UNIVERSITY OF SOUTHAMPTON

FACULTY OF HUMANITIES

Hominin cognitive and behavioural complexity in the Pleistocene: Assessment through identity, intentionality and visual display

by

James Nathan Cole

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Abstract

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The Social Brian Hypothesis predicts the cognitive ability of hominin species by utilising estimated brain and group sizes in relation to an ordinal scale of cognitive complexity expressed as orders of intentionality. The Social Brain Hypothesis predictions however, have never been correlated to the archaeological behavioural record in order to ascertain their behavioural validity. This thesis is concerned with testing the cognitive predictions of the Social Brain Hypothesis against the material culture evidence of hominin behaviour through a new theoretical construct termed the Identity Model. The Identity Model offers a theoretical perspective on the construction of individual and group identity through the Palaeolithic linked to a scale of cognitive complexity shared by the Social Brain Hypothesis. Embedded within the Identity Model are the notions that material culture / behaviour could be imbued with culturally significant social meaning once the ability to construct proxies had been achieved, this in turn feeds into the development of language from non-linguistic societies based on visual display to fully grammatical syntax. Using technological modes and widely held beliefs within the academic community relating to hominin behavioural practice and artefact manufacture as a heuristic, the Identity Model (and through the orders of intentionality, the Social Brain Hypothesis) has been related to the archaeological record, and the predictions preliminarily tested though a series of eleven case studies stretching circa 600,000 – 24,000 years before present. The results of the lithic analysis show that despite common perception (and the Social Brain Hypothesis predictions on cognitive potential), the use of lithic artefacts in actively negotiating hominin social relationships may not have had their genesis with the mode 2 (Acheulean) biface, but rather may be more securely associated with mode 3 prepared core technologies and the advent of the composite tool and pigment use. This in turn intimates that the Social Brain Hypothesis predicts the *potential* cognitive ability of ancient hominin species whilst the archaeology, through the filter of the Identity Model, illustrates the *realised* cognitive ability, and the two are not necessarily mutually exclusive. Based on the results and discussions of this thesis, it would appear that cognitive potential must therefore be in place before it can be realised, further suggesting that hominin physiological changes must occur before behavioural changes become evident within the archaeological record.

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Academic Thesis: Declaration Of Authorship

I, James Nathan Cole declare that the thesis entitled: **Hominin cognitive and behavioural complexity in the Pleistocene: Assessment through identity, intentionality and visual display,** and the work presented in the thesis are both my own, and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;

2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;

3. Where I have consulted the published work of others, this is always clearly attributed;

4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;

5. I have acknowledged all main sources of help;

6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;

7. None of this work has been published before submission.

Signed:

Date:

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Chapter 1 - Introduction

This thesis shall focus on testing the predictions made by the Social Brain Hypothesis in regards to hominin cognitive abilities against the archaeological record. In light of this my research question shall concentrate on assessing the cognitive abilities required to incorporate the body and material culture into systems of visual display and social communication in the Lower to Middle Palaeolithic. By such an assessment I will be able to ascertain whether the current hominin cognitive predictions of the Social Brain Hypothesis match the cognitive levels suggested through the behavioural record.

In brief, the Social Brain Hypothesis (Aiello and Dunbar 1993; Dunbar 1996; 1998a; 2003; 2004), is a biological predictive model relating to *Homo sapiens* brain encephalisation, where the hypothesis deals with the possible cognitive capabilities (expressed as orders of intentionality) of hominins based on predictions relating to brain and social group size (this is explained in greater detail in Chapter 2). These projections have yet to be fully related to the material / behavioural archaeological record, so subsequently, one of the primary aims of this thesis is to establish and test a theoretical link of my own construction termed the Identity Model, by which the archaeological record may be correlated to specific points of cognitive development seen with the Social Brain Hypothesis. The Identity Model (Chapter 3) offers a new and innovative theoretical perspective on the construction of individual and group identity through the Palaeolithic linked to a scale of cognitive complexity (the orders of intentionality) and the development of culturally meaningful social communications from non-linguistic societies (based on visual display) to linguistic societies (based on fully grammatical syntax).

It is proposed in this thesis that within non-linguistic societies, the vehicle for identity comprehension and perpetuation would have primarily been focused on the body. Therefore, a secondary aim of this thesis will be to explore the relationship between the use of the body as a primary vehicle for culturally significant visual display, and the use of material culture / behaviour as proxies within non-lingual social communications, and the evidence for such communication within the archaeological record of the Lower and Middle Palaeolithic. The premise being explored here being that it is only with a third-order of intentionality as a minimum that material culture / behaviour may become a proxy for culturally significant social communications. Based on lithic data collected from eleven Palaeolithic sites (nine British, one South African and one Middle Eastern) spanning some 500,000 years, I conclude that material culture / behaviour may have only become incorporated within culturally motivated systems of social communication with the advent of mode 3 (Clark 1969) technologies some 300,000 years ago.

The significance of these findings may prove controversial for the data presented within this thesis would suggest that there is a significant temporal difference between the cognitive *potential* of hominins suggested by the Social Brain Hypothesis, and the *realisation* of that potential as evidenced through the archaeological record.

I shall now offer a brief chapter outline and where appropriate, brief conclusions:

- **Chapter 1 – Introduction**: Setting the research questions and brief background information required for the reader to view the overall premise of this thesis and appreciably see how the following chapters expand and add detail to the tenants first discussed here.
- **Chapter 2 – Setting the Context of Research**: Describing the history of research into the subjects central to this thesis, the Social Brain Hypothesis, theories pertaining to the body, the archaeology of the body, the use of the body in social communiqués and an exploration of the neurological potential to map the use of the body as a vehicle in social communication through visual display within our hominin lineage.
- **Chapter 3 – The Identity Model**: Within this chapter I describe current theories pertaining to identity and the theoretical link of my own construction (the Identity Model) that relates constructions of identity to the body and its use in the progression from non-lingual to lingual social signalling. Within this chapter I also relate the Identity Model to the Social Brain Hypothesis through orders of intentionality and link the Identity Model to existing theories on identity construction.
- **Chapter 4 – Relating the Identity Model to the Archaeological Record**: Describes the theoretical link through embodied cognition that allows the Identity Model to be related to the archaeological record in such a way that permits access to the body's use as a vehicle of social communication.
- **Chapter 5 – Methodology and Lithic Analysis Strategy**: This chapter is concerned with how I intend to link the theoretical positions developed in the

preceding chapters to the physical archaeological record and how such links relate to the body and its use in social communication.

- **Chapter 6 – Sites**: This chapter details the background information for each site examined within this thesis. The chapter also includes a brief overview of the effect of raw material on the assemblages studied.
- **Chapter 7 – Lithic Analysis**: This chapter gives a summary of the data analysis for each lithic category (LCTs, flakes, flake tools and cores). Detailed site descriptions of the data are presented in Appendix 2 on a site by site basis.
- **Chapter 8 – Discussion of Lithic Analysis**: This chapter describes the discussion of the results displayed in Chapter 7 in relation to correlating the Identity Model to the archaeological record.
- **Chapter 9 – The Identity Model, the Social Brain Hypothesis and the Archaeological Record**: This chapter focuses on the cognitive and behavioural significance of composite tools and prepared core technologies (PCT) in relation to the Identity Model. The uses of material culture as proxies within systems of visual display in the Palaeolithic are examined in relation to the presence of PCT. Finally, the current view of hominin cognitive ability as expressed through the Social Brain Hypothesis is challenged by the results of the lithic analysis through the filter of the Identity Model, and a new cognitive map of hominin phylogeny offered.
- **Chapter 10 – Summary, Conclusions and Future Research**: This chapter briefly summarises the extent and conclusions of the thesis presented in the proceeding nine chapters and outlines points for further research.
- **Appendix 1 – Hominin Phylogeny**: This appendix gives a brief summary of all the hominin species known at the time of writing, including details where available on behavioural traits, environment, Social Brain position and bibliography.
- **Appendix 2 – Site by site lithic analysis**: This appendix gives a detailed site by site lithic analysis. The main purpose of this appendix is to display the raw data collected for each site in order that future researchers may utilise and interrogate it within their own studies.

1.1 Background Information: the scene of investigation

Given recent genetic, molecular and morphological evidence relating to the split between the primate and human lineages, I shall use the term hominin in this thesis to refer to the ancestors and relatives within the Subtribes Australopithecina and Hominina after Wood and Richmond (2000). The term hominid shall be used to refer to the other members of the primate clade. The exact hominin phylogeny followed within this thesis is discussed in Chapter 2, with a full comprehensive list presented in Appendix 1.

Many of the ideas discussed here have their genesis within the evolutionary framework as first discussed by Charles Darwin (1998 reprint) with a specific view to exploring the behavioural practices of our hominin ancestors that culminated in the anatomically modern individual constructed of body *and* mind. The modern human is typically a self-conscious sensate being aware of their own mind and those of others around them; a creature which is expert in the ways of grammatical and body language allowing the operator to safely navigate an overtly complex social world where political, religious, physical, familial and a host of other diverse social relationships must be constantly maintained and propagated.

Attempting to define what makes *Homo sapiens* 'human' is a subject that occupies many researchers' interests and for many students of the 'human' phenomenon the ability to create arbitrary relationships between the abstract and their physical manifestations – "to construct and use complex symbolic structures is the defining characteristic of *Homo sapiens*" (Hovers *et al* 2003: 491). Within the context of this thesis, the human body is taken as an interface that allows the individual to understand what it means to be human. As such, research into the body, both within and without archaeology, is currently riding a wave of fresh research interest as demonstrated by Sofaer's (2006) book *The Body as Material Culture*. Sofaer (2006) discusses the difficulties with past views of research into the body, often suffering from a dualistic plague of viewing the body and the mind as two separate components. Within the context of this thesis, I review attitudes (Chapter 2) to the body and the body's use in social communication, culminating in my own holistic re-definition of the body as a single entity composed of the physical body and the metaphysical mind. Discussions about the body cannot last long without reference towards identity and identity perpetuation (identity theories discussed and critically reviewed in Chapter 3).

I believe that the concept of identity is underpinned by the concept of 'self' where the 'self' is not only constituted by the body and the mind through a structure of understanding, but identity is the mechanism through which the 'self' becomes a realised fusion of body and mind (see Chapter 3 for greater detail). In order for us to truly *comprehend* the body and mind as the single entity of 'self,' our sense of self must be comfortably framed within an identity. Identity is defined here as "the fact of being who or what a person or thing is" (Hawker and Waite 2007: 452) and constitutes "an exercise in drawing boundaries" (Gamble 2007:34) on an intra- and inter- group basis. Consequently, by examining the Palaeolithic record through concepts of identity, it may be possible to access the body (and how the body was used in social communication) by examining the effects of identity propagation on material culture production. In order for identity to be propagated, it must be framed within a commonality of understanding – or culture – therefore, examining the Palaeolithic record for the influence of culture on artefact production may be crucial in recognizing the beginnings of identity perpetuation on an individual and group level.

In light of the above, investigating such questions as when culture changes body language from a predominantly biological signaller (communicating sex, fertility, age etc. using auditory, visual, tactile or olfactory mechanisms) to a social broadcaster (when the body incorporates material culture within social and cultural significant visual display) becomes an important component of the overall thesis. In order to answer the question of when such a cultural change would influence visual displays, I will utilise definitions of identity embedded within the Identity Model as a filter to exploring the potential role of the body and material culture as agents within social communication through the Palaeolithic record. By correlating specific categories of identity to a cognitive scale, in this instance the orders of intentionality embedded within the Social Brain Hypothesis, I aim to establish a testable link from behaviour and material culture to the cognitive capacities required to undertake such constructions. I will propose that by looking at the archaeological record using the filter of identity, that certain types of material culture production or certain behavioural practices may be related to the use of the body as a vehicle in social communication.

Central to the Identity Model is the idea that the body is both a physical and conceptual construction and subsequently the Identity Model actively encourages the premise of embodied material culture (Chapter 4). This approach to examining the archaeological record is particularly essential in studies of the Palaeolithic, where the majority of the archaeology is centred on material culture comprising lithic artefacts, and other archaeological remains such as beads and Palaeo-art with only a small amount of fragmentary skeletal remains giving a direct correlation to the bodies of the past. With such an examination of the archaeological record, archaeologists should be able to ascertain whether the creation of symbolic structures is truly unique to the 'human' condition.

Chapter 2 – Setting the Context of Research

Within this chapter, I shall review the Social Brain Hypothesis, stating in detail the main premise of the theory and highlighting what I believe are its strengths and weaknesses. Once the Social Brain Hypothesis has been reviewed, I shall give a brief phylogenic breakdown of the hominin clade (Wood and Lonergan 2008) with a more detailed examination contained in Appendix 1. Following on from there I shall offer an overview of how the social sciences' view research into the 'body'. The penultimate sections start with a definition of communication followed by a broad review of how animals and specifically primates use their bodies as a surface for communication. Finally, I shall look at how recent neurological evidence links in with theory of mind and lends weight to the idea that modern grammatical language developed out of a visual (body based signal as opposed to an auditory) system of communication.

2.1 The Social Brain Hypothesis

The Social Brain Hypothesis centres on the idea that social pressures arising from intra-group relationships powered the evolutionary growth of the hominin brain to a point where it is now 4.6 times the size expected for the average mammal (Aiello and Wheeler 1995) and constitutes a significantly higher percentage of total bodyweight than the brains of other primates (Henneberg 1998). The Social Brain Hypothesis does not reject other models of brain evolution (for example: Gibson 1986; Faulk 1990; Aiello and Wheeler 1995; Henneberg 1998), but rather incorporates the ideas that biology and physiology contributed to encephalisation whilst external factors inspired the overall process. The Social Brain Hypothesis suggests that it was the social solutions to ecological problems (through increased group size) that drove the intensification of social cohesion, and subsequently provided the selection pressure for large brain evolution (Dunbar 2003; Dunbar and Shultz 2007a).Within human encephalisation there is one area of the brain that has increased in size at a disproportionate rate to other brain components, and that is the neo-cortex (Finlay and Darlington 1995; Dunbar 2007). The neo-cortex is of marked relevance to the Social Brain Hypothesis because it is this part of the brain that governs reasoning and consciousness, stores memories, and organizes social relationships (Solomon *et al* 1990; Dunbar 1998a; Gamble 2007). Thereby, the Social Brain Hypothesis suggests that the larger the neo-cortex, the greater the ability of the animal to maintain social cohesion within larger groups (figure 2.1).

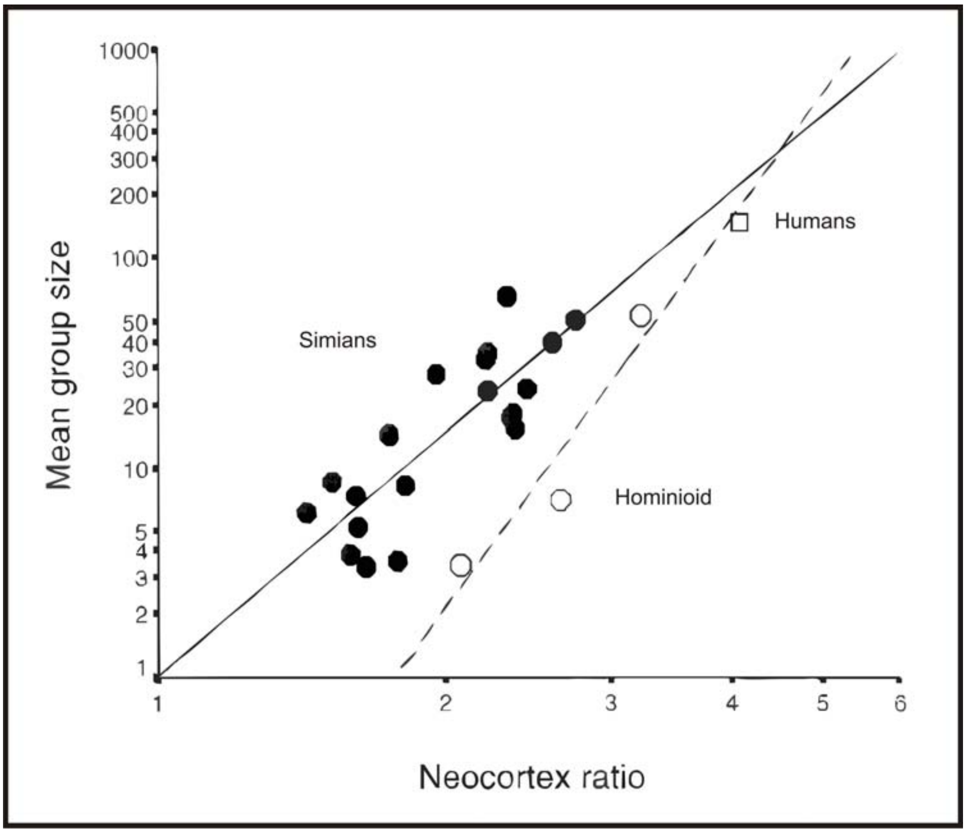


Figure 2.1: Showing the mean social group size for individual primate taxa (one species per genus) plotted against the relative neocortex volume (indexed as neocortex volume divided by the volume of the rest of the brain) (figure and caption reproduced from Dunbar 2003: 165, Figure 1).

A number of studies have recently corroborated the ideas that among primates, relative brain size and manifestations of social complexity such as group size do bear a direct relation to each other (Dunbar 1992; Lewis 2000; Kudo and Dunbar 2001; Reader and Laland 2002; Byrne and Corp 2004; Lindenfors 2005; Dunbar and Shultz 2007a; Dunbar and Shultz 2007b). It is the correlation between brain / group size and social complexity that forms the foundation of the Social Brain Hypothesis (Dunbar 2003; Gamble 2007), the larger the group, the more complex the social interactions required to maintain group cohesion, the larger the neo-cortex grew to facilitate the cognitive changes required to handle the increasingly byzantine social interactions. The evidence for this can be found in the way primates and modern humans maintain cohesion within, and the difference in scale between, their social networks.

Primates maintain social structure through the act of physically grooming each other commonly termed 'social' grooming. Although the social grooming mechanism may not be fully understood, there is a clear correlation between the size of a primate group and time spent grooming (Dunbar 2004: 113). The larger the group the more time individuals of the group spend social grooming. Amongst primates the average time spent on social grooming does not appear to exceed 20 percent of the active day, which places a cap on group size at around 50 individuals (Dunbar 2003; 2004: 114; Gamble 2007). It has been established that modern humans tend to live in a range of group / network sizes such as: *support cliques* containing a mean average of 4.6 individuals; *mean sympathy groups* containing 14.3 individuals; *mean bands* containing 42.6 individuals; *mean community groups* containing 132.5 individuals; *mean mega-bands* containing 566.6 individuals and a *mean large tribe* of 1728 individuals (Zhou *et al* 2005). The Social Brain Hypothesis predicts that modern human community size would centre around 150 individuals (Dunbar 1993) and this figure would seem to be supported by Zhou *et al's* (2005) work where community groups fall at a mean of 132.5 individuals. If modern humans engaged in primate like social grooming, then the amount of time needed to maintain social cohesion of a group consisting of 150 members would be 40 percent of the active day (Dunbar 2004: 114). This is clearly an untenable situation, time constraints of the dynamic day would simply not allow such indulgent socializing as the time spent looking for food would be greatly reduced and subsequent energy quotas remain unfulfilled. Dunbar has argued that the development of language would be the most suitable mechanism to maintain social consistency through increasing group size without impacting on energy quotas (Dunbar 1993; 2003; 2004: 114). To safely navigate the complex social structures that come with increasing group size the evolution of language from simple vocal chorusing to more complex syntactical construction allows social bonding through vocal grooming. Vocal grooming allows relationships between several individuals to be maintained simultaneously, thereby allowing the maintenance of social cohesion in large groups without jeopardizing energy quotients.

Language is the ability that facilitates grammar and syntax (Barbieri 2010). Language is essentially a symbol. Symbols are only understood through a shared and collective awareness of the arbitrary social conventions that give a symbol its significance (Deacon 1997). Furthermore, language as a form of social communication is widely accepted as lying in the domain of human communication whilst animal communications remain entirely distinct (Deacon 1997; Origgi and Sperber 2000; Dunbar 2004; Barbieri 2010). Crucially, in order for language (of any degree of complexity – gestural to grammatical) to work as a communication system, the sender must be able to anticipate how a receiver will appreciate what the message sent means, and vice versa, otherwise there is no advantage to communication in any form as a system of social bonding. The fundamental point Dunbar makes here is that in order to achieve understanding of speech and language, a theory of mind is required (Dunbar 2004: 119; Dunbar 2007). A theory of mind can be defined as when an individual "imputes mental states to himself and to others (either to conspecifics or to other species as well)" (Premack and Woodruff 1978: 515) or "the ability to reflect on the contents of one's own and other's minds" (Baron-Cohen 2001: 174). For example, Ben *believes* that Matthew *thinks* carnivals are fun. Baron-Cohen (1999) claims that *Homo sapiens* is the only extant species to posses a *developed* 'theory of mind', developed here meaning the ability to assign the full range of mental states (goal and knowledge) to ourselves and others, and crucially, to use such assignments to "make sense of and predict behaviour" (Baron-Cohen 1999: 261). The common thread from these definitions is that a theory of mind represents the ability to *comprehend the content of another's mind in relation to your own mind*.

In terms of cognitive significance, a theory of mind may be recast into a hierarchy of intentional states termed orders of intentionality (Premack and Woodruff 1978; Dunbar 2007). The concept of intentionality comes from notions of philosophy of mind and essentially relate to belief states epitomized through words such as *intend*, *suppose*, *imagine*, *think*, and *know* (Premack and Woodruff 1978; Dunbar 2007). Crucially, notions of intentionality describe self reflective mental states, or mental states experienced when we reflect upon the contents of our minds (Dunbar 2007). The importance of this in cognitive terms is that intentional mental states form a recursive hierarchy – Ben *intends* that David *supposes*, John to *imagine* Karen *thinks* that William *knows* (*italics* represent the orders of intentionality). – this hierarchical scale is commonly identified as levels or orders of intentionality (Dunbar 2007). First-order intentionality represents one mental state (Ben *intends*), second-order represents two mental states (David *supposes* John to *imagine*) and so on with the above example representing fifth-order intentionality. The orders of intentionality and a theory of mind have been directly correlated with a theory of mind requiring an individual to imagine the content of two minds, their own and that of someone else, therefore a theory of mind is equivalent to a second-order of intentionality – David *supposes* John to *imagine* (Dunbar 2007).

The interesting point about orders of intentionality is that a great deal of cognitive and social complexity can be imparted if even only a small number of different belief / mental states are linked together (Premack and Woodruff 1978) with modern humans operating at a comfortable level of five with an upper extent of six (Dunbar 2004: 46; Dunbar 2007). Although modern humans may operate at an upper limit of six-orders (occasionally higher) of intentionality, fifth-order intentionality is the average functional limit that we moderns tend to achieve (Dunbar 2004: 47) and as such I shall examine the behavioural and material archaeological record accordingly. For the benefit of clarity and understanding, below is offered an example of how the orders of intentionality work from an ordinal scale of one to five using the fictional story of Xi the hunter.

First-order intentionality applies when an entity is aware of the contents of its own mind:

- Xi *believes* he is a good hunter.

