Pitts (Figure 119), but he also includes the spectacular concave-sided later Neolithic Seamer axeheads and Duggleby adzes, which are best known from Yorkshire (due to the find of specimens on Seamer Moor and in Duggleby Howe, Yorkshire), although they are also present elsewhere (Manby 1979: 69; Field 2010). A selection of earlier Neolithic axeheads is shown in Figure 121, and Seamer/Duggleby axeheads in Figure 122. A selection of less common axehead types are shown in Figure 123.

The distinction between thick-, thin- and pointed-butted axeheads was introduced from Scandinavia, and although this classification is commonly used in Britain, there is disagreement as to how useful this approach is in a British context (Butler 2005: 142). Another classification schema based mainly on axehead cross-sections was suggested by Field & Wooley (1984), embracing the following general categories: 1) oval; at one extreme nearly circular, at the other flattened and becoming elliptical; 2) lenticular or bi-convex; 3) lenticular with faceted sides; 4) rectangular; and 5) D-shaped. In terms of the definition of flint axehead types, attribute analysis on the basis of broader sets of attributes (like those of Pitts and Manby) may be most helpful, with Pitts representing a numerical/mathematical approach, and Manby a more intuitive approach.

A number of Scandinavian-type axeheads with four-sided cross-sections have been recovered from Britain (Figures 124-125), such as the high-gloss polished Crudwell-Smerrick axeheads (resembling Scandinavian Middle Neolithic thin-butted Funnel Beaker Culture axeheads) and a group of more notably rectangular-

informants laughed at the suggestion that old unground axes could have been used – their opinion was that they must have been traded, and lost, in that unfinished state' (quote in Pitts 1996: 314).

Figure 119: Seven flint/stone axehead clusters derived from k-means clustering of principal components scores for 818 specimens, plotted on the first two components. The ellipses enclose the majority of points for each cluster, and the drawings are hypothetical axeheads based on average variable scores. Types 6 and 7 tend to be edge-ground, whereas the other types are more fully ground. Re-drawn by the author from Pitts (1996; Figure 13). The methodology behind this figure is explained in Pitts (1996).



A FLAKED ROUGH OUT	B COMPLETELY GROUND	C	D EDGE- GROUND	E REWORKED	TECHNIQUE CLASS TYPE
					1. NODULE or PEBBLE
					2. THIN BROAD BUTT
					3. THIN TAPER - ING BUTT
					4.
					5.
					6. POINTED BUTT, POINTED OVAL SECTION
					7. ADZE

Figure 120: Typology of Yorkshire flint axeheads (Manby 1979: Figure 2; artist: T.G. Manby; courtesy of T.G. Manby).

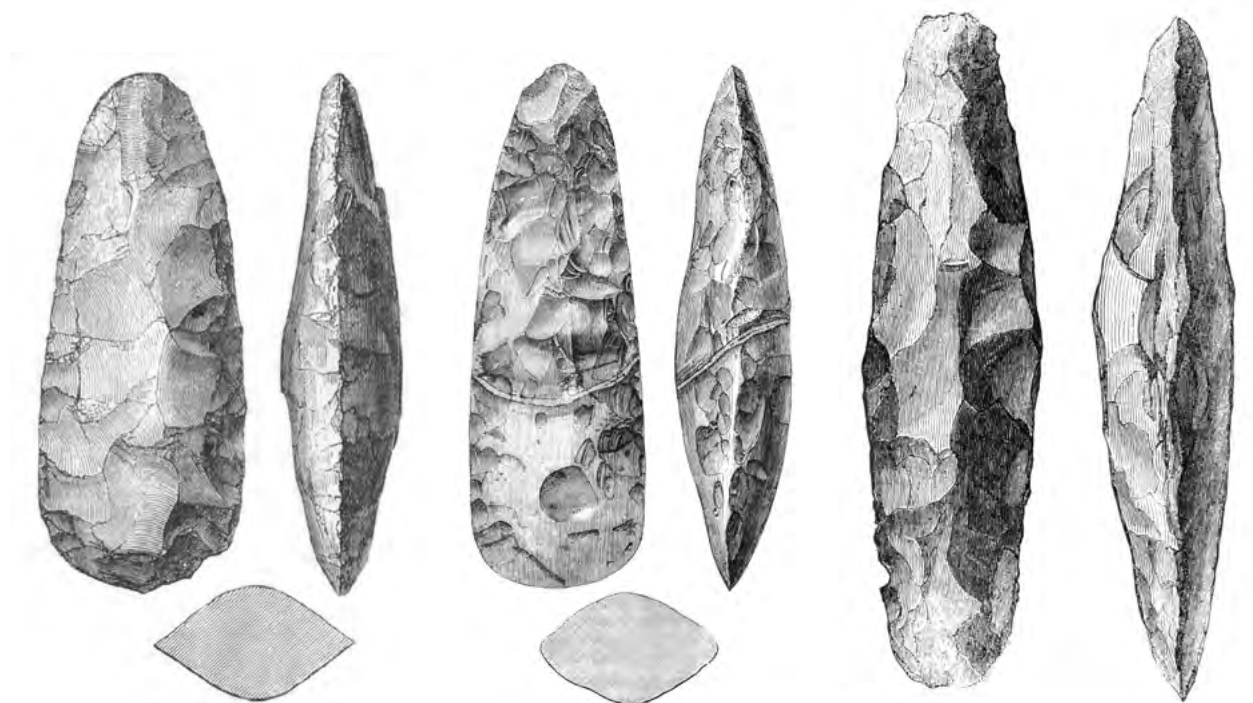


Figure 121: A selection of common types of earlier Neolithic flint axeheads: 1) Earlier Neolithic ovate axehead from Reach Fen, Cambridgeshire – GD = 148mm (Evans 1897: Figure 23; artist: J. Swain); 2) earlier Neolithic ovate axehead from Santon Downham, Suffolk – GD = 218mm (Evans 1897: Figure 43; artist: J. Swain); and 3) almost parallel-sided earlier Neolithic axehead from Forest of Bere, Hampshire – GD = 188mm (Evans 1897: Figure 25; artist: J. Swain).

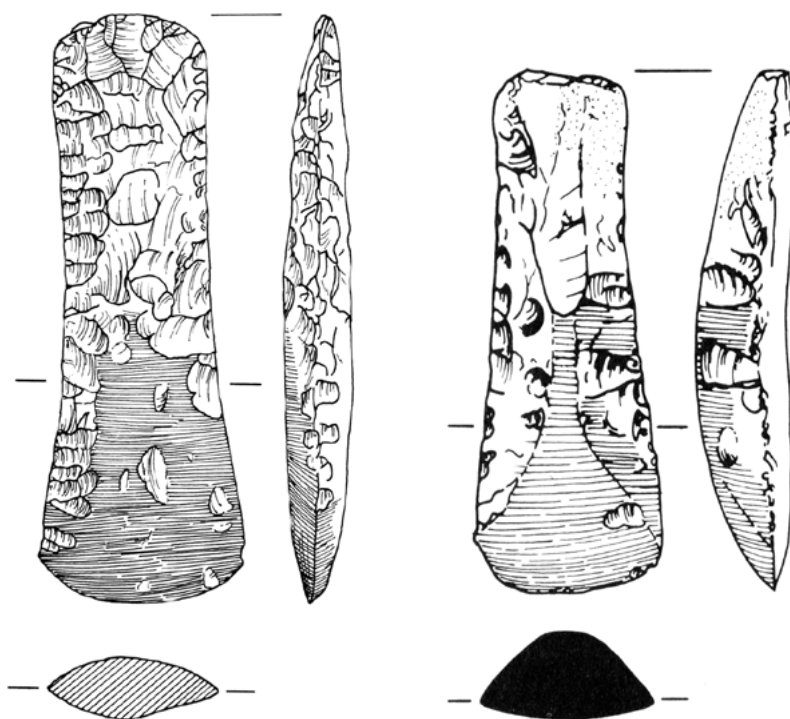
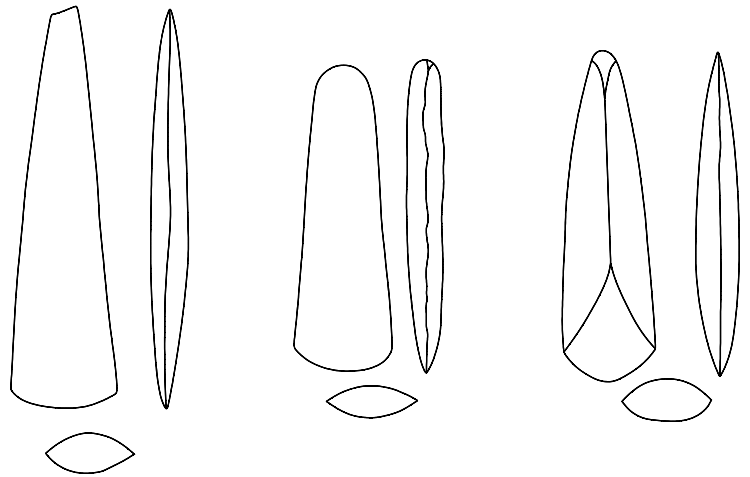