Second-order intentionality applies when an entity has a belief about someone else's intentions, the base criteria for a theory of mind:

- Xi *thinks* that O'wa *believes* he is a good hunter. Xi has formulated a belief system for O'wa based on his own ability to reflect on the content of his mind and on O'wa's mind.

Third-order intentionality becomes more complex:

- Xi *desires* the group to *think* that O'wa *believes* Xi is a good hunter. Where Xi is in third-order intentionality, the group is in second and O'wa in first.

Fourth-order intentionality encroaches on the average operating capacity for modern humans:

- The group *considers* O'wa to *believe* that Xi *thinks* he is a good hunter because the group *imagines* Xi to be a good hunter.

Fifth-order intentionality is the average that modern humans operate and where the abstract becomes fully developed:

- Xi *believes* that there are supernatural beings who can be made to *understand* that Xi *desires* O'wa to *imagine* the group to *consider* Xi to be a good hunter.

Theory of mind and to some degree orders of intentionality, allow the individual to mentally access the intentions behind a deliberate action. Without a theory of mind, agents are limited to reading the superficial behaviour which leaves the individual and / or group open to misinterpretation and deception (Dunbar 1998b). The crucial point to take away here is that without a theory of mind, language as we know it today would not exist; it is possible that there would be some form of verbal communication but these would likely be limited to factual statements conveying pragmatic information, with no works of fiction, abstract ideas, poetry or embellished oration (Dunbar 1998b).

The Identity Model detailed in the following chapter is my attempt to relate the orders of intentionality to the development of language as a social bonding system. It can be certain that fully developed grammatical language did not emerge through the hominin psyche at the same time as a theory of mind was attained. Rather, I would suggest that a more holistic gestural language based around the body as a canvas for social communication (after Hewes 1973) developed into a combination between utteral and gestural communiqués further developing into a 'protolanguage' (after Wray 1998) as developmental precursors to fully grammatical language.

The body is vitally important in communication used by modern humans today with people often taking conscious and subconscious cues as to the emotional state of the individual by looking at facial expressions and body posture (Meeren *et al* 2005). Primates also often gauge the goals and intentions of others by reading their body posture or facial orientation (Tomasello and Call 2008). Therefore, it stands to reason that the body has been an active agent in the development of hominin communication throughout our evolutionary history. The Identity Model detailed in the next chapter describes one method by which the use of the body as a means of social communication is integrated into the development of a behaviourally modern human by describing how the body is used in social communication and relating the use to a scale of cognitive complexity (the orders of intentionality) through categories of identity. However, it must first be ascertained whether the hominin clade are truly unique in their possession of a theory of mind.

Great apes, elephants and dolphins have been studied in theory of mind experiments and are said to posses mirror self recognition, a phenomenon thought to represent an expression of self recognition and self-awareness linked to a theory of mind / second-order intentionality (Povinelli *et al* 1997; Reiss and Marino 2001; Plotnik *et al* 2006). However, there have been claims that there is little direct empirical evidence to support the idea that mirror self recognition (and a host of other behaviours such as imitation and pretend play) are developmental foundations to a theory of mind (De Veer and Van Den Bos 1999; Nielson and Dissanayake 2004) and some doubt if non-human primates and other animals truly aspire to a theory of mind due to the difficulties in non-bias testing (Tomasello and Call 1997; Heyes 1998). When asking the question of whether non-human primates (or *Proboscidea*, *Delphinidae* and *Platanistoidea*) have a theory of mind, the answer is not a simple yes or no. Based on laboratory experiments where chimpanzees and children are subjected to similar belief state tests, chimpanzees would appear to have a broad understanding of the goals, intentions, perceptions and knowledge of others and they would appear to understand how these psychological states work together to produce intentional action, so in a wide, open sense, some would claim that chimpanzees have a theory of mind (Tomasello and Call 2008). However, it would appear that if great apes do posses a theory of mind, they do not appear to do it very well (*Dunbar pers. comm.*), which may be explained in a number of ways. First of all, chimpanzees do not seem to be able to correctly understand false belief states and cannot therefore be said to posses a fully human like belief-desire psyche (Tomasello and Call 2008). Secondly, the chimpanzees may not understand the purpose of the tasks they are being asked to perform, which calls into question the validity of any behavioural results that mimic theory of mind actually representing a true understanding of a theory of mind (Tomasello and Call 2008). There are some real concerns that the chimpanzees on which the majority of theory of mind / belief state experiments are conducted upon are mostly trained, hand reared, or captive chimpanzees with extensive human contact. Not to detract from the cognitive echelon of the chimpanzee (which is clearly a very intelligent animal), but I wonder if the effective ‘enculturation’ of these hand reared and trained individual animals may have affected or biased the tests results in favour of expanding the cognitive capabilities of the chimpanzees under study. In order to truly assess the cognitive capabilities of our closest living hominid cousins, wild chimpanzee populations should remain the focus of these studies, allowing a truer representation of the theory of mind state to be ascertained.

At present, in my opinion, it is only the hominin clade that has truly managed to break through the second-order intentionality boundary and attain a conscious theory of mind. The majority of other animals are only able to know the contents of their own mind, with no ability to truly imagine the contents of an other’s mind (Dunbar 2007). Dunbar (2003: 178) has related the orders of intentionality to the brain sizes of primates and interpolated them into the hominin fossil record (figure 2.2a below). From this study Dunbar concluded that forth-order intentionality was unlikely to have been breached before the introduction of anatomically modern humans. Subsequent work (Dunbar 2004: 46, 191; Dunbar 2007) led Dunbar to revise the fourth-order ceiling shown in figure 2.2b (below) and moved it up to fifth-order intentionality being the functioning level for modern humans with the idea that Neanderthal populations may have had the ability to span the fourth-order divide between modern and archaic *H. sapiens* populations.

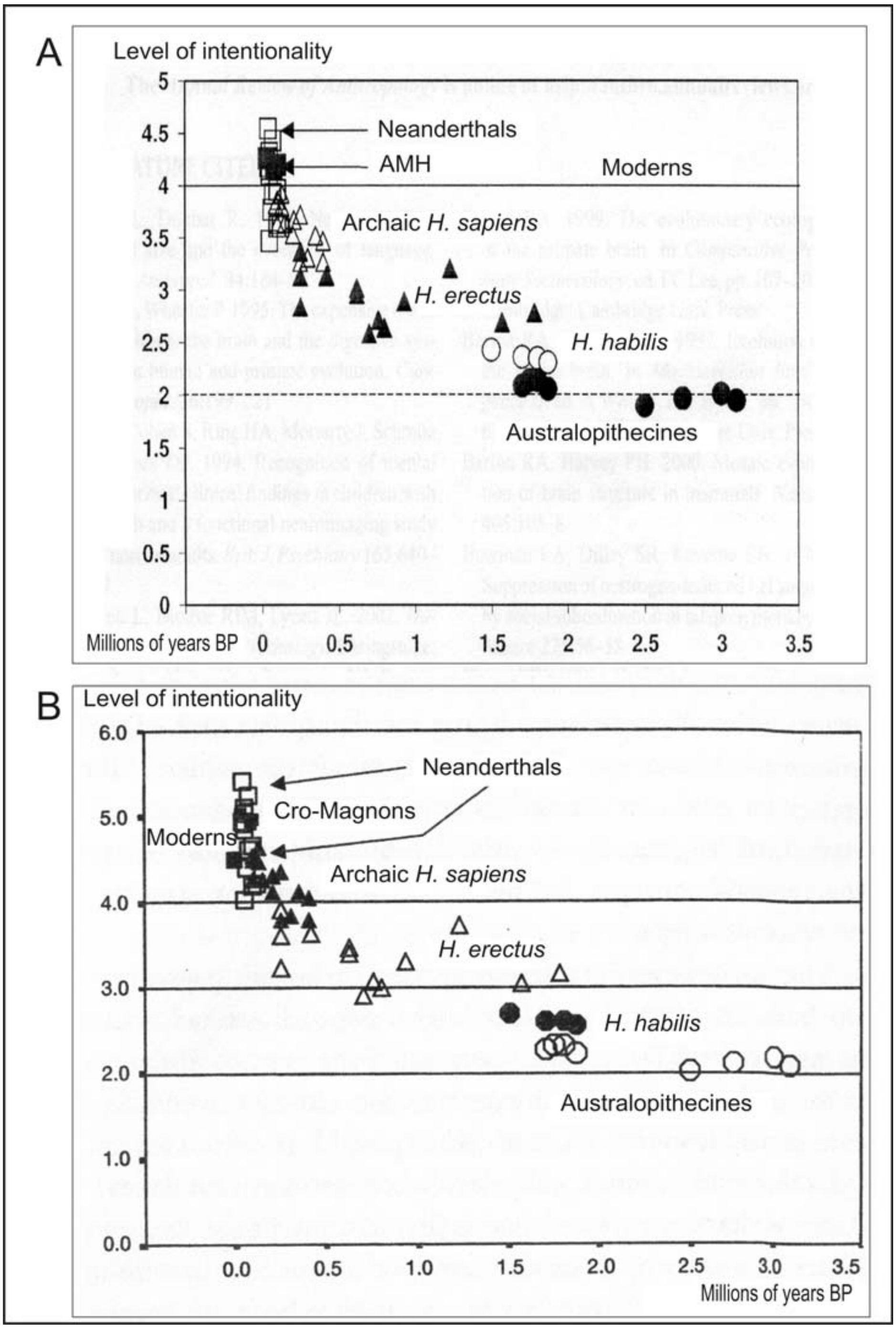


Figure 2.2: Showing the levels of intentionality for hominin populations plotted against time. Diagram A relates to Dunbar's original intentionality estimates prior to the 2004 publication, diagram B relates to Dunbar's intentionality estimates contained within the 2004 publication. For diagram A figure reproduced from Dunbar 2003: 178, Figure 4. For diagram B figure reproduced from Dunbar 2004: 191, Chapter 7, Figure 6.

Fifth-order intentionality is crucial to hominin and specifically human cognitive development because (in my opinion) only with fifth-order intentionality does a *full comprehension* of the abstract occur and subsequently grammatical language develop as a selective advantage to allow the expression of the *symbolic abstract* (Dunbar *pers.*

comm.). If the notion of symbolic abstraction is seen as a conceptual or metaphysical ideology made significant through social and cultural constructions (Deacon 1997), then I hope that it is clear that such a complex notion can only be explained to an external individual or group in a way that facilitates equal understanding through grammatical language. Non-verbal visual display utilising the body or material culture is simply not expressive or flexible enough to convey the full meaning of a totally abstract notion such as the supernatural. Therefore, I propose initially here (and expand upon in greater detail in Chapter 3) that if a full comprehension of complex abstract notions such as religion and the supernatural are only possible with a fifth-order of intentionality (Dunbar 2007), then it is only with a fifth-order of intentionality that fully developed grammatical language as a successful system of social communication and co-ordination becomes possible.

As useful as the orders of intentionality maybe as an ordinal scale of cognitive complexity, there is however, an issue in the linearity of how the orders of intentionality work together. For example, you cannot possess third-order intentionality unless you have second-order intentionality. In a broad evolutionary context, based upon extrapolations of brain and group size, this restrictive condition in the orders of intentionality scale seems to have been accepted as a reasonable sequence of cognitive development (figure 2.2; Dunbar 2003; 2004; 2007). But this has never been tested against the archaeological / behavioural record. Dunbar (2007) argues that there is no real need for the Social Brain Hypothesis to be corroborated against the archaeological record because the Social Brain Hypothesis explicitly deals with the mental processes that underlie social behaviour rather than on the overt behaviour itself or aspects of cognition that focus on instrumental skills like tool making. The tools in effect become a “red herring” as the mindsets that lie at the core of the Social Brain Hypothesis are unlikely to leave a visible trace in the fossil record that archaeologists may relate to the tools themselves (Dunbar 2007).

However, there have been extensive archaeological studies placing material culture as active participants in maintaining and structuring social relations (Gamble 1999; Gosden and Marshall 1999; Ingold 2007; Barham 2007; Barham 2010), supported through ethnographic studies illustrating that tools lie at the heart of mediating social relations, beliefs and social practices in non-Western / pre-industrial societies (Killick 2004). Even if it is often unclear which hominin species definitively produced certain tool types, the act of tool making and material culture creation is intrinsically a social act when related to problem solving and learning (however this was achieved e.g. through imitation, observation or demonstration) (Stout 2002; Bamforth and Finlay 2008; Barham 2010). Additionally, in regards to primates, there are some interesting studies that substantiate the importance of social environments in the retention of learnt skills and innovation in tool making (van Schaik and Pradham 2003). Therefore, if tool making is correctly placed within the socialscape of their creation, and Palaeolithic tools are examined with this in mind, there can be little doubt that tools have a great deal to potentially tell researchers about the behavioural and cognitive complexities of their hominin creators. Indeed in light of the social involvement that tools must be privy to, the statement that

> "tool-making and tool-use (are) less cognitively demanding than navigating one's way through the minefields of the social world" (Dunbar 2007: 93)

seems to be an effective (if flawed) way to avoid the complexities and uncertainties that must arise from any effort to correlate the Social Brain Hypothesis to the archaeological record. The Identity Model (Chapter 3) represents my attempt to associate the Social Brain Hypothesis to the archaeological record through constructs of identity, their relation to the orders of intentionality and the identification of the use of material culture and the body in social signalling.

A further caution to observe regarding the Social Brain Hypothesis is the use of predicted brain size (taken from estimated brain volumes of fossil crania) for each hominin as a reliable measure of intelligence. Although it is accepted that "brain volume and cognitive ability are positively associated in the general population" (Schenemann *et al* 2000: 4937), I query whether there is enough cranial fossil evidence for each hominin species to form an accurate and reliable proxy for the referent species as a whole. Furthermore, the Social Brain Hypothesis predictions are based on extant modern human and primate populations with the hominin levels of cognition being the result of extrapolations based on predicted group and brain size which may bear little relation to the actual cognitive capacity of the hominins understudy. In this thesis, one of the aims is to address the issues revolving around brain and group size predictions made by the Social Brain Hypothesis in relation to hominin cognitive capabilities (figure 2.2; Dunbar 2003; 2004; 2007) by examining the behavioural / material cultural record of the Palaeolithic using the Identity Model as a methodological insight.

Summary

The Social Brain Hypothesis predicts that as hominin social group size increased, more complex social interactions were required to maintain group cohesion, which drove the growth of the neo-cortex to facilitate the cognitive changes required to handle the increasingly convoluted social interactions. As a result of the social pressures driving biological changes within the hominin psychology and physiology, behavioural changes were also required to maintain the social cohesion of large groups. One example of this was the development of vocal grooming (or language) to maintain social equilibrium without impacting on energy quotients. Essentially, the Social Brain Hypothesis is a theory that explains the development of the 'human' through the primary push of social drivers. In the section below, I shall offer a brief overview of the hominin clade as known at the time of writing, with the aim of illustrating each hominin's current position in terms of predicted cognitive complexity within the Social Brain Hypothesis.

2.2 The Social Brain Hypothesis and seven million years of hominin evolution

A brief description of the members of the hominin species are set out below in relation to genera (figure 2.3; table 2.1) with a more detailed break down found in Appendix 1. Figure 2.4 shows a summary of the current thinking on hominin intentionality according to the Social Brain Hypothesis exemplified in table 2.1 and references within, mapped onto the phylogenic outline shown in figure 2.3.

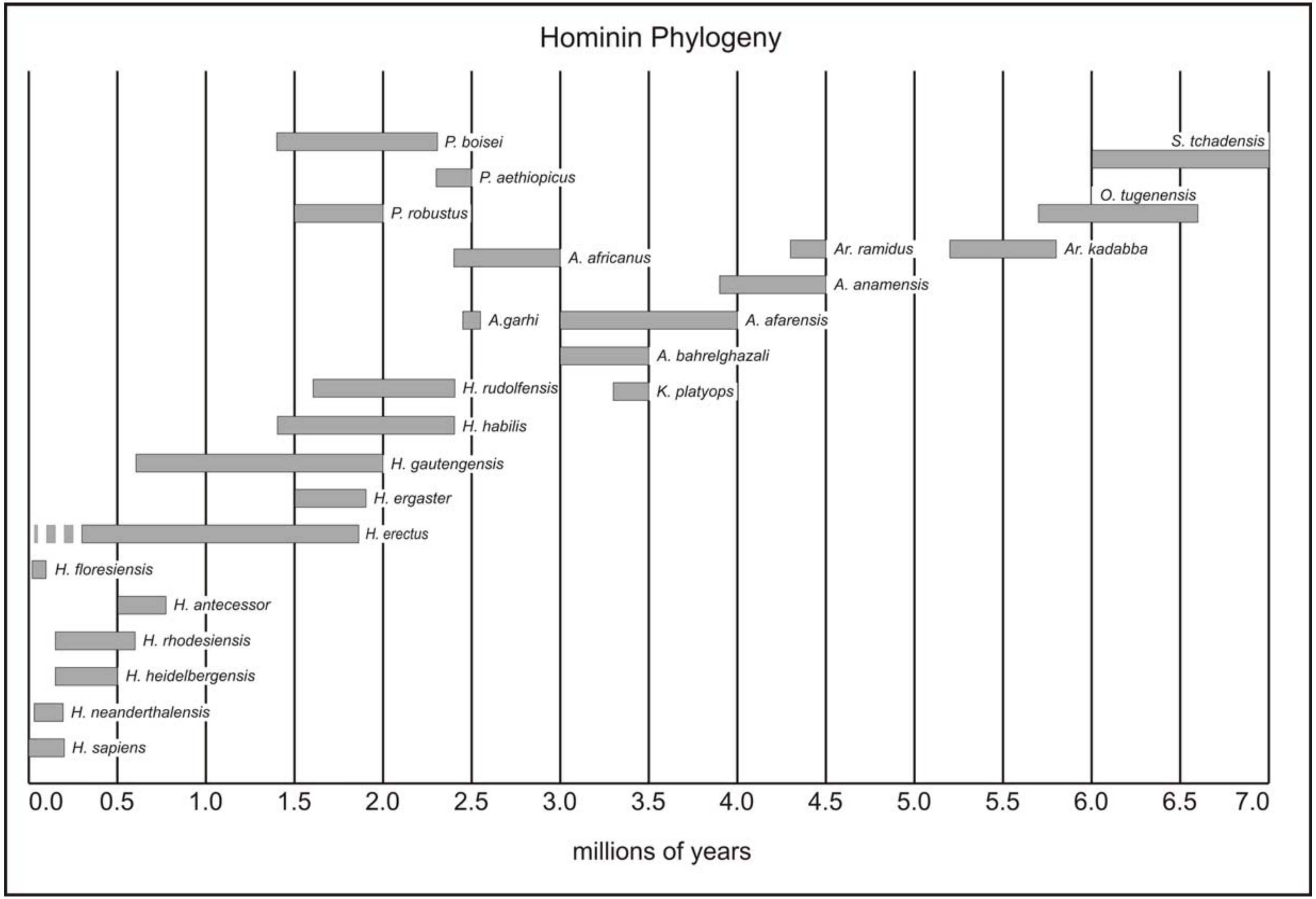


Figure 2.3: Diagram illustrating the hominin phylogeny to be followed within this thesis.

Species	Temporal Range (mya)	Group Size (individuals)	Average Stature	Cranial Capacity	Order of Intentionality
Sahelanthropus tchadensis	7.0 - 6.0	Unknown	Unknown	320 - 380cm^3	1st order
Orrorin tugenensis	6.6 - 5.7	Unknown	Unknown	Unknown	1st order
Ardipithecus kadabba	5.8 - 5.2	Unknown	Unknown	Unknown	1st order
Ardipithecus ramidus	4.5 - 4.3	Unknown	Unknown	Unknown	1st order
Australopithecus anamensis	4.5 - 3.9	Unknown	Unknown	Unknown	1st order
Australopithecus afarensis	4.0 - 3.0	c. 60	M = 1.51m; F = 1.05m	387 - 550cm^3	1st order
Australopithecus bahrelghazali	3.5 - 3.0	Unknown	Unknown	Unknown	1st order
Kenyanthropus platyops	3.5 - 3.3	Unknown	Unknown	Unknown	1st - 2nd order?
Australopithecus africanus	3.0 - 2.4	c. 65	M = 1.38m; F = 1.15m	428 - 560cm^3	1st - 2nd order
Australopithecus garhi	c. 2.5	c. 65	Unknown	c. 450cm^3	1st - 2nd order
Paranthropus aethiopicus	2.5 - 2.3	60 - 69	Unknown	400 - 490cm^3	1st - 2nd order
Paranthropus boisei	2.3 - 1.4	67 - 74	M = 1.37m; F = 1.24m	475 - 545cm^3	2nd order
Paranthropus robustus	2.0 - 1.5	65 - 72	M = 1.32m; F = 1.10m	450 - 530cm^3	2nd order
Homo rudolfensis	2.4 - 1.6	80 - 98	M = 1.60m; F = 1.50m	752 - 825cm^3	2nd order
Homo habilis	2.4 - 1.4	70 - 86	M = 1.31m; F = 1.00m	509 - 687cm^3	2nd order
Homo gautengensis	2.0 - 0.6	Unknown	c. 1.00m	Unknown	1st - 2nd order?
Homo ergaster	1.9 - 1.5	91 - 99	M = 1.80m; F = 1.60m	750 - 848cm^3	2nd - 3rd order
Homo erectus	1.8 - 0.3	90 - 127	M = 1.85m; F = 1.46m	727 - 1225cm^3	2nd - 3rd order
Homo antecessor	1.2 - 0.5	120 - 138	Unknown	1125 - 1390cm^3	3rd order
Homo rhodesiensis	0.6 - 0.1	129 - 134	Unknown	1250 - 1325cm^3	3rd - 4th order
Homo heidelbergensis	0.6 - 0.1	123 - 142	Unknown	1165 - 1430cm^3	3rd - 4th order
Homo neanderthalensis	0.3 - 0.028	126 - 161	c. 1.60m	1172 - 1740cm^3	4th - 5th order
Homo floresiensis	0.095 - 0.012	Unknown	c. 1.00m	c. 380cm^3	1st order?
Homo sapiens	0.2 - present	129 - 160	M = 1.75m; F = 1.60m	1304 - 1600cm^3	4th - 5th order

Table 2.1: Summarising the hominin position within the Social Brain Hypothesis. See Appendix 1 for a more detailed breakdown and full site specific references. mya = million years ago; M = male; F = female. Data from Aiello and Dunbar 1993; McHenry and Coffing 2000; Wood and Richmond 2000; Brunet *et al* 2002; Brunet *et al* 2005; Zollikofer *et al* 2005; Wood and Lonergan 2008; Curnoe 2010; Grove *pers comm*.