Figure 122: Later Neolithic 'waisted' axeheads: 1) Seamer axehead from Potter Brompton, Yorkshire – GD = 174mm (Manby 1979: Figure 5; artist: T.G. Manby; courtesy of T.G. Manby); and 2) Duggleby adzehead from York – GD = 166mm (Manby 1974: Figure 42; artist: T.G. Manby; courtesy of T.G. Manby).

Figure 123: Outlines of a selection of less common types of Neolithic flint axeheads: 1) Axehead with straight, tapering lateral sides – GD = 190mm; 2) axehead with straight, tapering lateral sides and a rounded butt – GD = 146mm; and 3) elongated ovate axehead with edge-facets and gently ridged broad-sides – GD = 156mm (Evans 1897: Figures 34, 35 and 46).



Figures 124-125: Polished Crudwell-Smerrick and Single Grave Culture axeheads. The piece to the left is a Crudwell-Smerrick axehead from Hayscastle, Pembrokeshire, resembling some Scandinavian thin-butted axeheads from the Funnel Beaker Culture – GD = 230mm (Walker 2018: Figure 6.2; courtesy of Tenby Museum); the piece to the right is a Scandinavian thick-butted Single Grave Culture axehead from Yorkshire – GD = 158mm (Walker 2018, front page; photo: Katherine Walker; courtesy of Katherine Walker).

sectioned axeheads which tend to be less well polished (probably mainly Scandinavian thick-butted Middle Neolithic Single Grave Culture axeheads) (Walker 2018: 85 and 101; also Evans 1897: Figure 61; Sheridan 1992: 208).⁶ Almost all these axeheads are uncontexted or poorly contexted (although remember the hoard? from Ramsgate in Kent where a Scandinavian type dagger, above, was recovered with two square-

sectioned polished flint axeheads; Frieman 2014: 38), but they are likely to either represent imported pieces from southern Scandinavia or Northern Germany; British-produced pieces inspired by southern Scandinavian/northern German forms; or possibly even lost collectors' objects. Due to their rarity, and the uncertainties regarding their contexts, these pieces will not be dealt with further in this section.

⁶ The Scandinavian Middle Neolithic Funnel Beaker Culture is dated to 3400-2800 cal BC, and the Scandinavian Single Grave Culture to 2800-2400 cal BC (Vang Petersen 1993: 16-17).

Chisels are basically slender miniature axeheads – unpolished, partially polished or fully polished – with approximately straight to slightly convex, parallel

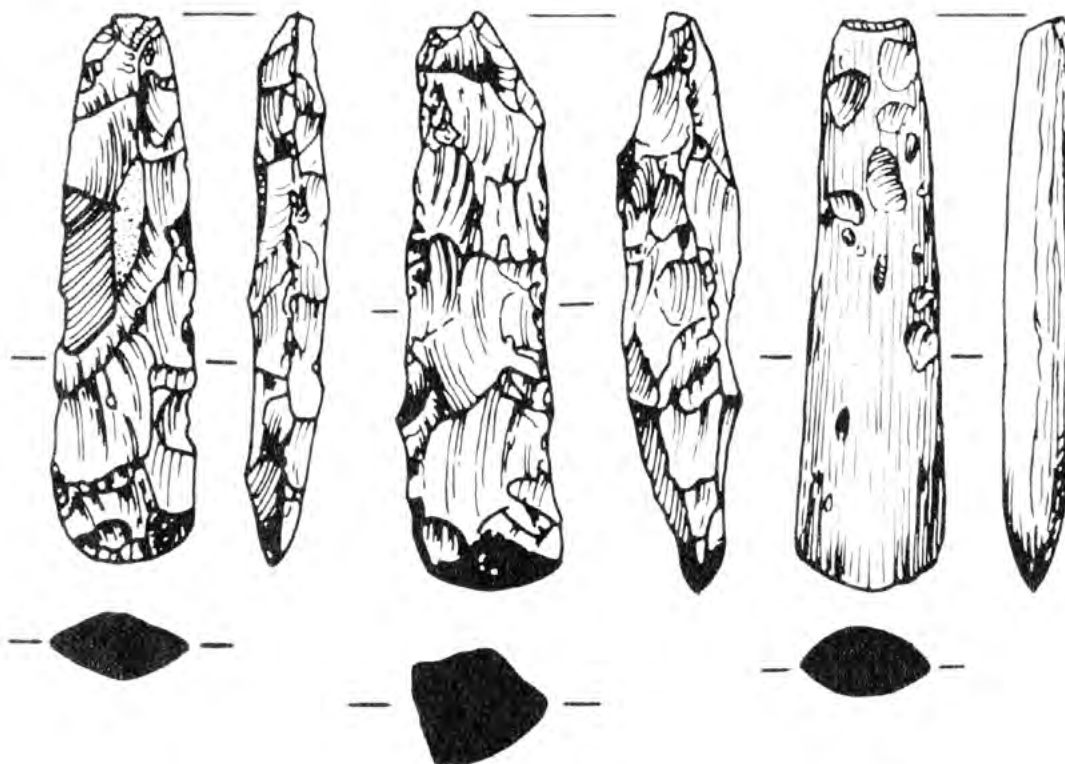


Figure 126: Chisels from Yorkshire – GD = c. 120mm
(Manby 1979: Figure 5; artist: T.G. Manby; courtesy of T.G. Manby).

to slightly tapering lateral sides (Figure 126), usually varying in length between 60-125mm and with a width of c. 25mm (Manby 1974: 90).

Tribrachs

This is an extremely rare lithic implement form, as only three pieces are known from the British Isles (Figure 127). The type was described by Evans (1897: 78) with the words: ‘... like three celts conjoining into one ...’. The best known specimen from the Isle of Wight has a diameter of 203mm and a thickness of 23mm at the centre (Field & Lambdin-Whymark 2007: 33), and it has been flaked bifacially, with a knapping seam running down both lateral sides of each arm. The function of these pieces is uncertain, but they are probably more likely to have been ceremonial objects than everyday functional tools (like the Scottish carved stone balls; Marshall asks [1977: 64]: ‘Could a ball [or in this case a tribrach; the author’s comment] have been used at a clan conference, the chief holding it as he considered a judgement, or perhaps being handed round, the one holding it having the right to speak?’). These objects are thought to date to the Neolithic or Early Bronze Age period.