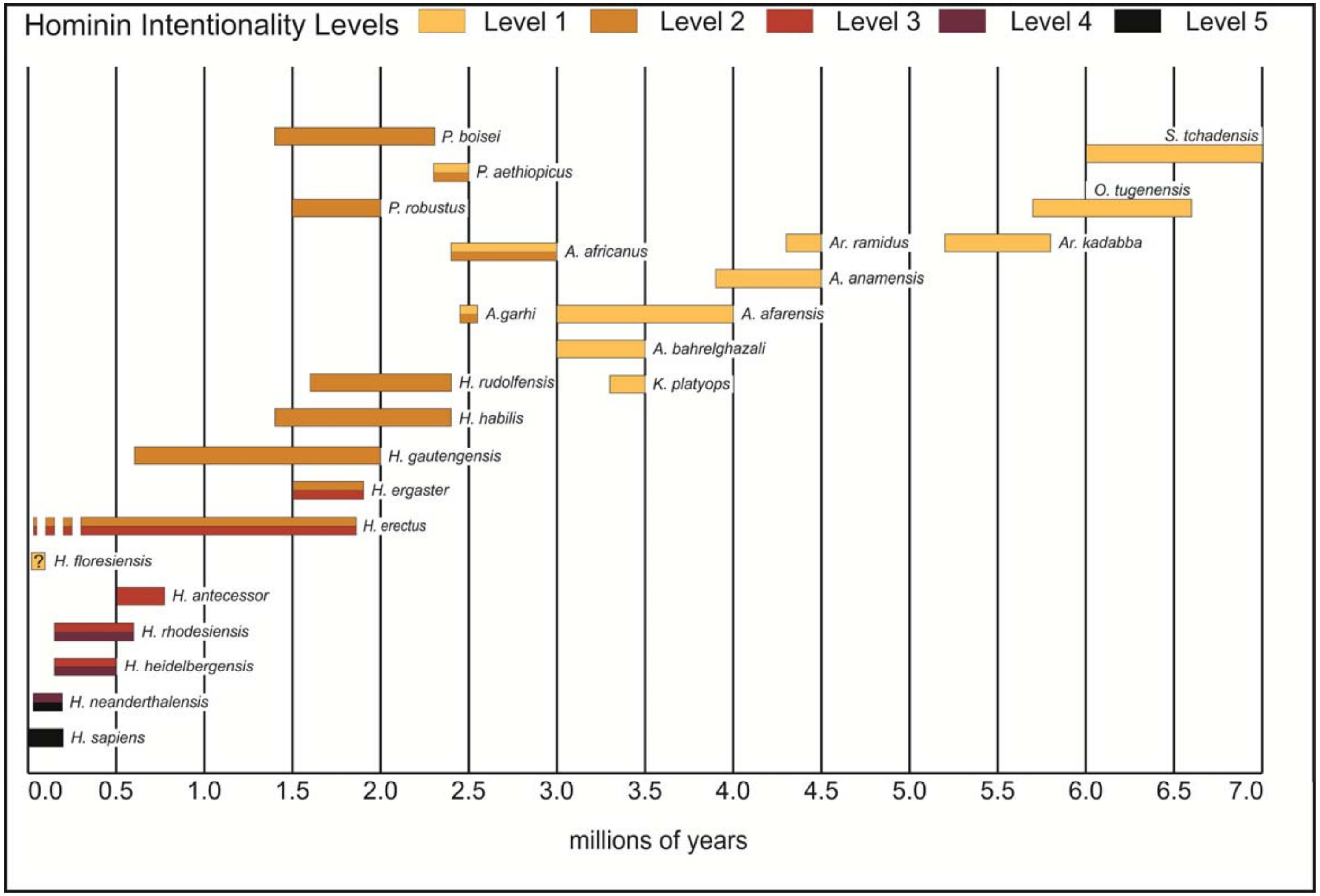


Figure 2.4: Summarising the view of hominin intentionality according to the Social Brain Hypothesis. Based on Table 2.1; Dunbar 2004; Gamble 2007 and McNabb 2007.

Having examined the summary data given above relating to hominin evolution, it may become apparent that we still know very little about our hominin ancestors in terms of their behaviour, psychology and in many instances physiology (evidenced through the lack of stature information for many hominins - table 2.1). Even where there is fossil evidence pertaining to a hominin species, much of the physiological classifications and interpretations are based on fragmentary fossils of more than one individual and almost all based on incomplete skeletal remains. As such there has been much confusion and debate surrounding the classification of certain fossils more often than not hindering rather than advancing our understanding of our ancient ancestors, with many hominin classifications still remaining contentious issues. In terms of the Social Brain Hypothesis, the assignment of intentionality orders to the hominin record has been done through estimated brain and group sizes (based on a sparse fossil record) with no real attempt to correlate such assignments to the material culture record (fairly abundant in comparison even if often chronologically uncertain and confused). Therefore, one must call into question the assignations of the orders of intentionality onto the hominin record.

Indeed, to echo a point made previously, the linearity of the application of the orders of intentionality to the hominin clade may create a false simplification of the social strategies of the hominins under study (particularly the Australopiths and *K. platyops*). The Identity Model given in Chapter 3 represents my attempt to produce an alternative scale of cognitive complexity that allows a direct assessment of the material culture record in relation to the body and its use in social communication. The use of the Identity Model to ascertain the cognitive abilities of ancient hominins based on their material culture over predicted brain and group size, may lead to a more robust assessment of the hominin record. Therefore, any theories relating to the cognitive abilities of the hominin line should not rely on the limited physiological cranial data alone, but should incorporate the material culture record and subsequent relationships to the social interactions of the body. In order to get closer to the use of the body as a vehicle for social communication within the hominin clade, we must first understand the current theoretical thinking surrounding the body.

2.3 Why is research into ‘the body’ important?

Academic interest in the human body has grown over the last few decades,

> “the body – as (a) metaphor for society, as (an) instrument of lived experience, and as (a) surface of inscription – has come to occupy a central place in contemporary social theory” (Joyce 2005: 140).

Social theories have two main approaches to the body, the so called ‘symbolic body’ focusing on the representative nature of the body as an outlet of social meaning, and the ‘agentic body’ highlighting the body as an agent in the social world (Reischer and Koo 2004: 298). However, during this discussion on why the ‘body’ is an important avenue of research for this thesis, I shall be focusing mainly on archaeological attitudes to the body and how archaeology as a discipline has viewed the body. I will also offer a holistic definition of the body of my own construction which I shall follow throughout the remainder of the thesis.

Attempting to define what is meant by the term ‘the body’ is a difficult task because the term itself could have a number of diverse meanings to different people depending on the context in which they are situated and what the term means to those individuals at that time. Critically, studies into the body have tended to view the body as a biological canvas on which cultural factors serve to define and endow significance (Lock 1993). In this light, some scholars may prefer to follow Grosz’s (1995) definition of the body as a:

> “concrete, material, animate organization of flesh, organs, nerves, skeletal structure and substances, which are given a unity and cohesiveness through psychical and social inscription of the body’s surface” (Grosz 1995: 104).

This definition is centred on the biological aspects of the body with an acknowledgement to how social factors may play a part in interpreting how the body is read from the ‘surface’. Grosz seems to imply in the definition that it is the external social world that defines the body. However, the body is much more than the biological components that allow it to function in a social world and the body is not dependent on the external social world in order to exist or to be a cohesive whole. Ultimately, "bodily practices mediate a personal realization of social values" (Lock 1993: 137), where the individual defines and constructs the body (adopting or rejecting external social rules) before the peripheral social world imposes its own definition. Indeed, it is the individual and the living body that lends, "substance to the social distinctions and differences that underpin social relations, symbolic systems, forms labour and quotidian intimacies" (Moore 2000: 317).

Therefore, I would suggest that 'the body' should be viewed as a vehicle that enables a corporeal grounding for the life form we call 'a human being', a creature that exists in both the physical and conceptual realms with the body not only playing an essential role in defining what it means to be human (Sofaer 2006: 42) but in bridging the gap between the physical and metaphoric worlds that we construct around ourselves. The body is both a container and an instrument (Gamble 2007: 110) that allows us to relate to the essence of what it is to be 'human' through a medium (the body) of which we have an inherent understanding. Sofaer states that (2006):

> "(h)uman beings are designated and defined through the biological criteria upon which social, intellectual or spiritual characteristics are overlaid. The identification of the body as human allows the study of people as a unit across time and space" (Sofaer 2006:4).

Sofaer asserts that the body itself is not a single unit, but rather is made up of a multiple number of components both physiological and metaphysical. The 'body' therefore can be seen as a conduit where its physiological and metaphysical components come together to construct a physical entity that individuals (and groups) can relate to and engage with. Indeed, when talking about the 'body' it is important to remember that the body is more than just the tangible, the body "is not just an instrument that…carries out…the orders of an insulated and 'disembodied' mind in which meaning and intentions reside" (Sofaer 2006: 42), the mind is as much a part of the essence of the body as the body constitutes the mind. The body allows individuals to comfortably realise that they are human and engage with other humans without having to consciously think about the significance of what it actually *means* to be 'human'. The body in this respect successfully "combines biology and culture" (Gamble 2007: 89) bridging the gap between the physical space in which the body inhabits and the metaphoric arenas that the bodies themselves construct. Therefore, a definition of ‘the body’ must remove the dualistic view of the body and the mind as two separate and independent entities. Instead the definition should take into account all aspects of the physical and conceptual worlds that the body inhabits otherwise the definition shall remain wanting.

Therefore, I would suggest that the body may be defined as:

- A vehicle which contains the biological components that constitute its physical structure (skeleton, nerves, organs, muscle etc) integrated with and dependent upon, a conceptual cognizant state (the mind) that both constructs and is constructed by the social and physical worlds in which it inhabits.

As such, the body is both a receptacle and an agent capable of creating a physical *and* abstract environment which it occupies. In a modern human sense, the body both constructs and is constructed by the external social world in which it resides, “a relative concept, conditioned and conditioning other complex entities that range from society to the cosmos” (Willis 1996: 75). Such a definition of the modern human body may allow the researcher of the Palaeolithic a ceiling point from which to examine the evolutionary development of the human form and mind into the holistic whole that we currently find ourselves. I shall now turn to a brief review of how archaeology as a discipline has viewed the body with the aim of illustrating how my definition and view of the body can help to improve our understanding of the body and its pivotal role in visual display as demonstrated within this thesis.

2.4 An archaeological view of the body

Archaeological interest in ‘the body’ is inherent to the discipline, with archaeologists long offering interpretations from recovered material culture and skeletal remains that refer to behavioural practices, ideals and experiences of our ancient and recent ancestors (Joyce 2005; Pettitt 2011). However, the archaeological view of the body has tended to be framed by the two opposing extremities of science and humanism (Sofaer 2006: 10), with osteoarchaeological investigations on the science front and academic theorising on the humanist. Osteoarchaeology has centred investigations of the skeletal body on scientific empirical traditions concerned with categorising and recording the sex, age, diet and palaeopathology (effects of disease etc. on skeletal remains) (Sofaer 2006: 1). Conversely, there is an attitude of academic theorising about the body based on social theory that tends to relegate the archaeological evidence of the physical body to the side lines in favour of a subjective, fluctuating and culture specific body that disqualifies science as an appropriate method of study (Sofaer 2006: 1-2).

It must be recognised that there may be a danger of narrowing our understanding of the body through preconceived notions of theory or a scientific interrogation that loses sight of the manner in which those very bodies' (i.e. the people) under study would have lived (Thomas 2000). Moreover, in the process of interpretation the physiological aspects that form the foundation of osteoarchaeological assessments are mute as attention is often focused on the artefacts surrounding the body, rather than the body itself (Sofaer 2006: 2). Therefore, future investigations into the body must be careful not to bias the interpretation one way or the other (science or humanist), and interpreters should ensure that the material culture surrounding the body is not separate to the body, but rather an extension of the body; the body in effect becomes material culture, and material culture in turn becomes linked to the body.

Certainly I would suggest that material culture of any description carries an embodied essence of its creator and user. *Before material culture can be created, it must be conceived*. As material culture moves from the conceptual to the tangible, the essence of the architect becomes *embodied* within the material culture through the act of creation. As other bodies come into contact with the material culture through exchanged ownership or utilization, essences of other bodies are added to the embodied personification of the original author. In this way a form of the artefact becomes an embodied representation of the architect (and subsequent users) which can be reproduced within a social network as the item of material culture moves through the landscapes and socialscapes that the architect / users inhabit. The embodied essences of 'other bodies' or utilisers are incorporated into the material culture's story, but the effects of the users embodied essences are transient in comparison to the architect as histories of ownership and utilization of the artefact may be lost / forgotten through the ages. However, I believe that the relationship of the creator –

artefact is permanently preserved through the embodied essence of conception within the archaeological record, i.e. the artefacts existence.

Many of the difficulties found in the discussions of the body in archaeology given above stem from the lack of a definition of the body that takes into account the complex worlds that often surround it. By utilising the definition that I have put forward, a definition that acknowledges the physical and conceptual boundaries of the body, a more inclusive archaeology of the body *and* embodiment can now begin. By realising that the body does not end with the excavated skeletal remains, or that the social group is not the only reader or architect of the body, but the individual *always* has a role to play, archaeologists may now develop theories and methodologies of interrogation that combine the scientific and humanist views that have divided the discipline for so long.

The next section of this chapter shall focus on how the body can be used as a vehicle for social communication, beginning by looking at how primates use their bodies to convey information to their conspecifics and ending up with theories regarding the neurological development of modern human language.

2.5 The body as a vehicle for communication

Before detailing how the body can be used as a vehicle for social communication it is important to define what we mean by communication. The word 'communication' describes a large range of behaviours of varying degrees of cognitive intent and complexity. It should be made clear at this junction that communication and grammatical language are not to be confused, grammatical language is a type of communication, the vehicle of communication exclusive to modern humans. Systems of communication are found at all levels within the animal kingdom – for example the honey bee shaking signal (Nieh 1998) - where communication can be simply defined as involving the "targeted exchange of information between a sender and a receiver, using a mutually agreed code" (Zanker 2007: R806). Communication defined in this broad way can encompass any form of communicative behaviour by any animal, for example, a macaque alarm call or a modern human conversation about astrophysics. Clearly these two forms of communicative behaviour do not require the same cognitive abilities in order to occur, so a clearer definition regarding ‘communication’ should be examined. One way to differentiate between the egocentric, dyadic (used to draw attention to the self) and context specific communications of the animal - and specifically primate (Flack and de Waal 2007) - world and the more complex abstract communications of the human world, is to define communication in relation to theory of mind.

Baron-Cohen (1999) describes eight behaviours that would not be possible without a developed theory of mind, included within these behaviours is ‘intentional communication’. Intentional communication defined as “communicative acts that are produced in order to change the knowledge state of the listener” (Baron-Cohen 1999: 262), where a theory of mind is required because to intentionally inform an ‘other’ you need to be able to conceive that the ‘other’ has a mind that can be enlightened or not (Baron-Cohen 1999). Some may argue here that the predator specific alarm calls of bonnet macaques (Coss *et al* 2007) or the variable gestural repertoire of the bonobo (Pollick and de Waal 2007) are examples of primate ‘intentional communication’ designed to change the knowledge state of their conspecifics, and to some degree this would seem to be the case.

However, this does not indicate that these primates have a theory of mind. In fact, the confusion arises here from Baron-Cohen’s simplified definition of ‘intentional communication’. Once a theory of mind has been achieved, communication can move beyond the dyadic dynamic into the triadic - where individuals may communicate about something that is not situated within the visual or auditory context of the signallers and receivers. Theory of mind represents the first step towards developing abstract thought – conceiving the contents of an ‘other’s’ mind - therefore, once a theory of mind has been attained, the mental representation of the world shifts from a perspective grounded in the egocentric, context specific present, to the other-centric, context independent triad of time (past, present, future) (Deacon 1997; Barham 2010).

A theory of mind allows the communication of information about a third party figure whether the object of interest is present or not, as well as allowing the perception and beginnings of comprehension in relation to understanding the triad of time (something happening in the *past*, something happens in the *present* and something that will happen in the *future*). The predator specific alarm calls of the macaques are very much context and time specific - the predator is visible in the present so the alarm call is sounded (Coss *et al* 2007) and the gestures of the bonobo although not context specific in action (Pollick and de Waal 2007), are context specific in intention (of the signaller), and crucially, interpretation (by the receiver). Modern humans however do have the ability to communicate triadically, we can communicate about an individual or object without the dyadic restraint of context or time (for example, a discussion between two people about Goya's *Shootings of May Third* whilst walking up Table Mountain – the people concerned can discuss Goya's 180 year old painting without having to view it at the time of discussion). Therefore, I would propose a redefinition and naming of Baron-Cohen's (1999) intentional communication to reflect the true consequence that a theory of mind endows on communication:

- Theory of mind communication – is a communicative act produced by a signaller in order to change the knowledge state of the receiver *without necessary recourse to the presently inhabited context*.

By redefining intentional communication in this way it is possible to clearly see the difference between animal and human communications. One of my intentions for this thesis is to develop a model offering a way through which members of the hominin clade developed and evolved their communication systems from those similar to the primate communiqués (body language and visual display in a non-lingual society) to the grammatical language of modern humans with specific attention to the use of the body in social communication. This is the Identity Model in Chapter 3. By social communication in reference to the hominins I refer to the theory of mind communication defined above, whereas in reference to primates I refer to the simpler context specific, dyadic communiqués currently seen within non-human communication (body language through the body's inhabited context).

I shall now examine in detail how primates currently use their bodies to communicate with their conspecifics before detailing new research on mirror neurons which will help to clarify the role of the body in relation to the development of language.

2.6 Primate Communication – "I'll scratch your back if you scratch mine"

From an evolutionary perspective, studies into primate communication and social construction is a subject of intense interest within the academic community and as such has been extensively reviewed on more than one occasion with new research constantly coming to light (for a small sample of this literature see: Hewes 1973; Peters and Ploog 1973; Snowdon *et al* 1982; Parr *et al* 2005a; Parr *et al* 2005b; Pollick and de Waal 2007). Primates communicate through a variety of methods consisting of auditory, visual, autonomic, tactile and olfactory signals (Peters and Ploog 1973). Keeping within the constant theme of 'the body' running through this thesis, I shall primarily focus here on how primates use their bodies to communicate, although not ignoring the auditory signals of the primates on which there is an extensive bibliography to be explored (for example: Peters and Ploog 1973; Ghazanfar and Hauser 1999; Arcadi 2005; Egnor *et al* 2006; Coss *et al* 2007). Furthermore, comparative studies between human and non-human primate vocalisations have not proved very successful due to the fact that the two types of communication are so different and far removed from each other that any relative study tends to reveal little about their common ancestry (Seyfarth and Cheney 2008).

All mammals use their bodies to communicate information on an inter and intra-group level. The information communicated by the body is species specific and communicated through body form; sex differences through sexual dimorphism (including pelage – defined as an animals covering of fur, hair or wool - dentition and behaviour); body posture and patterns of body movement; social hierarchy signalled through body posture and pelage; and age signalled through body shape and pelage (Peters and Ploog 1973). Whilst the examples of signal information given above are important to maintain an inter and intra-species sentient balance, this information alone will not maintain social cohesion on an intra-species level. In order to achieve intra-species group cohesion social signalling is required. One mechanism to create a system of social signalling is to signal emotional states (Peters and Ploog 1973). Emotional signalling has been viewed as an important factor fundamental to animal behaviour, crucial in organising physiological and psychological systems such as predator avoidance, reproduction, infant care, group cohesion and modulating inter and intra-specific aggression (Parr *et al* 2005b). Primates make use of all the body communiqués given above however, they also use facial expressions and vocalisations as the primary medium for communicating their emotional state (Parr *et al* 2005b).

Facial expression is a key component of using the body as a platform of social communication and there are a couple of interesting points to note regarding primate facial expressions. Firstly, it would appear that facial musculature relating to expression remain similar across the primate clade resulting in the same facial expression being represented across diverse taxonomic groups (Parr and Waller 2006) and in similar social situations possibly suggesting an evolutionary common meaning or function (Ekman 1998: 351; Parr *et al* 2005b). Furthermore, the fact that the facial muscular basis is similar throughout the primate clade supports the idea that "many facial expressions among closely related species are indeed homologous, including important expressions in chimpanzees and humans" (Parr *et al* 2005b: 717) which could suggest that the mechanism of using facial expression as a means of social communication (in a primate sense) is an evolutionary hang over from the last common ancestor between humans and primates. In addition to a commonality in physiology, Parr *et al* (2005b) have demonstrated that there would seem to be a strong phylogenetic relationship between "facial expression repertoire and specializations in the neural control of facial movement" (Parr *et al* 2005b: 718). Such a relationship is significant to the Social Brain Hypothesis because it would suggest that the evolution of neural specialisations to control complex facial movements may have "received increased selective pressures in our closest ancestors" (Parr *et al* 2005b: 718). This in turn would suggest that the use of the body (in this instance specifically the face) in primate social communications has been an important part of the evolutionary development of hominins and hominids for over seven million years. This serves to re-emphasise the importance of the research into the body within this thesis. Dobson (2009) highlights the strong link between facial mobility and body size – the larger the body, the larger the face, the more facial mobility, the greater the range of facial expression – however he still concludes that social factors played an important role in the evolution of facial flexibility adding further support to the Social Brain Hypothesis.

Primates and specifically the apes use other parts of their body apart from their face to communicate with each other. Studies of the Ngogo chimpanzee community in Kibale National Park, Uganda have shown that wild chimpanzees use directed scratches to indicate specific areas of the body that the signaller wants groomed (Pika and Mitani 2006). This type of directed gesture is clearly egocentric and context specific but it does illustrate the importance of the body in primate (non-lingual) communication within the grooming context. The use of the body within social grooming is central to the maintenance of social cohesion within primate groups (Bramblett 1970; Peters and Ploog 1973; Dunbar 1996; 1998a; 2003). Primates have been seen to use grooming to develop support cliques where they preferentially groom those individuals that groom them most and preferentially support those that support them most (Schino *et al* 2003; Schino 2006) tending to direct grooming up the hierarchy (Schino 2001). Although primate grooming may not be seen as an explicit form of communication, it still conforms to the broad definition proposed by Zanker (2007) where the information exchanged between individuals through grooming is the old adage of "I'll scratch your back if you scratch mine". In this way primate grooming reaffirms the social ties of individuals within the group maintaining hierarchical order and group cohesion.

Hewes (1973) has long thought that chimpanzees exhibit behaviour regarded as a "substrate for gestural language" (Hewes 1973: 7). Such behaviour consists of arm and hand gestures, facial expressions, body postures, and so called 'attention-orientation' toward dominate individuals (Hewes 1973). Furthermore, recent studies have shown that our primate cousins use 'brachio-manual' gestures more flexibly than facial expressions and vocalisation in cross context communications (Pollick and de Waal 2007), however as stated before, even though gesture action may be used cross contextually it does not indicate the presence of a theory of mind because the intention behind the action and the subsequent interpretation are very much context specific in ape communications. Additionally, studies by Pika (2008) have shown that the majority of ape gestures are dyadic and not triadic and therefore ape gesture is unlikely to represent any theory of mind achievement. One suggestion offered as to why gesture action can be used in different contexts as opposed to facial expression is because gesture is less closely tied to emotion and therefore posses a more adaptable function and they seem to be evolutionarily younger than facial expressions as shown by their presence in apes but not monkeys (Pollick and de Waal 2007).

Olfactory signals are used by primates to communicate information regarding territory, sex, sexual reproductivity, individual identity and social status (Epple 1974). Although, as the majority of the information obtained through smell tends to be broad general communications found in any mammal, it is unlikely to represent any theory of mind communication. Without the body, the communications described above would not be possible and would suggest that this demonstrates the truly ancient roots of using the body in acts of visual display (culturally or non-culturally motivated).

However, the question that naturally arises from this brief review is how does the use of the body as a vehicle for non-theory of mind communication develop into theory of mind communication and eventually fully grammatical language? The answer is explored in the next section in reference to the relatively recent discovery of mirror neurons.

2.7 Mirror Neurons and the evolution of language through the use of the body as a vehicle for social communication

Humans and non-human primates share a close genetic structure, broad physical form and analogous social structure when interacting with conspecifics (Arbib 2005; Pika 2008) however the brains, bodies and individual behaviours differ rather drastically. In terms of behaviour there is one particular action that humans do that no wild primates do, that is to use language - although some captive chimpanzees and bonobos have been trained to acquire a form of language that compares to that of a two year old human child (Arbib 2005). The question to be addressed within this section is how did a gestural language (as put forward by Hewes 1973) centred on the body develop into the grammatical language of modern humans. Recent research into the neural structures of primate and human brains has revealed some interesting possibilities in terms of how this development may have taken place. Within the monkey brain there is a ventral premotor area called F5 which is primarily responsible for the visuomotor control of hand movements (Arbib 2005). Within the F5 area of the monkey brain, a specific set of neurons called mirror neurons have been found which fire not only when the monkey executes a specific hand or mouth action, but when the monkey observes a familiar action by another individual using their hands or mouth; familiar actions involving tool use; and mirror neurons react to sounds of familiar object-related actions (Kohler *et al* 2002; Arbib 2005; Ferrari *et al* 2005). The fact that mirror neurons fire in area F5 during the observation of tool use may suggest that mirror neurons are fashioned through visual experience which further suggests that mirror neurons may be crucial in imitation and imitative learning (Iacoboni and Mazziotta 2007). However, mirror neuron activity is dependant on the observer having a motor representation of the observed action and not just having the visual understanding of what is being observed (Calvo-Merino *et al* 2006).

In the human brain, the region homologous to the monkey's F5 is part of Broca's area traditionally ascribed as the area involved exclusively with language production (Arbib 2005). However, recent studies have shown that Broca's area also plays an essential role in finger movement and other aspects of motor behaviour and imitation (Meiser *et al* 2003; Iacoboni and Wilson 2006). The use of Broca's area in motor behaviour suggests an evolutionary link between action recognition, imitation and ultimately grammatical language with a shared neural mechanism between individuals that facilitate a 'neural identity' between the signaller and receiver establishing common understanding (Meiser *et al* 2003). With the appreciation that area F5 in monkeys is the homologue of Broca's area in humans it can be recognized that the homologue provides a neurological link for the idea that gestural communication preceded speech in the evolution of language (Arbib 2002; 2005).

Mirror neurons in this context would appear to provide a neural mechanism for recognising familiar actions performed by others (Iacoboni and Mazziotta 2007) which has been suggested as *allowing the observer to access the mental state of the performer*, possibly representing a "precursor in phylogeny, of a simulation heuristic that might underlie mind-reading" (Gallese and Goldman 1998: 498). In other words, for movement to become a motor act the presence of a mental goal is required, this is important because the presence of a goal allows the role of the motor system to be interpreted not only as the manipulation of the functional variables of movement, but as a contender mechanism for the understanding of mental states (intentions) of others (Gallese and Goldman 1998). Or in other words, mirror neurons may provide a neurological basis for a theory of mind. In support of this idea, recent studies have shown that the mirror neurons in monkeys discharge differently depending on whether an observed grasping hand action is followed by raising the grasped object to the mouth or placing it elsewhere (Gallese 2006). The interesting point to note here is that the mirror neurons discharged before the monkey observed the experimenter starting the motor act, this suggests that mirror neurons not only cipher observed motor acts but also allow the receiver to predict the signallers' next action and subsequently their intent or *potential* mental state (Gallese 2006).

The question that arises is how mirror neurons (as a mechanism) allow access to the mental states of others? Mirror neurons are not a homologous whole but are divided into two main categories, strictly congruent and broadly congruent mirror neurons (Gallese *et al* 1996; Iacoboni and Mazziotta 2007; Newman-Norlund *et al* 2007). Strictly congruent mirror neurons make up approximately a third of all mirror neurons and only discharge in response to an action being either observed or executed (Gallese *et al* 1996; Newman-Norlund *et al* 2007). Broadly congruent mirror neurons make up approximately two thirds of all mirror neurons and discharge in response to the same action executed or observed, but they also fire for actions that are logically related or achieve the same goal (Gallese *et al* 1996; Newman-Norlund *et al* 2007). Furthermore, strictly congruent mirror neurons discharge in relation to an observed action independent of context whilst broadly congruent mirror neurons discharge in relation to complementary actions that are related to a different but associated response (Newman-Norlund *et al* 2007). Moreover, the fact that there would appear to be twice as many broadly congruent, as opposed to strictly congruent, mirror neurons intimates that mirror neurons are not simply related to mirroring others, but assist in maintaining social relations where individuals perform similar actions to achieve a common goal (Iacoboni and Mazziotta 2007; Newman-Norlund *et al* 2007). Mirror neurons highlight that our understanding of others is a "distributed process that requires action in the world" (Barrett *et al* 2007: 571), mirror neurons provide a mechanism by which an observer can understand a viewed action through an unconscious mental simulation of the action without an actual execution of the action (Jacob and Jeannerod 2005).

In terms of how this affects social behaviour, mirror neurons may provide a basis of empathy founded on action simulation and intention reading which may underlie the human empathetic ability to understand the emotional and mental states of others (Iacoboni and Mazziotta 2007). In other words, there would appear to be a neurological basis for a theory of mind (the ability to project an understanding of your 'self' and 'self's' action onto another, to empathically comprehend an 'others' action) in relation to an internal understanding of action.

At this juncture it is important to note that in order to fully understand any cognitive processes we must understand how such processes are established within the experience of the body and bodily action (Anderson 2003; Barret *et al* 2007). Mirror neurons essentially model the functions of the body in the observed world yet they also significantly contribute to our own awareness of our own 'lived body' and how that body interacts with the world in which it inhabits (Gallese 2005). Catmur *et al* (2008) have put forward the idea that as mirror neurons seem to play a part in our ability to interact with others, this particular property of the mirror neuron system may itself have been as a result of complex social interactions during the mirror system's development (Catmur *et al* 2008). So not only do the mirror neurons help to allow a comprehension of the body, but (in some ways unsurprisingly) the body itself may have helped to define the role of the mirror neurons.

Having reviewed how mirror neurons work and how they relate to the body it is now time to explore the connection between mirror neurons and the evolution of grammatical language. The mirror system hypothesis (Arbib and Rizzolatti 1997; Rizzolatti and Arbib 1998; Arbib 2002; Arbib 2005) explores the link between mirror neurons and the evolution of fully grammatical language by hypothesising seven stages in the evolution of language with imitation (based on mirror neurons) being the foundation for two of the stages. The stages for the mirror system hypothesis are as follows, the first three steps are suggested to have occurred pre-hominin (stage descriptions below have been taken from Arbib 2002; 2005):

- *Stage 1*: Grasping – the Anterior Intra-Parietal sulcus and ventral premotor area F5 in monkeys are key elements in a cortical circuit which converts visual information on the essential properties of objects into hand movements that allow the animal to grasp the objects suitably.
- *Stage 2*: Mirror systems for grasping – when a monkey observes a familiar motor act a neural code is retrieved and discharges when the monkey executes the observed act. This mirror system for grasping is thought to be shared with the common ancestor of humans and other primates.
- *Stage 3*: A simple imitation system for grasping – an imitation system for object directed grasping that develops through repeated exposure. This

imitation system is suggested to have been shared with the common ancestor of humans and chimpanzees.

It would be prudent to repeat Arbib's (2002) warning that language played no role in the evolution of monkeys, chimpanzees or the common ancestors shared by humans with them with, "(a)ny changes…chart(ed) prior to the hominid line should be shown to be adaptive in their own right, rather than as precursors of language" (Arbib 2002: 256).

The next three stages distinguish the hominin line from that of the apes:

- *Stage 4*: A complex imitation system for grasping – acquiring the ability to recognise the actions performed by another as a set of familiar actions and proceed to repeat or recognise that a performance could combine novel actions constructed from a familiar repertoire of actions.
- *Stage 5*: Protosign – a gestural based communication system which breaks through the fixed repertoire of primate vocalisations to generate an open repertoire.
- *Stage 6*: Protospeech – as a result of the control mechanisms evolved for protosign being brought to control the vocal apparatus.

Arbib (2005) states that Stage 7 involves little if any biological changes but rather results from a cultural evolution *Homo sapiens*:

- *Stage 7*: Language – changing from action-object reference frames to verb-argument structures to syntax and semantics resulting in the coevolution of cognitive and linguistic complexity.

The mirror system hypothesis hinges on the idea that the mechanisms that developed the role of Broca's area in language crucially depend on the mechanism formed in Stage 2 (Arbib 2005).

From the evidence discussed so far, I believe that the presence of mirror neurons in primates and humans indicates a strong selective advantage for the monitoring of others' actions which may have developed into a form of manual communication where mirror neurons were crucial to the correct reading of the signals by both the observer and the observed. The natural progression of such underpinning neurological behaviour is the physical expression through a shared commonality of understanding or culturally developed meaning that the self and other must share and appreciate. This may be further supported by recent studies by Iverson and Goldin-Meadow (2005) where it has been shown that there is a close link between gesture and speech in modern human language development with gesture often being "a harbinger of change in the child's developing language system" (Iverson and Goldin-Meadow 2005: 370). The use of the body within this type of communication system is clearly implicit and underlies once again the importance of the body (through action recognition / visual display) in the development of the modern human. Furthermore I agree with Arbib's (2005) sentiment that grammatical language developed more as a result of cultural influences which is something explored in greater detail within the Identity Model where I hypothesise that grammatical language developed in order to explain and communicate abstract ideals.

Essentially, the presence of mirror neurons highlights the importance of visual acuity in hominid and hominin evolution. Mirror neurons provide a neurological precedent for visual display systems within the development of hominin communications that ultimately result in the plethora of grammatical languages found in our modern world. It is the theme of visual display in the Palaeolithic as complex systems of social communications in non-linguistic societies that shall be taken up in later chapters.

2.8 Summary

Over the course of the preceding sections I have attempted to describe current theoretical positions relating to the body and its use as a social signaller. By redefining the body in such a way that incorporates the mind and the physical extent with the social factors (both individual and group) that construct the body I aimed to create an holistic definition of the body that would prove useful to researchers when attempting to access the bodies of the past. Furthermore, by examining the body's role in primate communications and how they differ to the possibilities enabled through theory of mind communication, I wanted to exemplify the importance of how breaking the theory of mind barrier was crucial to the development of the use of the body in the increasingly complex social communications of our hominin ancestors. Moreover, I aimed at clarifying the position of this thesis that extant primates have yet to attain a true theory of mind despite the incredibly complex social systems that they may inhabit. The discussion on mirror neurons forms a crucial aspect of the research within this thesis, as they allow researchers to access a neurological pathway that may help in explaining how our hominin ancestors broke through the theory of mind barrier by using their bodies as open canvases of social interactions. Arbib's (2002; 2005) mirror system hypothesis suggests a plausible avenue through which grammatical language developed out of the body's social signalling, and further highlights the importance of relating studies pertaining to the Palaeolithic to the visual displays and the uses of our ancestral bodies in non-lingual communication when offering behavioural interpretations on the hominin lineage.

In the next chapter I shall detail a method through which discussions about the body can be related to the Social Brain Hypothesis through the Identity Model, and how such a relationship will allow a testing of the Social Brain Hypothesis against the behavioural / material culture record of the Palaeolithic.

Chapter 3 – The Identity Model

Within this chapter, I will examine why identity theories offer a relevant perspective into the body, and then I will detail my Identity Model. The Identity Model is made up of three sections, the first describes the seven categories of identity that make up the core of the Identity Model and how they relate to the orders of intentionality, the second section explains how the Identity Model informs how individuals may progress from one order of intentionality to the next, the third section within this chapter discusses how the Identity Model fits in with established theories of identity.

3.1 Why Identity?

Questions relating to identity and the self have been repeatedly asked within many disciplines of academia primarily because the ability for self awareness and self reflection is a quality unique to the human condition (Devos and Banaji 2003). Similar to studies of the body, archaeology as a discipline has unconsciously and consciously been dealing with issues of identity since the very inception of the field. Through the creation of typologies (such as Bordes 1961; 1972) and archaeological 'cultures' (such as Childe 1929) archaeology as a discipline has created, defined, and imposed chronological cultural boundaries on material culture and human life ways (Shepherd 2003), constructing and imposing identities on aspects of the human past through the simple process of labelling and classifying. However, explicit interests in archaeological identities, past and present, are relatively recent, yet one of the largest areas of academic interest within the discipline forming a "critical nexus in academic discourse" (Meskell 2002: 281) that emphasise the "types of archaeology, the level of political engagement, and the points of connection archaeologists experience" (Meskell 2002: 281). Most importantly however, is the fact that questions of identity in archaeology can not only connect the discipline with other academic fields such as psychology, philosophy, geography and biology but with the wider public audience (Meskell 2002). Within this plethora of academic disciplines relating to identity, psychology has come closest to placing identity into a testable system of empirically sound research (Stryker and Burke 2000).

Psychology has a long tradition of grounding issues of the self and identity as being experienced in relation to the individual or group 'other' (James 1890; Baldwin 1897; Cooley 1902; Mead 1934; Goffman 1959; Greenwald and Breckler 1985; Breckler and Greenwald 1986; Banaji and Prentice 1994; Brewer and Gardner 1996; Sedikides and Brewer 2000; Anderson and Chen 2002; Devos and Banaji 2003; Chen, Boucher and Tapias 2006). Psychological forays into the questions of identity are numerous and varied (see Banaji and Prentice 1994; Stryker and Burke 2000; Devos and Banaji 2003 and Chen, Boucher and Tapias 2006 for basic reviews and bibliographies) however, there does seem to be a broad consent that individuals define themselves in relation to their relationships with individual 'others' and larger collectives "deriving much of their self-evaluation from such social identities" (Breckler and Greenwald 1986 cited in Brewer and Gardner 1996: 83; Greenwald and Breckler 1985). The view of identity from this psychological perspective essentially dictates that the self is created and defined from the actions and reactions of the 'other' in relation to the self (Brewer and Gardner 1996). According to Brewer and Gardner (1996), people seek to achieve their identity in three ways:

- in terms of their own individuality
- dualistic relationships
- group membership

The assumption being that the three identities of the self co-exist within the same individual (Sedikides and Brewer 2000). As such Psychology recognizes the formation of three types of self; the individual or personal self, the relational self and the collective self (Brewer and Gardner 1996; Sedikides and Brewer 2000). The individual self is defined as containing:

> "those aspects of the self-concept that differentiate the person from other persons as a unique constellation of traits and characteristics that distinguish the individual within his or her social context" (Sedikides and Brewer 2000: 1).

The individual self depends on comparing the self to an ‘other’ on an individual basis with the impetus of buoying up or ensuring the self’s differentiation in psychology to the surrounding ‘others’ (Markus 1977; Brewer and Gardner 1996; Sedikides 1993; Sedikides and Brewer 2000). In contrast, the relational self, is defined as containing:

> “those aspects of the self-concept that are shared with relationship partners and define the person’s role or position within significant relationships” (Sedikides and Brewer 2000: 1).

Also redefined as “the self that is experienced in relation to the significant others in one’s life” (Chen, Boucher and Tapias 2006: 173). In other words, an individual’s identities are constructed and formed in relation to our experiences with our closest confidents (whoever they may be). The relational self is established upon connections of personal attachment to significant others with the purpose of enhancing the significant other and preserving the relationship (Brewer and Gardner 1996; Sedikides and Brewer 2000). The collective self is defined as being:

> “achieved by inclusion in large social groups and contrasting the group to which one belongs (i.e., the in-group) with relevant out-groups” (Sedikides and Brewer 2000: 2).

The collective self focuses on the formal relationships with others that have a common association with a group. The collective self’s incentive is the enhancement of the so called ‘in-group’ (the group that the self belongs to) versus the ‘out-group’ (any other group or collection of individuals that are external to the ‘in-group’) (Brewer and Gardner 1996; Sedikides and Brewer 2000).

From the three classes of the self given above found within psychology studies, it seems that the issues of the self and identity are not singular or static concepts, yet fluid intangible notions that shift and change according to the social interactions of the individual in relation to the single or mass ‘other’.

Whilst I do agree with this point of view to a certain extent, in as much as the external social world does play an important role in how the individual accesses and constructs their identity; I do not agree that the individual's identity is *entirely* constructed by the 'other'. The individual always has a choice to either accept or reject the identity that the 'other' prescribes to them. Indeed, the individual as an active agent within their environment can not only accept or reject the identities that the peripheral 'others' may assign to them, but the individual also has the power to change and adapt the peripheral identities of the 'others' to fit their own perception of their own identity. This line of thought can be related to the idea of 'symbolic interactionism' (Cooley 1902; Thomas 1923; Mead 1934; Schlenker 1985a) where "people are not just passive reactors to situations, programmed by society with fixed action patterns" (Schlenker 1985b: 17). Indeed, individual people:

> "project images of self and define and appraise one another to allow them to select goals and develop plans for their joint activities. Once identities are fixed in terms that are understandable and potentially agreeable to the parties involved, all other dealings can follow. Without these personal and social specifications, done consciously or unconsciously, confusion and tentativeness result because the nature and meaning of the person would be unclear" (Schlenker 1985c: 65).

The individual is an active agent in the construction of the social world and should not be forgotten when discussing the construction of the individuals' identity and self within said world.

Furthermore, the psychological classes of self described above only seem to consider the 'mental self', failing totally to acknowledge the physical embodiment of the individual, relational and collective selves. As discussed previously, the self is a construction of the body and the mind, therefore, the body can be considered as the porous interface through which the individual, relational or collective self interact with the abstract and physical worlds that surround. The importance of the body in the creation of the self cannot be overstated, the body is the fabric upon which the understanding of the 'self' and 'other' is written. The body that separates the selves within the individual self; the book through which the reactions of the 'significant other' are read, and which constitute the building blocks of the relational self; and it is the bodies of the in-group that form the physical boundary that separate the out-group of the collective self. Therefore it is clear that discussions of identity creation and perpetuation must references to the body in order to gain a truly holistic understanding.

Therefore, any model of identity must not only take into account existing and accepted theories of identity, but must also contribute to ideas on identity that take into account the ability of the individual to construct and perceive their own identities and acknowledge the role of the body in the construction of the self and identity. Within the context of this thesis, any model relating to identity must also correlate to theories of evolutionary change relating to the hominin clade.

3.2 The Identity Model

The Identity Model I propose allows archaeologists to measure the cognitive potential of species based on an inherent understanding of the body seen through the filter of the material and behavioural archaeological record. This is in contrast to the more traditional filter of brain size. The model works on the basis that there are a minimum of seven categories of identity. Each of the identity categories builds on, is informed by, and informs upon, the previous identity category. Furthermore, each category of identity requires a certain minimum cognitive complexity on the part of the hominin in order to comprehend its situation. This minimum cognitive potential is measured through the orders of intentionality (Chapter 2). The seven categories of identity take into account both individual and group action in their construction; comfortably fit within the three psychological classes of self described above; relate to evolutionary theory through a correlation to orders of intentionality laid out in the Social Brain Hypothesis: and directly acknowledge the importance of the body not only in identity construction, but identity perpetuation through visual display in primarily non-lingual, but also lingual societies. The Identity Model offers a theoretical position in which the body and material culture may play a part in social communications in a predominantly non-lingual society. It is a central tenant of the Identity Model that the majority of hominin communication would have been non-lingual or limited, and centred around visual display. And it is through the assessment of Palaeolithic material culture using the Identity Model, that the Social Brain Hypothesis shall be related to hominin archaeology.

The Identity Model consists of seven categories which I shall summarise and define below. When reading the definitions given below, readers should refer to Table 3.1 and 3.2. Table 3.1 offers a simplified definition for each category of identity from the more complex ones given below and relates them to the orders of intentionality, whilst Table 3.2 tenders a fictional intentionality example of Xi the hunter to explain and clarify the relation.

Equivalent Orders of Intentionality				
1st - 2nd order	2nd order	3rd - 4th order		5th order
Internal Identity: Self is conscious of an awareness of own self. The awareness of *own* self forming a bridge between 1st and 2nd order intentionality.	**External Identity**: Self is conscious of their own mind, and that Other has a mind of their own. Subsequently, Self is also aware that Other may hold an opinion of Self other than that encapsulated within Self's internal identity	**Intex Identity**: Is the identity that Self desires Other(s) to buy into. **Perpetuated Intex**: Using material culture / behaviour to broadcast the intex.	**Collective Identity**: Self's belief in a commonality of understanding of the whole group	**Abstract Identity**: An ideational component to Collective Identity. **Perpetuated Abstract**: Using material culture / behaviour to broadcast the Abstract Identity.
Internal	External	Intex Perpetuated Intex	Collective	Abstract Perpetuated Abstract
Categories of Identity				

Table 3.1: Correlating the orders of intentionality to the categories of identity.

Equivalent Orders of Intentionality

1st - 2nd order	2nd order	3rd - 4th order		5th order
Xi *believes* he is a good hunter. This is a 1st to 2nd order of intentionality because Xi is aware of his own identity (a good hunter), rather than Xi just being aware.	**Xi *hopes* that O'wa *believes* that Xi is a good hunter.**	**Xi *hopes* the group *accepts* O'wa's *belief* that Xi is an exceptionally cunning hunter.** * Xi brings food to O'wa and re-enacts (falsely) his bravey and exceptional cunning in his hunt of a buffalo	**Xi *expects* the group to *believe* that O'wa *considers* that Xi's *intex* is true.** O'wa re-enacts Xi's kill for the group to convince the group of Xi's hunting prowess	**Xi *intends* O'wa to *think* that the Ancestors *desire* the group to *accept* Xi's *belief* in his own intex.** Xi achieves this by telling O'wa (using language) that the Ancestors have given Xi extraordinary prowess as a hunter
Internal	External	Intex * Perpetuated Intex	Collective	Abstract Perpetuated Abstract

Categories of Identity

Table 3.2: An intentionality example illustrating how the categories of identity work within the orders of intentionality.

The first category of identity is termed:

- **Internal identity** (figure 3.1) **–** internal identity is the *comprehension* of the body and mind as the single entity of the self. Self being an internally sentient organism with a conscious realisation of this state of mind. The internalisation of such a mental state means that an individual's internal identity is only truly known to them and therefore cannot be viewed or accessed by the other.