Tools used to produce the lithic assemblages (see Inizan *et al.* 1992)

The production of the lithic assemblages involved a number of different implements, some of which were based on stone, whereas others were based on organic materials (antler, bone, wood) or even metal (copper-

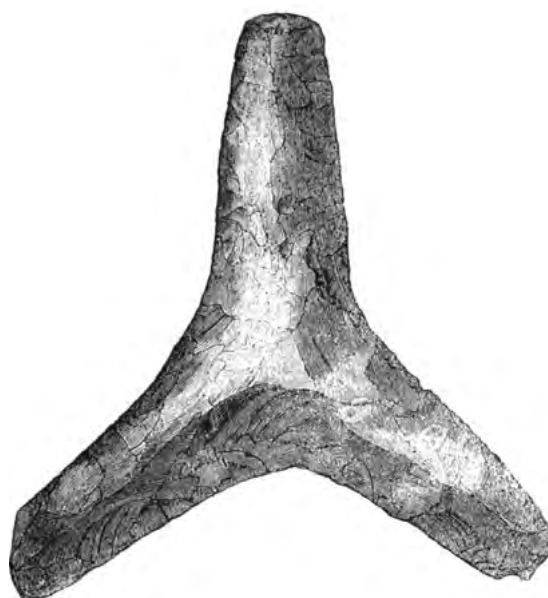


Figure 127: Tribrach from the Isle of Wight – GD = 158mm
(Evans 1897: Figure 25A; artist: J. Swain).

tipped pressure-flakers). In this section, only the ones based on stone are discussed.

The most common form is the *hammerstone*, which may be of any type of relatively hard stone, such as for example flint, quartz, quartzite, or dolerite. They were used either to strike the core directly, or indirectly (using a punch). Those involved in direct hard percussion reduction usually display crushing or pecking at one or both ends, or all around. Bipolar technique involved the use of a flatter stone surface, an *anvil*, which after prolonged use developed a pit in

one or both broadsides, where the flint core was placed and then struck with a hammerstone. Occasionally, cores themselves have been re-used as hammers. Many hammerstones were also used as anvils, technically defining them as combination tools. Some small pebbles, for example sandstone or quartzite, were used as *abrading tools* in connection with the abrasion of core platform-edges (cf. Inizan *et al.* 1992: Figures 38 and 46). They frequently display series of incised parallel lines. A selection of hammerstones, anvils and combined hammerstones/anvils are shown in Figure 128.