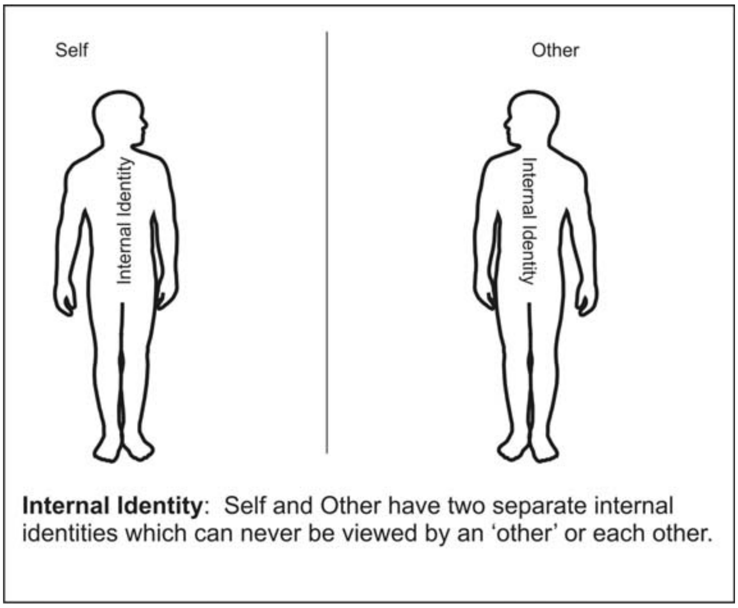


Figure 3.1: Illustrating internal identity.

I propose that internal identity forms the vehicle to theory of mind. The realization that the body and the mind constitute the 'self' is not an inherent comprehension; individuals must reach a *conscious* understanding that this is the case before progressing along the cognitive scale. I suggest here that the realisation of an internal identity allows for a reflection on the contents of your own mind and therefore constitutes the mechanism to attaining a theory of mind and a vital step between first and second-order intentionality. The internal identity is informed through the exposures of the 'self' (body and mind) to the experienced world. Every individual's exposure to the experienced world will be different thereby informing distinct internal identities for each individual. It is this difference that creates the discreet entities encapsulated within each individual. Following this reasoning, although extant primates and other mammalian have first-order intentionality, unlike modern humans they do not have a realised / conscious sense of self, nor a realised internal identity therefore they are not able to *reflect* on the contents of their own minds, let alone anyone else's (Dunbar 2007).

- **External identity** (figure 3.2) **–** external identity is the external view of the other by the self (and *vice versa*). The external identity is the identity created by the self for the other as a scaffold when accessing other's mental state.

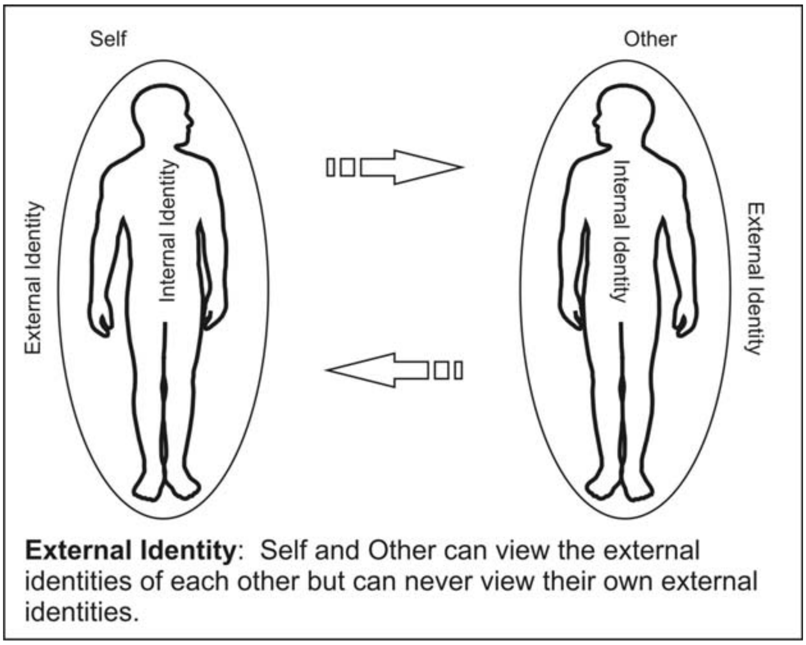


Figure 3.2: Illustrating external identity.

As self is able to reflect on their own minds' contents, then self is aware that other can do the same. Therefore, the self constructs an identity for other (external identity) as a mental scaffold to allow the self to access and relate to the intentions of the other. In order to be able to access the mind of the other, a theory of mind must be achieved, and subsequently external identity must fall within a second-order of intentionality.

Once a theory of mind has been attained, the potential in cognitive complexity for interactions between the individuals or between an individual and the group become markedly more elaborate. Subsequently, from this category onward, the individual now has the ability to manipulate their identities on an individual and group basis.

The third category of identity is the:

- **Intex identity** (figure 3.3) **–** intex identity is the internal to external view of the self (**intex** being an abbreviation derived from '**int**ernal to **ex**ternal'). This category of identity is different from external identity in that intex identity is how the self would *like* others to view it, whereas external identity simply acknowledges others' will have views of the self (and *vice versa*).

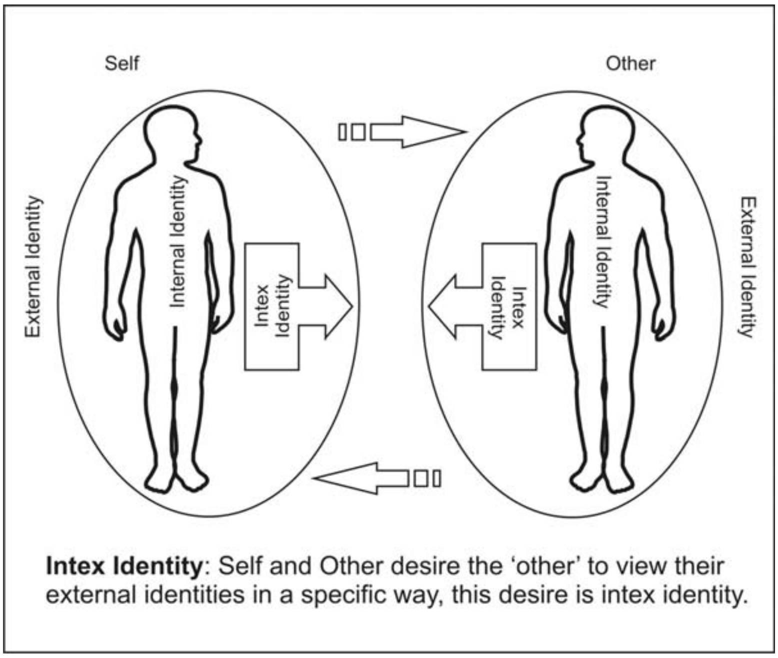


Figure 3.3: Illustrating intex identity.

The intex and internal identities are not necessarily mutually exclusive; an individual could wish to project an intex which is very different to their internal identity depending on the social situations that that individual inhabits (e.g. when T.S. Eliot's J. Alfred Prufrock prepares "a face to meet the faces that you meet" – Eliot 1974: 4). However, desire alone will not manipulate the view of the external identity - action is required. Therefore an external mechanism must be in place to broadcast the desire of the intex identity to an external observer. This mechanism is encapsulated within the fourth category of identity – 'perpetuated intex:'

- **Perpetuated intex** (figure 3.4) – is the mechanism by which the intex is propagated / broadcast through *behaviour and material culture* to the other. Perpetuated intex deals with the use of the body and / or material culture to *manipulate* the projection of the intex to the other in such a way that increases the chances that the other will accept the intex that the self wishes to project.

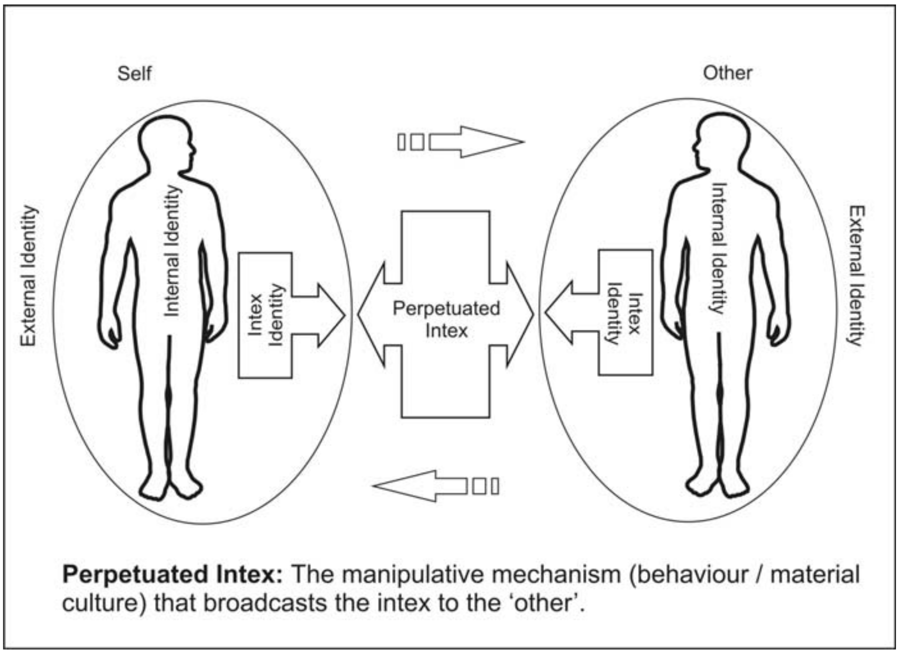


Figure 3.4: Illustrating perpetuated intex.

Perpetuated intex deals with the deliberate manipulation of how the other views the external identity of the self in relation to the intex identity (e.g. in relation to table 3.2 – Xi the hunter, stumbles across the carcass of a dead buffalo. In order to increase his standing as an exceptionally cunning hunter in O'wa's eyes, Xi takes some meat from the buffalo carcass, and presents it to O'wa. Whilst presenting the food to O'wa, Xi enacts a pantomime relating the story of how he stalked and killed the buffalo. Thereby, Xi creates an intex for himself as an exceptionally cunning hunter, and in order to get O'wa's external identity of Xi to conform to Xi's intex, he enacts the fictitious scenario that portrays him as an exceptionally cunning hunter in his killing of the buffalo). Both intex and perpetuated intex fall within a minimum of a third-order intentionality bracket where the self must be able to take into consideration that at least three states of mind are involved within the identity propagation, for example Xi *hopes* that O'wa *believes* Xi's *intex* to be true.

The use of the body is vital to the propagation process because it is the body that manipulates the perpetuated intex in its projection to the 'other' through visual display in a non-lingual society. In many ways, "the body functions as both a 'transmitter' and 'receiver' of information" (Lock 1993: 136), forming the link between intex identity and external identity, the body being the vehicle for propagation through perpetuated intex. *The manipulation of the body in perpetuated intex is achieved through visual display and embodied material culture which was made for a specific purpose*. Through the creation process the perpetuated intex of the creator becomes embodied within the material culture and will remain so through the material culture's history. With perpetuated intex, material / behavioural culture ceases to have a purely utilitarian function but begins to take on an additional culturally significant meaning.

Through acts such as gesture, the body itself becomes the medium of communication through which an explicit perpetuated intex is broadcast to the other. Perpetuated intex at the third to fourth-order intentionality bracket involves broadcasting on an individual to individual basis, and on a larger individual to group basis. The use of the body and material culture in this third to fourth-order intentionality context relates to physical body manipulations such as gesture or visual displays, in which material culture is involved in structuring social interactions tacking between individuals and the group (Gamble 1998). The body becomes the context and the engine for the effective broadcast of perpetuated intex. In order for the manipulation of the perpetuated intex to carry meaning across to the other from the self, the self must be sure that the other will correctly interpret the intended meaning within the perpetuated intex. Culture is the framework that ensures standardized meaning, commonality of understanding or agreed social convention is present.

In order for culture to impose a standardized meaning encapsulated in a social structure, there must be a framework of common understanding. This framework of understanding is the fifth category of identity described here, 'collective identity:'

- **Collective identity** (figure 3.5) **–** is the commonality of understanding that empowers the self's certainty that everyone understands things the way the self does. Collective identity therefore creates and propagates culture and in turn culture creates and propagates collective identity.

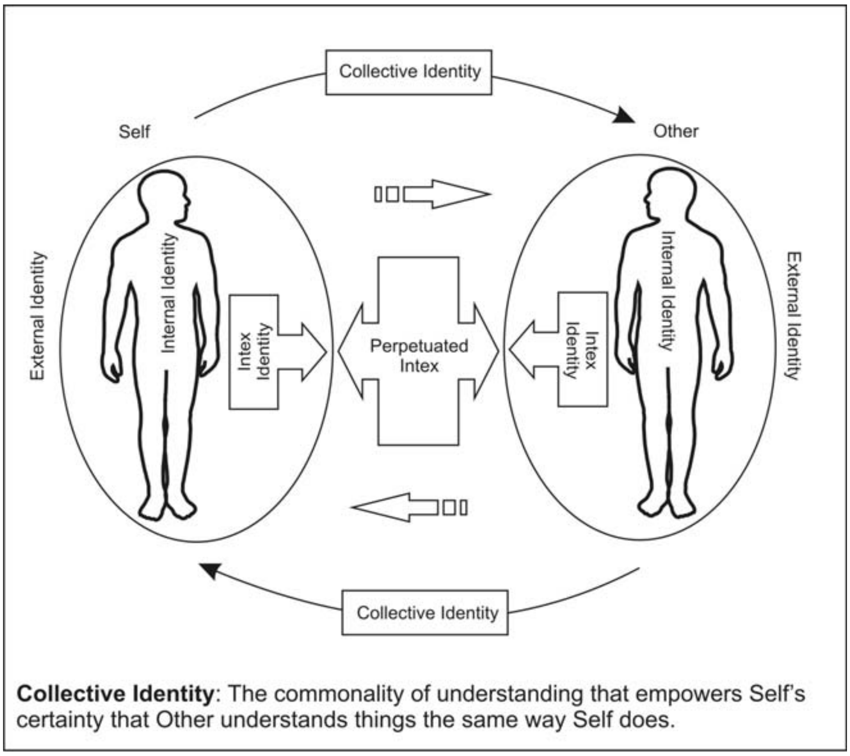


Figure 3.5: Illustrating collective identity.

Collective identity is informed by the internal, external, intex and perpetuated intex identities of all of the individuals involved in the identity propagation, and by the internal and external identities of the receivers. Because of this, culture / collective identity can either be accepted or rejected by individuals who subscribe, or not, to the collective identity put forward by the one or many. Similarly, due to the uniqueness of each internal identity / perpetuated intex and their relationship to collective identity, culture / collective identity has the potential to change as each individual propagates the culture / collective identity in relation to their own internal identities: essentially a form of 'cultural drift'. Collective identity involves groups as well as individuals within identity propagation, and therefore collective identity is a minimum of third to fourth-order intentionality. The commonality of understanding allows the behavioural and material culture production involved in perpetuated intex to be broadcast to, and understood by, a wider scale of audience (groups as opposed to individuals), and as such inform the construction and propagation of the collective identity.

In order for collective identity / culture to develop beyond a commonality of understanding, constrained by behaviour and an embodied material culture, an ideological scaffold must be in place. This scaffold is the sixth category of identity, 'abstract identity:'

- **Abstract identity** (figure 3.6) **–** is an ideational component to the commonality of understanding within collective identity. Abstract identity is a conceptual framework that once attained creates and propagates collective identity and in turn, collective identity propagates and creates abstract identity.

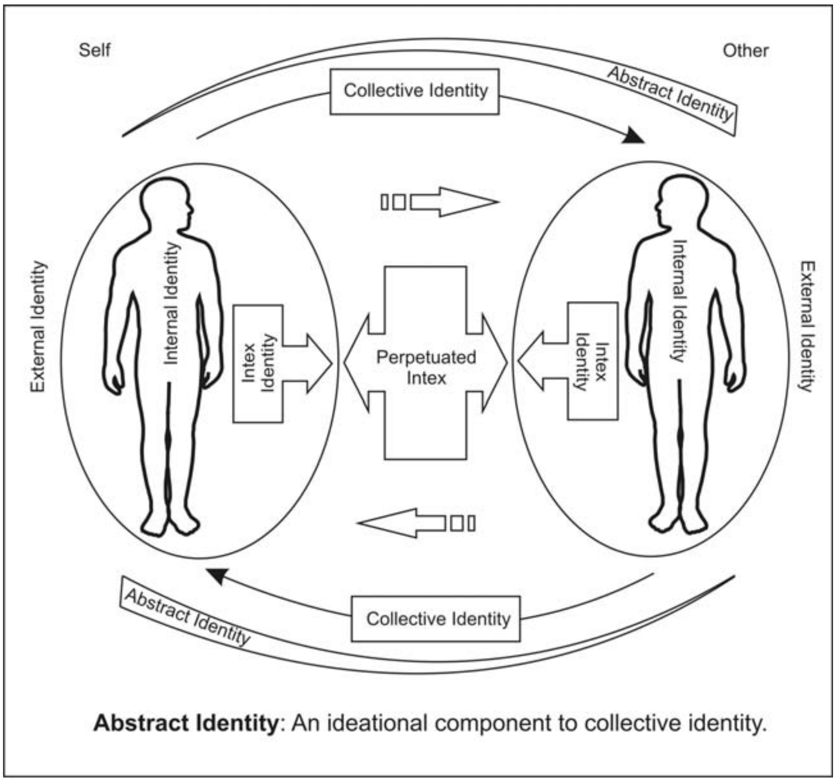


Figure 3.6: Illustrating abstract identity.

Abstract identity is concerned entirely with a conceptual component of collective identity / culture. As such, abstract identity is informed by collective identity (and all the identities therein involved) and therefore may be accepted or rejected by individuals or groups depending on whether the receivers subscribe or not to the collective and abstract identities offered by the propagators. Collective identity is an integral component of the abstract identity and, once an abstract identity has been achieved abstract identity becomes a key constituent of collective identity. For instance taking on board the identity of a religious, political or ethnic group.

Abstract identity cannot endure as a purely ideological construction it must be represented in the physical and tactile world – it must be perpetuated by individuals acting in a collective manner. Therefore a mechanism must be in place to broadcast the abstract identity to an external observer(s), this mechanism is the seventh category of identity: 'perpetuated abstract'

- **Perpetuated abstract** (figure 3.7) - is the mechanism by which the abstract identity is propagated / broadcast through behaviour and material culture to the other. Perpetuated abstract is concerned with the dissemination of the conceptual through a physical medium not directly related to the abstract concept being related. For example perpetuated abstract is encompassed within grammatical language and related by-products such as art and ornamentation (beads) as mechanisms for visualising / expressing abstract concepts.

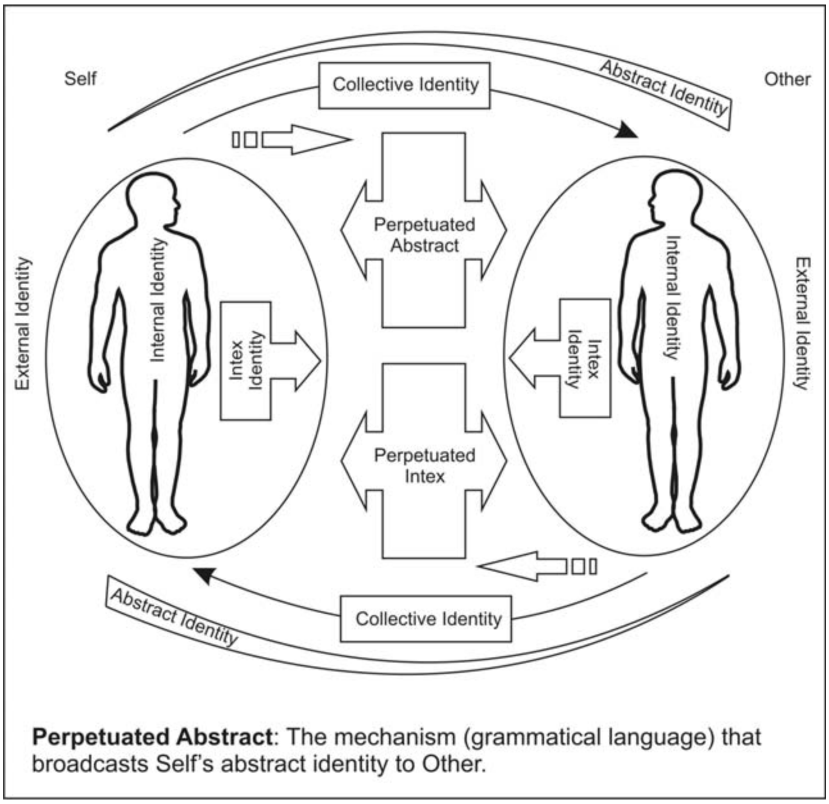


Figure 3.7: Illustrating perpetuated abstract.

Abstract identity and perpetuated abstract deal with the deliberate creation and dissemination of an ideology and are therefore *only* possible once fifth-order intentionality has been achieved. Fifth-order intentionality is the minimum requirement where fully abstract concepts, such as religion on a communal or group scale, may be formulated in a cogent manner (Dunbar 2007). Furthermore, perpetuated abstract can only be successfully expressed and disseminated through fully-grammatical language or *speech* and subsequent behavioural markers. The behavioural markers / archaeological evidence for grammatical language relate to abstract representations such as art, figurines and ornamentation (for example, Conard 2003; d'Errico *et al* 2005). It is the physical expression of abstract notions through speech, art, ornamentation and figurines that constitute the perpetuated abstract. The crucial point to take away here is that once grammatical language markers enter the archaeological record, fifth-order intentionality must have been reached by the hominin creating the marker. Although at the time of writing, such signatures are only related incontrovertibly to anatomically modern humans.

The seven categories of identity defined above form one facet of the Identity Model. The second facet details how the ideas relating to identity given above relate to a scale of cognitive complexity and established theories on identity construction.

3.3 Relating the Identity Model to the Social Brain Hypothesis

In terms of linking the Identity Model to the Social Brain Hypothesis, tables 3.1, 3.2 and the definitions of identity given above have already offered a scheme for relating the categories of identity defined above to the orders of intentionality. I shall briefly summarise and clarify below exactly how each category relates to the corresponding order of intentionality shown in table 3.1.

An internal identity is seen as a first to second-order intentionality where the conscious realisation of an internal identity represents a self reflective process. In other words, in order to realise that you think of your self in a particular way, you must be able to reflect on the contents of your own mind. *Knowing* the contents of your own mind represents a first-order of intentionality, and can refer to basic knowledge states such as *hunger* or *tiredness*. However, the ability to *reflect* on the contents of your own mind as is represented by an acknowledgement of an internal identity represents something more than a first-order of intentionality, for example, I *understand* who I am, rather than just knowing I am. Internal identity still represents a first to second-order intentionality position and not a full blown theory of mind because the self reflective quality of the internal identity category is confined to the contents of one mind, and not two. Therefore, I suggest that an internal identity constitutes the mechanism to attaining a theory of mind and a vital step between first and second-order intentionality, where the self must first consciously realise they have their own mind before imagining the contents of an other's mind. External identity is the acknowledgement by the self that the other has a mind similar to self's and may hold views that are similar or different to self. Therefore, the self constructs an identity for other (external identity) as a mental scaffold to frame the self's imagination of the mind of the other. In order to be able to access or imagine the mind of the other, a theory of mind or second-order of intentionality must be achieved. Both intex and perpetuated intex fall within a minimum of third to fourth-order intentionality bracket where the self must be able to take into consideration that three or four states of mind are involved within the identity propagation (self *desires* other to *think* that self's *intex* is true). Similarly, collective identity involves an individual accessing the mindset of a group as well as those of the individuals contained by the group within identity propagation, and therefore collective identity has to be a minimum of third to fourth-order intentionality. Abstract identity and perpetuated abstract deal with the deliberate creation and dissemination of an ideology – a fully realised and engaged notion of the abstract - and as such, is only possible once fifth-order intentionality has been achieved. Furthermore, an ideology / perpetuated abstract identity can only be expressed and diffused through fully grammatical language and its markers within the archaeological record such as art and ornamentation.

By correlating the categories of identity to the equivalent orders of intentionality not only has the Identity Model been connected to a scale of cognitive complexity, but the Identity Model may also inform on how the orders of intentionality may be useful as a measure of hominin cognitive ability. Figure 3.8 shows how the orders of intentionality are currently related to the evolutionary context through the Social Brain Hypothesis where there is an implicit step like progression through time between one order of intentionality and another.

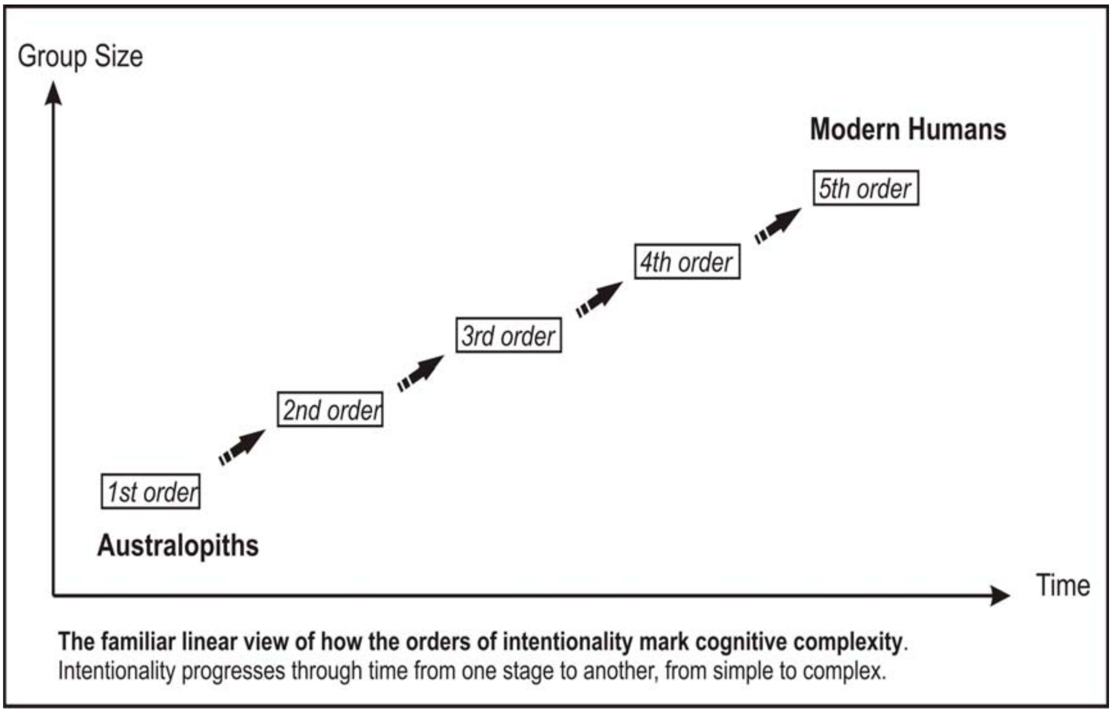


Figure 3.8: A simplified view of the way the Social Brain Hypothesis lays out the orders of intentionality in a stepped fashion through time.

What is missing from the Social Brain's application of the orders of intentionality to the hominin record is the mechanism that allows a progression from one order of intentionality to another. For example, how do you progress from a first order of intentionality to a second? However, if we examine the orders of intentionality through the Identity Model in relation to group size and time, I propose that the mechanism of progression is linked to concepts of identity construction of the self, and the single or collective other (figure 3.9).

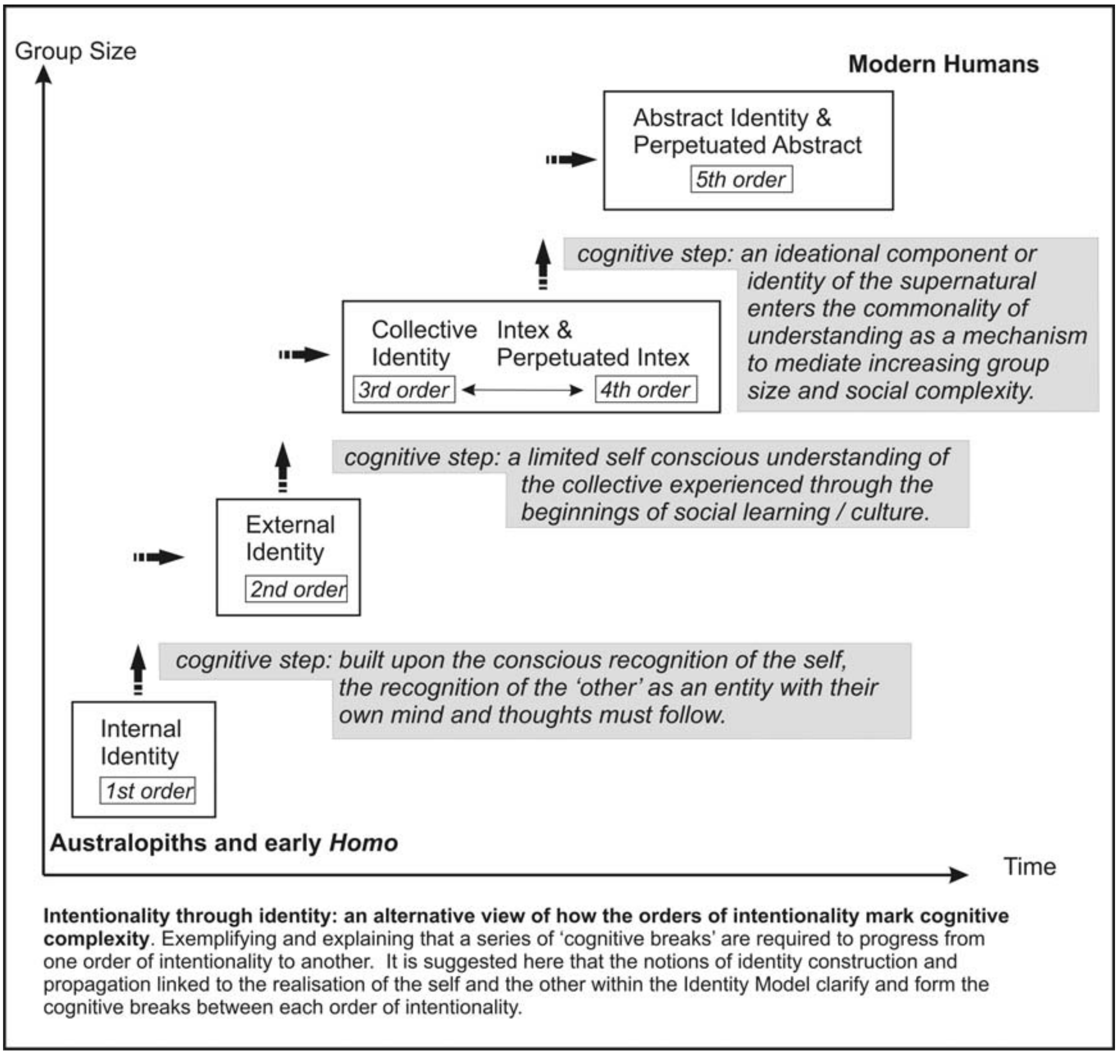


Figure 3.9: A simplified view of the way the Identity Model lays out the orders of intentionality in a stepped fashion through time.

I do not propose that the cognitive steps proposed in figure 3.9 represent the definitive cognitive mechanisms relating to increasing orders of intentionality. Rather I would suggest that viewing the progression of increasing cognitive complexity over time through the filter of the Identity Model allows a discursive heuristic when considering how increasing levels of social complexity, group size and the constructions of individual and group identities correspond to an increase in the order of intentionality. This is not to advocate a series of 'cognitive revolutions' within the evolution of the hominin, rather the recognition of identity in 'self' and 'others,' must march in lockstep with increasing social complexity. Furthermore, due to the body's inherent position within the understanding and propagation of identity in lingual and non-lingual societies (particularly exemplified within the perpetuated intex and perpetuated abstract categories of identity), the use of the body and material culture as vehicles for social communication should therefore also become more byzantine and multi-layered as social complexity increases.

3.4 Relating the Identity Model to the Classes of Self

According to the criteria for developing a model of identity stated above, the categories of identity defined should take into account and fit with an existing framework of identity theory and if possible make a relevant contribution to those existing theories. Table 3.3 shows how the identity categories of the Identity Model relate to the psychological classes of the self described and discussed above. The rest of this chapter shall be concerned with demonstrating the links proposed in table 3.3.

Class of Self	Category of Identity
The Individual Self	• Internal Identity • External Identity
The Relational Self (presumes an awareness of Internal and external Identities)	• Intex Identity • Perpetuated Intex Identity
The Collective Self (presumes an awareness of internal, external, intex and perpetuated intex identities)	• Collective Identity • Abstract Identity • Perpetuated Abstract Identity

Table 3.3: Detailing the relationship between the psychological classes of self (after Sedikides and Brewer 2000) and the categories of identity found within the Identity Model.

As can be seen, the categories of identity found within the Identity Model can be correlated to the psychologists' classes of self. However, it is suggested here that not only can the categories of identity be correlated to the classes of self, but in fact, the categories of identity constitute or form the classes of self. It is through the internal and external identities that the 'individual self' exists. Internal identity (being a vehicle to self awareness) *makes the concept of 'the self' accessible*, where as the external identity *allows* the 'individual self' to recognise and react to the separateness of the 'other'. Figure 3.10 shows how the individual self is constructed through internal and external identity, which, in turn define the interactions of the individual self in relation to the 'other'.

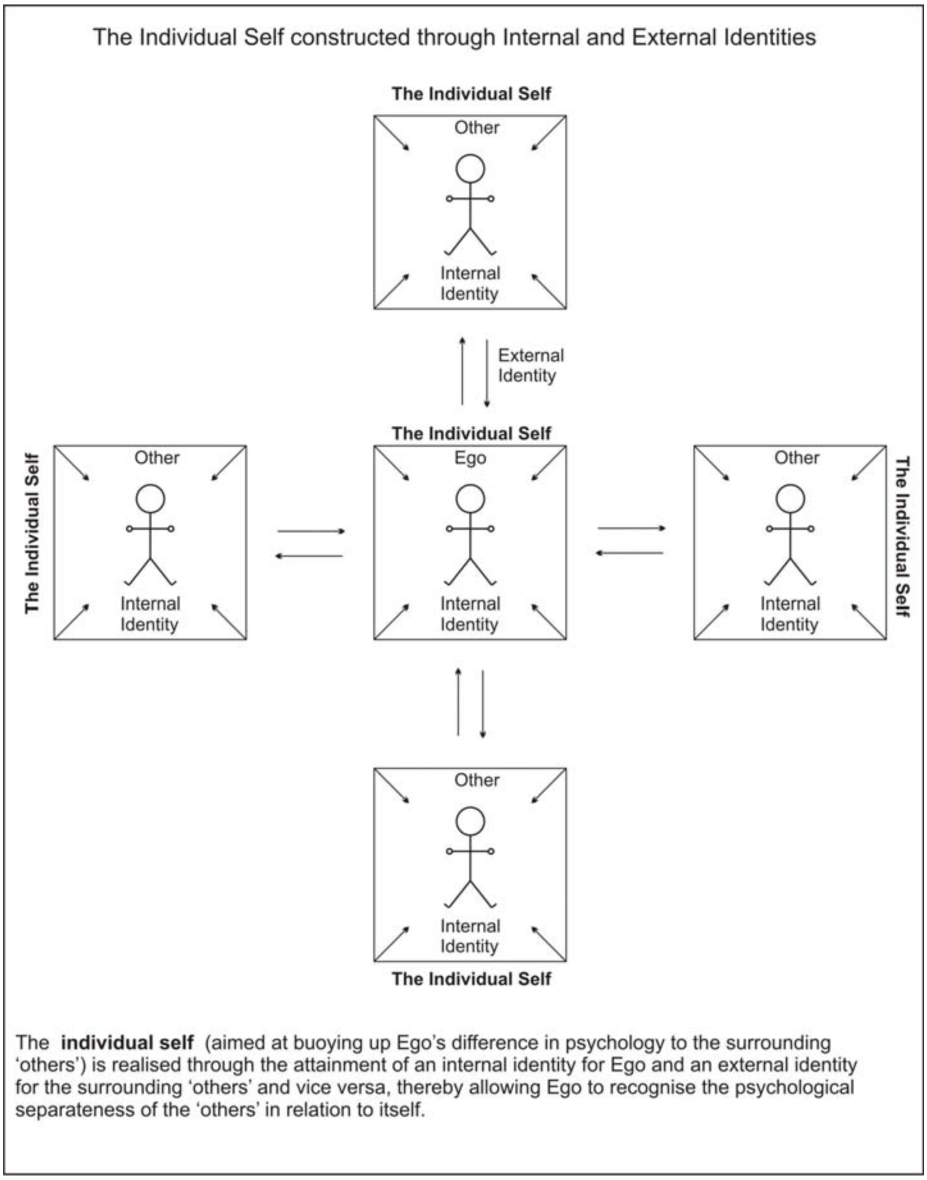


Figure 3.10: Showing the relationship between internal and external identity and their role in constructing the 'individual self'.

Similarly, it is through the internal, external, intex and perpetuated intex identities that the 'relational self' is constructed. Internal identity allows a base line of similarity that the external identity then accesses to recognise not only the separateness of the ‘other’ (in terms of the ‘individual self’) but the similarity of the ‘other’ / ‘significant other’ to the self. Furthermore, it is through intex and perpetuated intex that the individual maintains the relationships desired in the ‘relational self’ and the separateness desired in the ‘individual self’. Figure 3.11 shows the relationship between the Identity Model proposed here and the relational self.

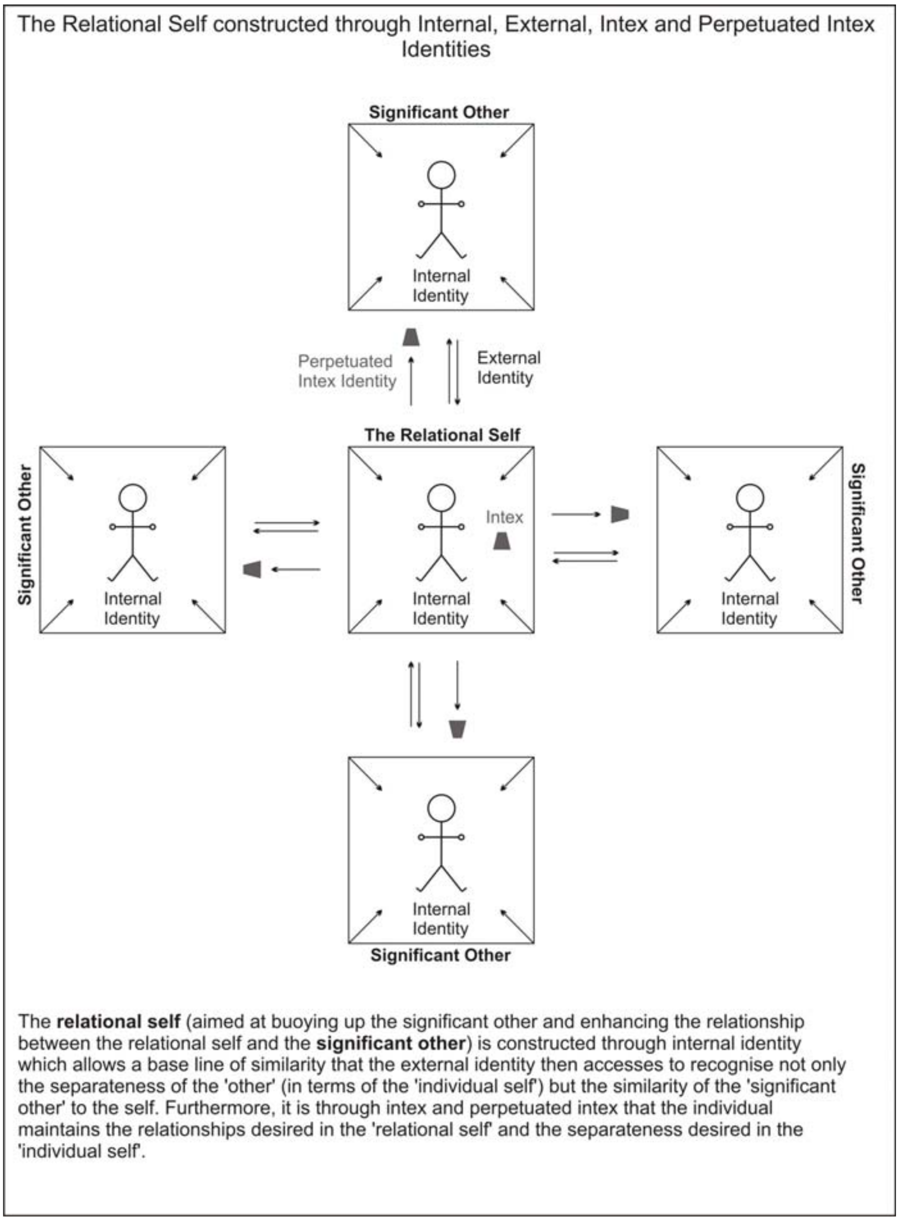


Figure 3.11: Showing the relationship between internal, external, intex and perpetuated intex identity and their role in constructing the ‘relational self’

Finally, it is through the collective, abstract and perpetuated abstract identities that the 'collective self' (Sedikides and Brewer 2000) becomes a coherent concept. Collective, abstract and perpetuated abstract identities both construct and allow the individual to recognize the binding thread of the 'in-group' and distinguish the differences of the 'out-group'. Indeed, it is through these group orientated identities that the 'collective self' is constructed. Figure 3.12 shows how the Identity Model relates to the collective self.

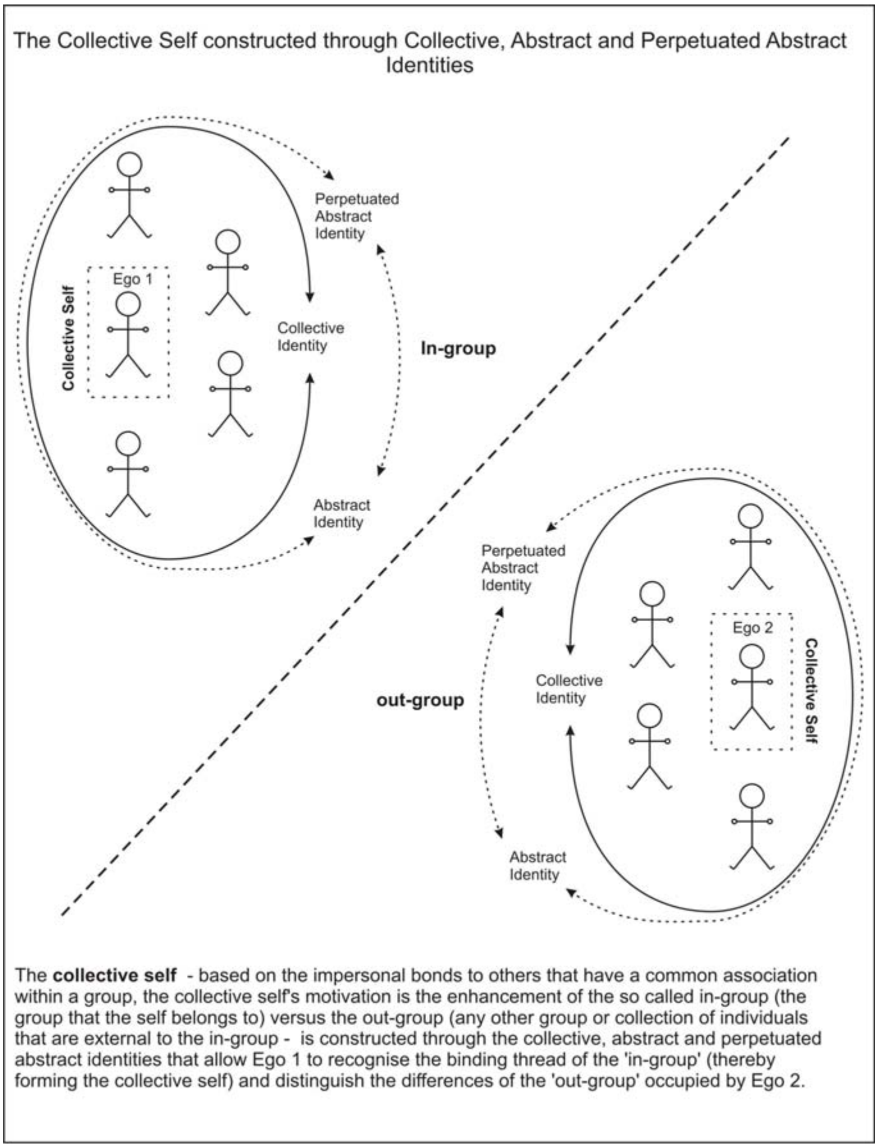


Figure 3.12: Showing the relationship between collective, abstract and perpetuated abstract identity and their role in constructing the 'collective self'.

As illustrated above, the Identity Model proposed here not only links with established theories of the self (Brewer and Gardner 1996; Sedikides and Brewer 2000; Andersen and Chen 2002; Chen, Boucher and Tapias 2006), but maps easily onto the categories of identity defined above, and actually contributes and offers an explanation for the construction of the classes of self identified within the psychology (previously unknown), thereby contributing to a greater understanding of how the classes of self are formed. The next chapter shall detail how to relate the Identity Model to the archaeological record through the theoretical position of embodied cognition.

Chapter 4 - Relating the Identity Model to the Archaeological Record

We have now reached a stage where a number of factors need to be drawn together: the Identity Model, the concept of the body as defined in Chapter 2, and the material culture / behavioural record of the Palaeolithic. Within this chapter I shall detail a theoretical position (embodied cognition) that successfully illustrates a link between the archaeological record and the scale of cognitive complexity embedded within the Identity Model. I shall also explain how the Identity Model may be related to the archaeological record through the use of Clark's (1969) modes of technology, linking in hominin behavioural assertions drawn from the archaeological record (Ambrose 2001) in regards to the role of the body in social signalling.

4.1 Embodied Cognition

The theoretical stand point that I propose allows the archaeological record to be examined in relation to the body and cognitive ability falls under the term embodied cognition (Clark 1999; Wilson 2002; Anderson 2003; Garbarini and Adenzato 2004; Wheeler and Clark 2008). Embodied cognition is a theoretical perspective that is aimed at recognising the body's role in shaping and constructing the mind and arose from the field of cognitive science and artificial intelligence (AI) (Wilson 2002). In contrast to the more traditional perspectives held within cognitive sciences where the mind is seen as an abstract processor of information separated from the outside world (Gibson 1979), embodied cognition recognises that the mind must be understood in relation to the physical body that interacts with the world (Wilson 2002) and the two are not distinct entities (as described in Chapter 2).