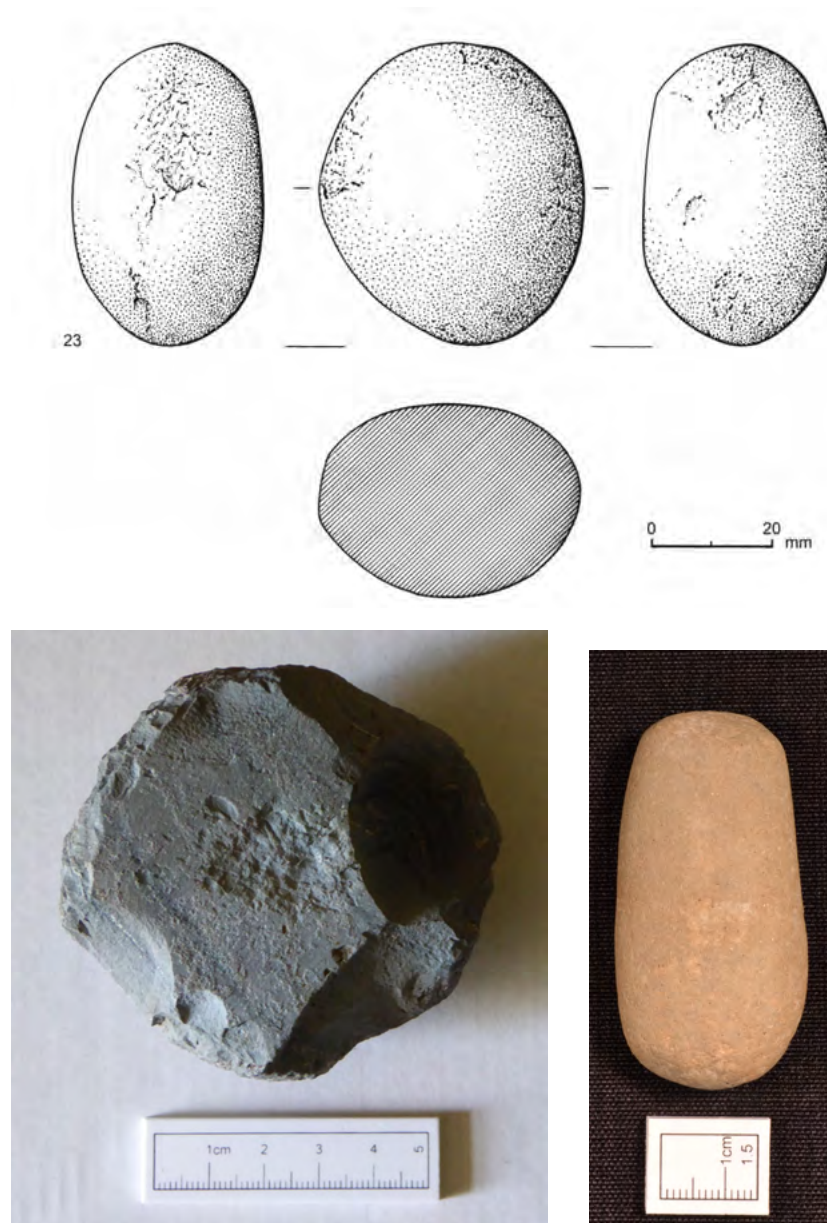


Figure 128: Tools used to produce the lithic assemblages: 1) 'Classic' hammerstone of quartz from Kilmelfort Cave, Highland (Saville & Ballin 2009, Illus 13; artist: Marion O'Neil); 2) hammerstone/anvil of felsite from the North Roe quarry complex, Shetland (Ballin 2017d, Figure 4.21; photo: Beverley Ballin Smith); and 3) a small hammerstone/anvil of quartzite from Udal RUX6, North Uist, for finer reduction work (Ballin 2018b, Figure 5.40; photo: Beverley Ballin Smith).

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A system for the hierarchical *Classification of Lithic Artefacts from the British Late Glacial and Holocene Periods* is offered in this book. It is hoped that it may find use as a guide book for archaeology students, museum staff, non-specialist archaeologists, local archaeology groups and lay enthusiasts. To allow the individual categories of lithic objects to be classified and characterised in detail, it was necessary to first define a number of descriptive terms, which forms the first part of this guide. The main part of the book is the lithic classification section, which offers definitions of the individual formal debitage, core and tool types. The basic questions asked are: what defines Object X as a tool and not a piece of debitage or a core; what defines a microlith as a microlith and not a knife or a piercer; and what defines a specific implement as a scalene triangle and not an isosceles one? As shown in the book, there are disagreements within the lithics community as to the specific definition of some types, demonstrating the need for all lithics reports to define which typological framework they are based on.

After having worked as an archaeological specialist and Project Manager in Denmark, the Faroe Islands and Norway, *Torben Ballin* relocated to Scotland in 1998. Since then, he has worked as an independent lithics specialist in Scotland, England, Northern Ireland and Ireland, representing the consultancy Lithic Research. Torben's special interests have been lithic terminology and typology, lithic technology, chronological frameworks, raw material studies, intra-site spatial analyses, prehistoric territories and exchange networks, and Scotland's Late Upper Palaeolithic and Early Mesolithic industries. His interest in lithic terminology and typology led to the production and publication of a number of works on general lithic typology within and outwith Britain.