Indeed, it has been acknowledged that supporters of embodied cognition take their theoretical starting point as "not a mind working on abstract problems, but a body that requires a mind to make it function" (Wilson 2002: 625) following on from Clark's (1999) idea that biological brains regulate embodied action resulting in a cognitive profile that is fundamentally "the profile of an embodied and situated organism" (Clark

1999: 14). Embodied cognition focuses on the idea that cognition is more than psychological representation (Anderson 2003) but requires environmental and bodily experiences to validate and justify mental processes within the lived and experienced world. In other words, embodied cognition serves to reiterate the points made in Chapter 2 that the mind must be examined within the context of the physical body.

Within the broad term of embodied cognition, there are six main theoretical standpoints: situated cognition; time pressured cognition; off-loaded cognition; environmental cognition; action cognition and body based off-line cognition. In order to gain an understanding of how cognitive science views and understands the concept of embodied cognition, the six main theoretical standpoints need to be explored in more detail within a synopsis of Wilson's (2002) review:

- **Situated cognition –** is cognition that occurs within the context of task associated inputs and outputs in relation to the external environment involving perception and action.

Critically, situated cognition sees cognition as being contextually bound through task relevant inputs and outputs, for example driving. However, this notion of cognition fails to take into account such off-line activities such as planning or remembering where the immediate context may bear no relevance to the future plan being made, or the past action remembered. In relating the general embodied cognition concept to the Social Brain Hypothesis, the Identity Model and the Palaeolithic record, I would agree with the notion of situated cognition if you are only dealing with cognitive functions of first-order intentionality. Once second-order intentionality (theory of mind) has been attained, however, cognition gains the ability to be released from the immediate dyadic constraints of context and time. Activities such as hunting, gathering and knapping require cognitive inputs that are not entirely reliant upon the context in which those actions are performed. Rather they require the individual or group to plan their movements through the landscape in advance in order to intercept game, to find seasonal food sources, and to find raw material and then decide upon the appropriate *chaîne opératoires* for producing the required tool. Therefore, although a situated cognition may have played a role within hominin cognitive development, it does not account for the full range of complex behaviours and cognitive abilities that persist through the hominin record.

- **Time pressured cognition –** centres on the idea that cognition must be understood in relation to real time interaction with the environment and that cognition must be able to cope with time pressure.

This is an interesting view of embodied cognition as it is dependent on real time reactions to changes in the environment. Time pressured cognition arose from the AI community where real time responsive feed back is integral to the field of behaviour-based robotics and their attempts to construct ‘autonomous agents’. Sadly however, despite the existence of a small minority of interesting and valuable archaeological examples where time constraints are evident in hominin decision making and behaviour, such as the horse butchery site at Boxgrove GTP-17 (Pitts and Roberts 1997; Pope 2002); such a theoretical viewpoint is virtually impossible to access when looking at the deep time behavioural patterns examined within the Palaeolithic within the broad evolutionary scale of this thesis. As such, I find it difficult to see how such a view of cognition may instructively inform the ideas of hominin development proposed within this thesis and therefore suggest that this particular avenue of embodied cognition is not utilised or examined further here. Although it certainly should form an integral component in more fine grained future studies.

- **Off-loaded cognition –** focuses on the premise that due to limits on information processing abilities (such as memory), humans utilise the environment (including the physical, material culture, behavioural and social environments) to reduce cognitive labour.

In other words, it is suggested that humans can reduce the cognitive workload by manipulating the environment in such a way that information can be stored externally and accessed as needed. An example put forward by Wilson (2002) is the act of counting on one’s fingers, where by doing the physical manipulation of counting on your fingers rather than processing such a calculation internally saves cognitive work. Routine with the performing of actions within a specific order could also be a further example of off-loaded cognition where the routine itself becomes the system of cognition off-load. Such a cognitive process also applies to knapping and the set *chaîne opératoires* encountered in the production of various tool forms. As such this concept of embodied cognition has a great significance in allowing archaeologists to access the potential cognitive abilities of hominin species through the remains of their material culture. Specifically, the implications of off-loaded cognition in relation to perpetuated intex and perpetuated abstract identities should be relatively clear as these types of identity could themselves be seen as further examples of off-loaded cognition. Therefore, this type of embodied cognition certainly holds some intriguing possibilities in applying the Identity Model to the archaeological record.

- **Environmental cognition –** is based upon the idea that the environment forms part of the cognitive structure to such an extent that proponents see cognition as extending through an interactive situation which would include the mind, body and environment. The reasoning behind this position is that cognitive drivers are not limited to inside the head of an individual but are dispersed through the individual and the environment as they interact.

This form of embodied cognition links into a distribution of cognitive processes into the external environment. However, this definition of embodied cognition does not so much radically change how cognition is viewed in relation to external factors as increase the number of factors the idea of embodied cognition encompasses. And so may be useful in providing a wider scope of analysis in terms of hominin behaviour within landscapes and socialscapes when looking at the Palaeolithic record through the Identity Model.

- **Action cognition –** focuses on the idea that the mind's function is to guide action whilst cognitive functions such as memory and perception should be understood in regards to their input in guiding situation appropriate behaviour.

In many ways cognition does seem to guide or serve action, either directly through memory and concepts, or more indirectly through flexible strategies where information about the external world is stored for future use. However, how much can it be said that cognition serves action rather than action being a result of cognition, or that cognition drives action? Once again, this notion of embodied cognition may provide an interesting heuristic when examining *chaîne opératoires* when piecing together knapping sequences, and decisions in regards to the cognitive processes such an action may require .

- **Body based off-line cognition –** centres on the idea that even when disconnected from the environment, cognition is grounded in mechanisms that evolved to interact with the environment, such as “mechanisms of sensory processing and motor control” (Wilson 2002: 626) i.e. the body. ‘Off-line’ examples of cognition include mental imagery, working memory, episodic memory, implicit memory, reasoning, and problem solving.

Body based off-line cognition suggests that there are a wide variety of ways in which sensory and motor resources are used in off-line activity. However, if one looks at the body through the definition given in Chapter 2, it can be seen that a similar conclusion has already been drawn. Therefore, this type of embodied cognition only serves to further emphasise the point that cognition and the mind should not and cannot be separated from the physical body in which they are an integral part.

Embodied cognition can therefore be seen to incorporate a range of distinct theoretical perspectives on how cognition works in relation to a range of external and internal factors. In order to apply the idea of embodied cognition in a useful manner to the evolutionary context of this thesis, it would perhaps be beneficial to more clearly focus on those concepts that would aid our interpretation of hominin behaviour. Wilson (2002) advocates that embodied cognition is looked at in respect to the specific claims stated above in order for the discipline to advance. However, in the context of this thesis, I advocate using embodied cognition as a single viewpoint that incorporates the use of situated, off-loaded, environmental, action, and body based off-line cognition in order to develop a holistic view of embodied cognition through which the Identity Model may be applied to the Palaeolithic record. By omitting time-pressured cognition from the definition of embodied cognition, I am removing the elements of real-time cognitive responses to external stimuli that are mostly invisible in the Palaeolithic record (although there are a few limited exceptions such as Boxgrove GTP-17 (Pitts and Roberts 1997; Pope 2002)), and are only really relevant to current AI studies of cognition within the broad context of analysis seen within this thesis. And by taking the notion of embodied cognition in such a holistic manner I aim to be able to examine the diverse and often disparate aspects of the Palaeolithic record in relation to hominin behaviour and allow researchers to view these distinct signatures under an over-arching theoretical perspective that allows a clearer pathway to the cognitive abilities and motivations of our hominin ancestors.

From such a holistic embodied cognition approach suggested above, I aim to emphasise that cognition is much more than mere mental representation (Anderson 2003) and that intelligence does not necessarily lie with the individual, but within the dynamic interactions of the social cognition occupied by many individuals (Anderson 2003). Furthermore, the notion of embodied cognition allows an assessment of the archaeological record as a series of manipulations and environmental interactions through the interface of the body in order to create structures that advance and reduce cognitive tasks (Anderson 2003). If this idea is taken further, it may be suggested that anthropogenically modified props of the archaeological record can be seen as "culturally inherited tools or structures manipulated by culturally transmitted practices, might themselves count as proper parts of extended cognitive processes" (Wheeler and Clark 2008: 3566). In terms of Palaeolithic research, this view point is particularly useful as the vast majority of the archaeological resource consists of anthropogenically modified props in the form of lithic or organic implements where one of the primary aims of examining archaeological data from a cognitive perspective is to establish a link between the observed behaviour evidenced within the artefacts, and the underlying cognitive mechanism (Hallos 2005). Therefore, if we investigate the archaeological record through the theory of embodied cognition then we can see that any form of material culture that has been produced must be linked to the body of the creator and the level of cognition inherent within that body. The material culture in many ways becomes an extension of the body and the level of cognition held by the architect.

From the literature review in Chapter 2 it becomes evident that the Social Brain Hypothesis lays out a cognitive map based on predicted group and brain size with no attempt to acknowledge the role of the body within cognition, and little to no direct grounding within the archaeological record. Therefore, I suggest that through the theory of embodied cognition, the Identity Model can relate the Palaeolithic artefactual record to the Social Brain Hypothesis whilst offering insight into the behavioural and social significance of the body and its role in material culture production, cognitive development and systems of social communication through visual display.

4.2 The Identity Model and the Archaeological Record

When discussing the Palaeolithic record with specific reference to anthropogenically modified stone artefacts there exists a plethora of terminology from different geographical regions describing a number of diverse lithic technologies spanning over two million years. Added to which the different approaches to examining the technological diversity seen within lithic artefacts tend to emphasise different aspects spanning from flake production, typological form, metrical variation, core reduction and microwear analysis (Foley and Lahr 2003). Within the context of this thesis I believe that a scheme of terminology that allows a description of broad changes across a global and a regional scale is required, and as such an appropriate *heuristic* for creating a classification system is Clark's (1969: 31) technological modes (table 4.1).

Technology Mode	Time Period
Mode 1: Pebble tool industries (Oldowan): simple struck flakes and chopping tools	Lower Palaeolithic
Mode 2: Biface industries (Acheulean): bifacially worked large flakes or cores	Lower Palaeolithic
Mode 3: Prepared core industries (Levallois): cores are prepared prior to flake removal and shaping	Middle Palaeolithic
Mode 4: Blade industries: long thin flakes are removed and shaped into a large number of different tool types	Upper Palaeolithic
Mode 5: Microlithic industries: very small flakes and blades are produced and used in composite tools	Mesolithic

Table 4.1: Describing the technological modes and their approximate corresponding time periods. Table based on Clark 1969: 31 and Foley and Lahr 2003: 114 - 115, Box 1.

Before explaining in greater detail the advantages of using Clark's modes as a general descriptive scheme relating to Palaeolithic archaeology, it would be beneficial to examine what the actual differences between the modes are in terms of the nature of change and output between them (table 4.2).

Mode Transition	Nature of Change	Nature of Output
Pre-Mode 1 → Mode 1	Moves from stone tool use to deliberate stone tool modification for a specific purpose.	Flakes and chopping tools with little formal shape and little variation in form. Regional variation presumed to be determined by raw material. related
Mode 1 → Mode 2	Able to extract large flakes from cobbles or to reduce nodules in such a way as to allow bifacial working.	Handaxes with little form variation but with a clear preferred shape often exhibiting signs of symmetry. Regional variation presumed to be determined by raw material.
Mode 2 → Mode 3	Extension of the planning involved in Mode 2 toward core preparation allowing greater control of flake production (size and shape). Shift from core to flake tools.	A diverse range of predetermined flakes for modification in different tools (such as points). Regional variation may begin to be associated with cultural factors over raw material constraints.
Mode 3 → Mode 4/5	Continued emphasis on flake production and predetermined shape with a stress on long narrow flakes - blades - (Mode 4) and miniaturization (Mode 5).	Blade blanks knapped for use as composite tools or secondary working. Regional variation associated with cultural factors over raw material constraints.

Table 4.2: Showing the nature of change and output between the different mode industries (based on Foley and Lahr 2003: 121, Table 2).

The technological modes developed by Clark (1969) describe the basic manufacturing procedures and broad tool outputs for each classification. There are continuities between the technological modes and time divisions that tables 4.1 and 4.2 do not illustrate. However, the modes do demonstrate that through time methods of lithic artefact production become more complex leading to greater control in knapping techniques and raw material utilisation (Foley and Lahr 2003). The immediate advantage of using Clark's modes as a basis for classifying different lithic industries lies in the fact that the majority of Palaeolithic researchers are familiar with Clark's modes and what material culture they are attempting to describe. Therefore, when constructing a complex theoretical scheme to relate the Identity Model (and by proxy the Social Brain Hypothesis) to the archaeological record the modes form an accessible heuristic as a starting point to allow readers entry into the complex notions that follow. Another advantage of using Clark's mode system of artefact classification is the avoidance with the ideas that particular tool industries are strictly tied to particular time periods (although a broad and general scheme is presented in table 4.1), for example calling one industry Mode 3 does not imply that other techniques were not also used, only that is was the predominant strategy employed (Barham and Mitchell 2008: 16). Furthermore, the use of Clark's modes allows for a global comparison of stone tool use across different continents (Barham and Mitchell 2008: 16), particularly useful within the context of this thesis.

There are however, some drawbacks to Clark's (1969) mode classificatory system for the context of this thesis, in-as-much as the technological modes only relate to lithic artefact production. Within this thesis, all types of material culture production must either be considered or at least acknowledged (including bone and wood tools, pigments, ornamentation etc) and related to the body, therefore I shall describe below (table 4.3) my own methodological classificatory system modified after Clark's (1969) technological modes and assumed behavioural traits linked to the different artefact mode productions summarised by Ambrose (2001). Table 4.3 represents the synthesis and operational scheme central to the relation of the Identity Model and the Social Brain Hypothesis by proxy to the archaeological record.

Category of material culture (modified after Clark 1969: 31)	Description	Behavioural implications	Role of the body in social communication	Category of identity
1	• Deliberate lithic tool production to create specific edges for use. • No standard form imposition, tool shape governed by raw material size, shape and mechanical properties. • Consists of pebble tool industries dominated by small flake removals (<10cm) and chopping tools (Oldowan). • Bone or wood tools that have limited evidence for anthropogenic modification.	• Hominins have a realised sense of self which compliments the egocentric goal directed behaviour reflected in the strategies of tool production. • Evidence for some forward planning in raw material procurement. • Social communications governed by egocentric, dyadic, gestural and attention directed auditory signals with a greater repertoire than extant primates. • The beginnings of simple imitative learning may be evidenced here.	• Similar to that of extant primates. • The body is limited to egocentric, context specific and dyadic non-theory of mind social communications. • The body is used in sexual selection through visual display with an increased propensity for female choice in mate selection within a predominantly polygynous mating strategy. • Visual display plays an important role in social communication on an intra and inter-group level.	• Internal
2	• Deliberate imposition of shape and form to lithic tools evidenced through the presence of symmetry and a degree of conceptual standardisation. • Lithic tools predominantly based on large flakes (>10cm) or bifacially reduced cores. • Consists mostly of bifacially knapped handaxes and cleavers (Acheulean). • Regional variation in shape and form primarily affected by raw material.	• Hominins have a ToM which marks the beginnings of abstract thought reflected in the imposition of deliberate shape and form on lithic artefacts. • Evidence for goal directed behaviour associated with greater planning capabilities and complex imitative learning. • Social communication centered around visual display and gesture.	• With the attainment of a ToM, the body becomes a focal point for socially significant triadic visual display and gesture accompanied by limited vocalisation. • Complex imitative learning focuses on the body where individuals acquire the ability to recognise familiar actions performed by an 'other' and are able to repeat or perform novel actions constructed from a familiar repertoire. Visual display and social signalling are direct and context specific. • The body plays a reduced role in direct sexual selection evidenced through a reduction in sexual dimorphism. Reflecting a higher degree of female choice and an increasing importance in material culture?	• Internal • External
	* Toward the end of Mode 2 (later Acheulean), an element of prepared core technology may enter the archaeological record, although there is still a strong emphasis on large flake production and bifacially reduced cores.	* If assemblages have a definite bias toward 'true' symmetry or contain artefacts of 'extraordinary design' (e.g. giant handaxes) then it may be that such artefacts have an implication beyond the purely functional and may hold some limited social significance.	* The body and material culture may begin to play a more pronounced role in identity perpetuation broadcast on a context independent and individual by individual basis.	• Internal • External • Intex • Perpetuated Intex

Table 4.3: Illustrating the methodology through which the Identity Model may be related to the Palaeolithic record. ToM = theory of mind. Behavioural implications based on Ronen 1982; Mellars 1989; 1991; Saragusti *et al* 1998; Kohn and Mithen 1999; Ambrose 2001; Wenban-Smith 2004; Foley and Gamble 2009.

Category of material culture (modified after Clark 1969: 31)	Description	Behavioural implications	Role of the body in social communication	Category of identity
3	• A shift from producing lithic tools from cores and flakes, to preparing cores to extract flakes of a particular form. • Prepared core technologies (e.g. Levallois) focuses on producing standardised flakes with the potential for later modification (e.g. into points or handaxes). • This type of lithic production also indicates the presence of composite tools. • Regional variation possibly driven by cultural influences rather than raw material, although raw material may still govern shape and size of artefact to a certain degree.	• Hominins have a commonality of understanding (cultural affinities) and a clear sense of shape and form that begin to play a role beyond the purely functional. • The capability to produce composite tools displays an ability for abstract thought beyond a functional level, which further manifests itself in the beginnings of cultural influences seen within the archaeological record. • Artefacts maintain a predominantly functional significance but may carry limited social meaning in regards to the creator (on an individual and group scale). • Social communication is centered around complex gesture and utterance incorporated within visual display.	• The body has a central role in social communication becoming a transmitter and receiver of social information centered around visual display and manual gesture accompanied by vocal utterance. • The body also plays an important role in identity perpetuation, the social boundaries of the body begin to be extended through material culture on a limited individual and group basis. Visual display and social signalling may begin to be indirect and context independent. • However, material culture remains predominantly functional within this category. • Sexual dimorphism reaches levels similar to modern humans indicating a greatly reduced role of the body in direct sexual selection possibly indicating active female choice in mate selection with an emphasis on skilled visual display and material culture as selection drivers.	• Internal • External • Intex • Perpetuated Intex • Collective
4 - 5	• Continued emphasis on flake production with a predetermined shape and form. • Flake blanks within this category are primarily concerned with composite tool production with limited secondary shaping. • This category includes an expanded repertoire of complex bone tools (such as harpoon heads). • In addition, material culture with a purely non-utilitarian design enter the record in the form of ornamentation (beads), art and figurines (humanoid and anthropomorphic). • Clear evidence for regional variation in material culture production on a cultural basis.	• Hominins have a commonality of understanding, a clear sense of shape and form, and the capacity for fully symbolic and functional abstract thought evidenced through the presence of non-utilitarian and composite material culture and behaviours (such as burial). • Social communication is centered around visual display, gesture and grammatical language. • Artefacts carry social meaning in relation to the creator and user (individual and group) and are now fully complicit in identity propagation.	• The body maintains a prominent role in social communication as a transmitter and receiver of social information centered around visual display (enhanced through bodily ornamentation), manual gesture and grammatical language. • The body's boundaries are now fully extended through material culture (through ornamentation, figurines, art and tool production) on an individual and group basis with material culture adopting a functional and symbolic role. Visual display and social signalling now completely indirect and context independent. • The body plays a full role in identity perpetuation through visual, vocal display and material culture. • The body may play a more important role in sexual selection aided through ornamentation, although skilled visual display in material culture production may still play an important role.	• Internal • External • Intex • Perpetuated Intex • Collective • Abstract • Perpetuated Abstract

Table 4.3 continued: Illustrating the methodology through which the Identity Model may be related to the Palaeolithic record. ToM = theory of mind. Behavioural implications based on Ronen 1982; Mellars 1989; 1991; Saragusti *et al* 1998; Kohn and Mithen 1999; Ambrose 2001; Wenban-Smith 2004; Foley and Gamble 2009.

By examining the archaeological record through each of the categories of material culture that I have described above it may seem that I have limited over 2.6 million years of material culture production (Semaw *et al* 2003) into five set categories. However, this is not the case, as with Clark's technological modes (1969:31) there are large areas of crossover and continuity between the material culture categories and the cladistic advantages of Clark's modes still apply here. The importance of this methodology is the *developed / derived* artefact (such as a symmetrical LCT / handaxe) and what that can tell researchers about behaviour, the use of the body, identity perpetuation and cognition. Furthermore, it is assumed that if a minimum of one of the derived elements from each material culture category is securely provenanced within an assemblage, for example if a predominantly prepared core technology assemblage (category 3) contains an element of ornamentation (category 4-5) then it may be cautiously inferred that the creating hominins have attained a degree of identity perpetuation seen within the higher category of material culture.

The Identity Model proposed in this thesis and applied through table 4.3 allows an interpretation of the material culture in a way that incorporates the body into the interpretation through visual display and social communication. Essentially, the Identity Model and theoretical application is a vehicle to an "archaeology of embodiment" (Joyce 2005: 147) which includes an acknowledgement of the sensory experiences of the lived body when interpreting the archaeological remains in order to include aspects of human experience in the past that encouraged people to behave in certain ways. Without such a view of the material culture of our past ancestors we run the risk of reducing people in the past to, "automatons or to cerebral essences" (Kus 1992: 172). In many ways, the body's senses define the physical environments that the body inhabits therefore, even if the sensory motivations of bodies in the past are archaeologically inaccessible, can we as students of the human experience afford to ignore such a fundamental characteristic of the human condition (Kus 1992)? Indeed, for the prehistoric archaeologist without documentary sources detailing the sensory experiences of certain events, phenomenological approaches to prehistoric archaeology may be the only way to begin to explore the issues of embodiment (Joyce 2005: 148) and future archaeological discourse on the subject of 'the body' should ensure that the lived experience of the body is taken into account when expounding an interpretation.

Therefore, if lithic assemblages and other Palaeolithic artefacts are examined in order to classify the artefacts according to the categories given in table 4.3 above, then it should be possible to access the behavioural attitudes to the body and the inherent cognitive state of the hominin that created the artefact. The following chapter shall detail the methodology of lithic analysis that shall allow an assessment of the Palaeolithic record in relation to the predictions sated in table 4.3.

Chapter 5 – Methodology and Lithic Analysis Strategy

In this chapter I will describe how I intend to link the theoretical position developed in the last two chapters, and exemplified in table 4.3 to the physical archaeological record. I intend to use data from material culture categories 2 – 3 (table 4.3: Acheulean → Middle Palaeolithic) spanning a time frame of circa 500, 000 years in order to evaluate the data sets for a sense of continuity within *and* between techno-complexes (should one exist). The reasons for focussing on categories 2 and 3 lie with the widely held belief that category 2 handaxe form represents the first clear examples of culturally mediated tool production (Kohn and Mithen 1999; Wenban-Smith 2004), while category 3 artefacts represent a further cognitive leap with the presence of composite tools (Barham 2010). By exploring in detail the predicted links stated in table 4.3 regarding material culture categories 2 and 3 within this thesis, I hope to test against a large data set the opinion that handaxe manufacture represents an example of material culture being made to specific social conventions, and the notion that composite tools represent a cognitive advance evidenced through a change in hominin behaviour. Furthermore, by concentrating on categories 2 and 3, I hope to focus the scope of analysis to test a very specific set of assumptions / predictions which may then lead to a validation of the behavioural links laid out in categories 1, 4 and 5 by inference, in that if the behavioural links for categories 2 and 3 work here, then they may also work in the remaining categories. Although I must emphasise that I hope to test the behavioural linkages in categories 1, 4 and 5 in future post-doctoral research.

It is worth clarifying at this juncture that the theoretical positions developed in the preceding chapters and exemplified in table 4.3 are predictive in nature and based on widely held beliefs relating to artefact production and associated hominin behavioural implications (exemplified in Ambrose 2001). *As such the aim of the lithics analysis strategy is to develop a means to test the predictions laid out in table 4.3* ***against*** *the archaeological data*. If the data suggests a pattern different to the predictions posed then this is still a valid result and discussions shall progress accordingly. Below I present a summary of the behavioural, cognitive and social communication predictions relating to material culture categories 2 and 3:

- Category 2 – Hominins have a theory of mind, impose non-standardised conceptual form onto artefacts, possibly indicating that social communications are primarily focused through the body as a mechanism for visual display with a realised internal and external identity. However, where standardisation of artefact production is present (through the extended presence of symmetrical handaxes) there may be an element of culturally mediated artefact production that could indicate a third-order of intentionality function represented through a realisation of an intex and perpetuated intex.
- Category 3 – Hominins display a third-order intentionality ability through the production of composite tools where artefacts may begin to play a role in social communications (assumed to be evidenced through standardisation in artefact production and form) indicating a realisation of an intex, perpetuated intex and collective identities.

In order to test the predictions above at their most basic level, artefacts from categories 2 and 3 must be examined through a lithics analysis strategy that assesses the imposition of culturally mediated or standardised form across all tool types. This is the methodology that shall be described below. However, before going into the detail of the methodology, I must first examine briefly whether examining lithic tool production from a view point of standardisation is the correct way to assess the predictions laid out in table 4.3 in regards to hominin cognitive potential and social communication structure.

Lithic tool production reflects varying degrees of planning, problem solving, perceptual-motor co-ordination and sociality (Stout and Chaminade 2009) and therefore the analysis of lithic artefacts allows access to the cognitive and behavioural practices of our hominin ancestors. Amongst other things, lithic measurements and classifications are intended to describe and classify, and through this understand. When appropriate to the research question posed, this may focus on standardisation, shape and overall morphology. Within the context of this thesis, I shall primarily focus upon testing whether there is evidence for standardisation within artefact form or manufacture or whether standardisation is absent (due to life history, function, individual skill, cultural tradition or raw material constraint). Standardisation in artefact form or manufacture is seen as particularly significant because the imposition of standardisation and deliberate shape is thought to have substantial cognitive and cultural implications for ancient hominins (see Ronen 1982; Mellars 1989; 1991; Saragusti *et al* 1998; Kohn and Mithen 1999; McNabb *et al* 2004; Wenban-Smith 2004; Monnier 2006; Stout and Chaminade 2009 - although see Chase1991 for discussions against). The argument defending this position is as follows. The higher the degree of standardisation and deliberate imposition of shape and form, the higher the influence social learning plays on the formation of lithic tools (McNabb *et al* 2004; Monnier 2006). Standardisation in artefact production represents a desired end result in accordance with socially defined or accepted parameters which in turn are the consequence of mental categories which may be representative in nature (Monnier 2006). When viewed within the context of table 4.3, once social influences begins to affect artefact form and shape, it is predicted that material culture has the capacity to play a role along side the body in social signalling. Indeed, the body may play a smaller or more specialised role in social signalling once material culture becomes incorporated and utilised as a social signaller.

One of the key research questions regarding the material culture category 2 (Acheulean) artefacts is whether bifaces were purely functional in design, or whether they were imbued with cultural meaning through increased symmetry and attention to form imposition. McNabb *et al* (2004) conducted a detailed analysis of large cutting tools from seven South African Acheulean sites and found an overall lack of absolute symmetry within these tools leading to the conclusion that social tradition or cultural influence did not appear to dictate the appearance of large cutting tools at the sites under study. McNabb *et al* (2004) rather favour the idea of a conceptual standardisation or attention to shape (Wynn 2004) for the regularity seen in large cutting tool blanks, a position which conforms to my second category of material culture in table 4.3. However, as stated in table 4.3 there may be rare exceptional artefacts technically assigned to category 2, such as giant handaxes (Wenban-Smith 2004) or the elusive truly symmetrical large cutting tool assemblage so eagerly sought by researchers, that may display signs of some degree of social significance. However, these are very much exceptions to the rule, and if encountered, should be assessed with the category 3 artefacts in terms of identity assignation. Certainly, it is not until the third category of material culture (table 4.3), with the advent of prepared core technologies (PCT) (and by inference, composite tools –

Barham and Mitchell 2010: 16) that I would expect cultural influences to play a definitive role in artefact form and shape. A cautionary note here is that lithic artefacts from categories three, four and five inherently hold the imposition of specific shape and form chosen by the knapper through the very nature of the structured approach to PCT core preparation under practice which may lead to distinctive typologies of individual PCT flake tool assemblages / industries (for example the Levallois point). Therefore, the further imposition of shape may only be accessed through the role of secondary working or retouch in influencing the final form of the artefact.

The methodological level of analysis followed within this thesis is a high-level regional overview aimed at identifying hominin behaviour at a species level. As such it is expected that general trends in hominin behaviour will overprint any local quirks in the archaeological record (Gamble 1996; Gamble 1998). Critical to discussions on standardisation within assemblages is to take account of apparent 'short-lived' episodes of artefact standardisation such as seen within the handaxe pairs at Boxgrove or Foxhall Road (White and Plunkett 2004; Hopkinson and White 2005; Pope *et al*. 2006) do not become lost or invisible within the scale of analysis proposed. However, the position of this thesis and scale of analysis is that if standardisation played a genuinely significant role within hominin social signalling, behaviour and cognitive ability, then this would filter through social groups and become visible at the scale of enquiry proposed within this thesis.

The lithic analysis strategy will primarily focus on derived products found within lithic assemblages i.e. flake tools and bifaces, although flakes and cores are examined as part of an assemblage wide analysis approach. The reason for not including debitage (chunks and chips <20mm – Schick 1986) is because there is a limited amount of information that may be extracted concerning cognitive capability and the use of the body in social signalling from debitage artefacts. The debitage pieces whose presence have been noted are those pieces that are above 20mm and generally encompass flakes that are clearly waste products yet their size precluded them from immediate dismissal from the analysis.

5.1 Raw Material

All artefacts studied shall have their raw material type identified in order to allow a multi-assemblage comparison on raw material use based on the following research questions:

- What raw materials were being utilised?
- Were the raw materials utilised primarily local or exotic?
- Are there any patterns relating to raw material and tool type?
- Did raw material constraints affect tool making and subsequent behaviour?

Such a comparison will allow a number of assessments such as whether certain tools are limited to certain raw materials. This in turn may inform on the cognitive and knapping abilities of the creators by allowing an assessment of the lithic material in terms of ascertaining whether certain tool types were limited to certain raw materials or not. In regards to the idea of deliberate form imposition on tool types, raw material analysis shall determine whether tool morphology was limited by raw material constraints or the deliberate choice of the knapper. Furthermore, raw material analysis will enable researchers to ascertain whether certain raw materials are curated and moved through the landscape, or whether hominins are solely, or predominantly, using raw material found in local environs. For example, evidence for raw material curation has significant implications for the cognitive abilities and how the body is used in social communications of the hominins under study when linked to forward planning goal directed behaviours (see table 4.3 for linkages between goal directed behaviour and the role of the body in social communication).

As part of the raw material assessment, detached pieces (flakes and flake tools) shall have their Toth types recorded (Toth 1985) where:

Toth type 1 = flakes with a wholly cortical dorsal face and cortex on the butt.
Toth type 2 = flakes with some cortex on the dorsal face butt.
Toth type 3 = flakes with some cortex on the butt and none on the dorsal.

Toth type 4 = flakes with no cortex on the butt but the dorsal is wholly cortical.

Toth type 5 = flakes with some cortex on the dorsal but none on the butt.

Toth type 6 = flakes with no cortex on the dorsal or butt.

By categorising the flakes according to Toth type it will be possible to assess whether the detached pieces are worked entirely at the point of initial reduction, or whether cores were partially knapped elsewhere with the desired products being transported through the landscape.

I shall now detail how I propose to analyse the three main types of lithic artefact (large cutting tools or handaxes, cores, and flake tools) found within the Palaeolithic, working through each artefact type in turn.

5.2 Large cutting tools (LCTs)

LCTs commonly comprise handaxes, cleavers, knives and unifaces (Kleindienst 1962; McNabb *et al* 2004). From table 4.3 the primary predictions relating to bifacially knapped tools are:

- The body maintains a dominant position in social communiqués although material culture may begin to play a role in social signalling as evidenced through a greater attention to form imposition and the presence of symmetry within biface tool manufacture.

Therefore, in order to test the predictions given above (and in table 4.3), biface tools should be examined for the:

- Imposition of standardisation in size within assemblages.
- Extent of standardised imposition of form and shape through the presence of symmetry and tip form.

- The extent (if any) of standardised methods of artefact manufacture imposed on the LCT under study through the degree of secondary flaking / shaping and edge working.
- Do the above criteria change in relation to time, i.e. from material culture category 2 to 3.

Bifaces shall be measured for maximum length, breadth and thickness in order to ascertain whether there are patterns of standardisation in relation to LCT proportion, whilst the range of sites examined for this thesis shall test for changes through time. In terms of assessing biface morphology, tip shape shall be examined and classified according to McNabb *et al* (2004) where the top third of the artefact is considered the tip and assigned to one of seven potential categories (figure 5.1):

- Markedly convergent
- Convergent with a squared –off tip (or nearly so) at right angles to the long axis of the artefact.
- Convergent with an oblique tip
- Convergent with a generalised tip.
- Wide (parallel) or divergent.
- Wide or divergent with an oblique tip / blade.
- Wide with a very convex tip.

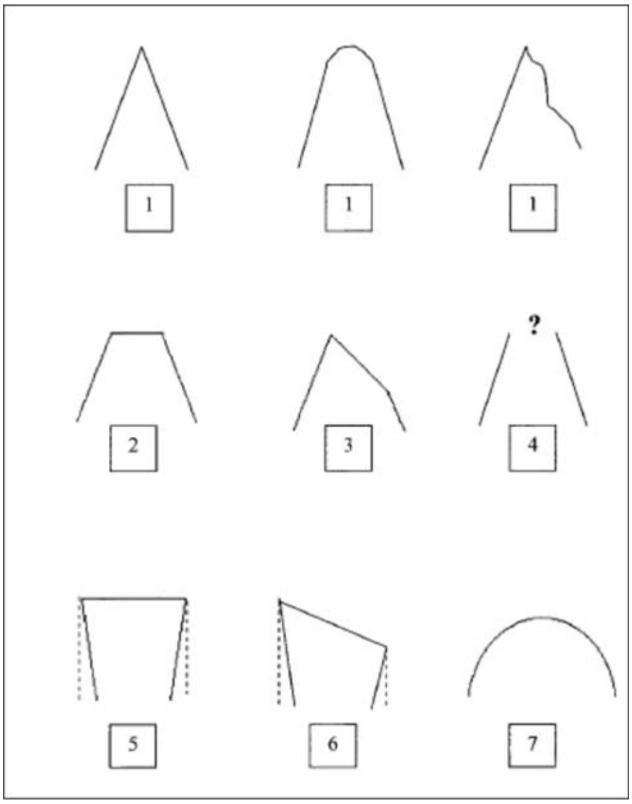


Figure 5.1: Illustrating the seven categories of tip classification: 1, markedly convergent; 2, convergent with a squared-off tip at right angles or nearly so; 3, convergent with an oblique tip; 4, convergent with a generalised tip; 5, wide (parallel) or divergent; 6, wide or divergent with an oblique tip; 7, wide with a very convex tip. Illustration and category description from McNabb *et al* 2004: 657, Figure 3.

By classifying LCT tip shapes through such a schema it should be possible to ascertain what tip shapes were being produced and allow a comparison on an intra- and inter-assemblage basis. This in turn will allow researchers to determine whether there are any preferences (or not), for particular tip shapes which in turn may reveal whether there are any standardised LCT morphologies present through the data sample. I should clarify here that tip shape is considered to adequately reflect overall LCT morphology within the variations offered by McNabb *et al* (2004) and as such the medial and butt of LCTs examined were not recorded separately in regards to overall LCT morphology.

The extent of secondary flaking on both faces of the artefact of the LCT shall be examined following the methodology laid out in McNabb *et al* (2004). Five categories of secondary flaking were identified (figure 5.2):

- Complete.
- Complete marginal.
- Partial marginal – consisting of sporadic thinning and shaping along the margin made up of isolated edge working, short to medium continuous lengths or a combination thereof.
- Partial – consisting of a whole area of the face of the tool being thinned and shaped continuously from one edge to another.
- Substantial – thinning and shaping cover the majority of the tool surface.

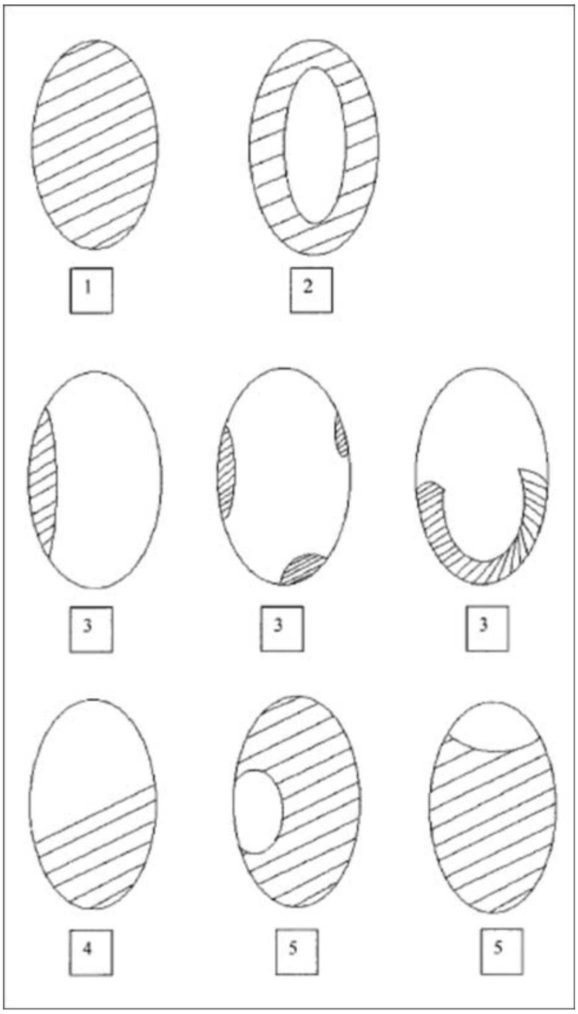
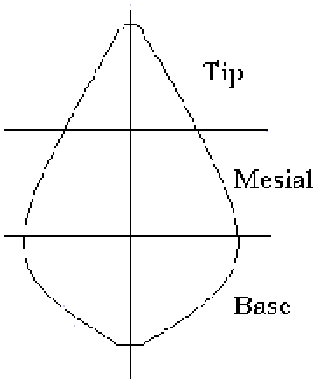


Figure 5.2: Illustrating the five categories of secondary flaking extent and pattern: 1, complete; 2, complete marginal; 3, partial marginal; 4, partial; 5, substantial. Illustration and category descriptions from McNabb *et al* 2004: 658, Figure 4.

Such an assessment of the secondary flaking or LCT shaping strategies shall allow for an analysis of LCT manufacture in regards to standardised methods of imposing LCT form onto a LCT blank. This in turn should illustrate whether hominins were making LCTs in a culturally determined method of manufacture (if LCTs are all made using the same shaping strategy) or whether individual preference or ability play more of a governing factor in LCT production (a more random pattern of shaping within the data).

In order to test the predictions of the methodology described in table 4.3 a test for symmetry needs to be included. Given that I am looking for general trends within the data set, I believe that the methodology for investigating symmetry as laid out by McNabb *et al* (2004) is sufficient for this task. I acknowledge that there have been criticisms of this methodology (Machin and Mithen 2004; Underhill 2007) however, the criticisms mostly focus on the subjectivity of the system of analysis in regards to the fine grained data scrutiny required for studying biface symmetry within tightly constrained time periods. As the data for this thesis regarding bifaces stretches over more than two million years, I believe the broad trends in symmetry that the McNabb *et al* (2004) methodology allows access to shall be amply sufficient. Furthermore, as McNabb (2009: 87) states “if symmetry was important to the original knappers, appreciation by eye would have been the method through which they judged the results of their handiwork. A simple eyeball test of symmetry does therefore reflect this process.” Furthermore, although observer bias between more than one individual is acknowledged by McNabb (*pers. comm.*), single observer consistency is present within the data set for this thesis. Therefore, in line with this train of thought I believe that the symmetry analysis proposed within McNabb *et al* (2004) and McNabb and Sinclair (2009) and detailed below shall prove more than appropriate for the task at hand.

Symmetry within this methodology is determined by dividing the artefact into three equal sections along the long axis on both faces (figure 5.3).



Classification	1	2	3	4	5	6	7	8
Tip	yes	yes	yes	no	no	no	no	yes
Mesial	yes	yes	no	yes	no	no	yes	no
Base	yes	no	no	yes	yes	no	no	yes

Figure 5.3: Illustrating LCT symmetry and schema for recording. Caption and illustration from McNabb *et al* 2004: 659, Figure 5.

Each horizontal third of the artefact is then 'mentally folded over' to determine whether the edge outlines are symmetrical around the line of the long axis and a simple 'yes' or 'no' score recorded. The artefact is then categorized by the three scores (for the tip, medial and base) and assigned to a symmetry category based on the eight possible combinations of scores.

A further three symmetry categories were identified in McNabb *et al* (2004: 658):

- Balanced – where an artefact may not be perfectly symmetrical in the modern sense, yet is still clearly balanced along the longitudinal axis.
- Parallel distinctive features along the margin – where there are visually distinct features located in parallel along opposite edges of the artefact, such as notches or trimmed concavities.
- Profoundly asymmetrical tips – tips which are the clear result of working but appear bent or 'curved'.

By assessing the imposition of symmetry upon LCTs using such a methodology, researchers shall be able to compare the degree of standardisation, as evidenced through the presence of symmetry, in LCT morphology both within and between assemblages. Such a comparison will allow an analysis of changing patterns of symmetry imposition against time in order to test the long held assumption that the presence of symmetry within LCT manufacture increases as time progresses (Saragusti *et al* 1998), and therefore that LCTs became increasingly important in mediating hominin social behaviour (e.g. Kohn and Mithen 1999).

Continuing to follow McNabb *et al* (2004), the amount of edge working shall be examined and recorded. The amount of edge working refers to the quantification of the amount of the edge that has been worked to finish the tool with the tool being divided into 12 sections (6 on each face) (figure 5.4).

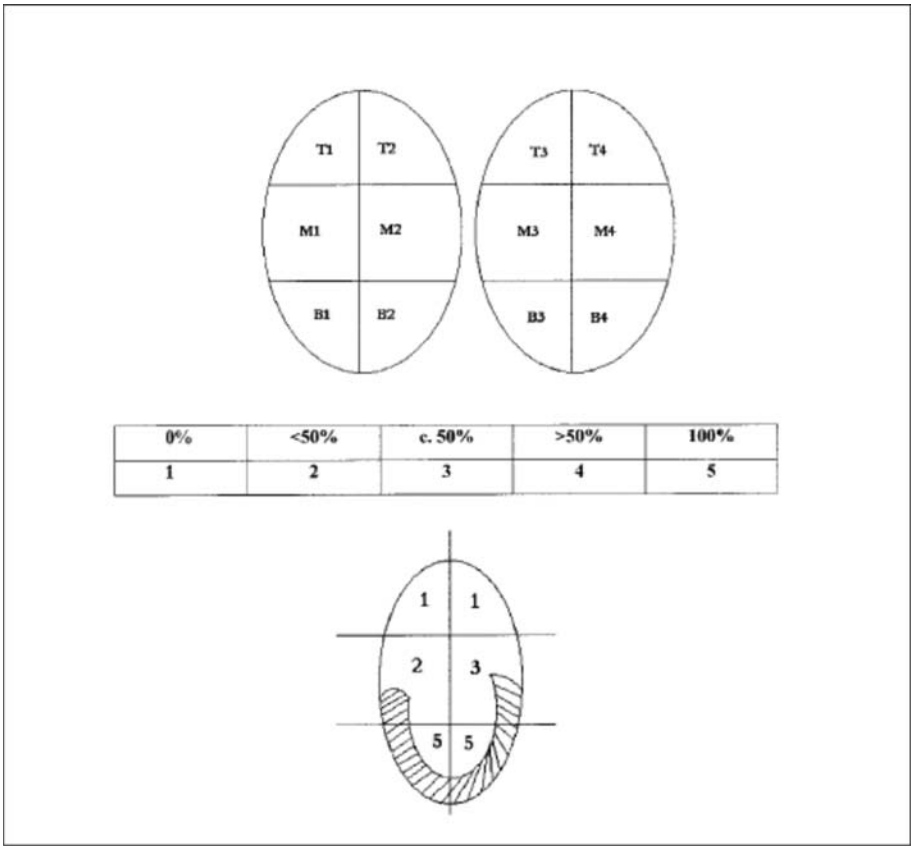


Figure 5.4: Illustrating how to quantify the amount of edge working on an LCT. In the bottom diagram, T1/T2 have no working so have been classified as 1, M1 has <50% edge trimming so has been classified as 2, M2 has c. 50% edge trimming so is classified as 3. Both B1 and B2 have continuous edge trimming which covers 100% of the edges so have been classified as 5. The cumulative value of this face is then 17. The same would be done for the other face and the artefact given a single value, the sum of the values for the two faces. Illustration and caption from McNabb *et al* 2004: 661, Figure 7.

Each section of the artefact will be scored according to the specifics laid out in figure 5.4 moving in an anticlockwise direction from T1 to T2, and T3 to T4. Using this method for analysing the extent of edge working, a relative index is created with the minimum total score for an artefact regarding edge working being 12 and the maximum 60. For ease of analysis, groupings shall be made within the data set based on the total edge working score for each artefact, these groups shall constitute a broad index for edge working following the categories of: 12-24 (low index of edge working); 25-36 (medium to low index of edge working); 37-48 (medium to high index of edge working) and 49-60 (high index of edge working). By assessing the extent of edge working in this manner, it should be possible to analyse the degree to which hominin knappers are altering the shape and imposing form onto the LCT through edge working. This in turn would also allow researchers to ascertain whether there was a link between edge working and standardisation in LCT form, or whether LCT form was governed predominantly by the secondary flaking strategy described above.

By following the McNabb et al (2004) methodology described for all LCTs from material category 2 and 3 I shall be able to assess the degree of standardised form being imposed on all LCTs under study. Through the analysis of primary and secondary flaking extents, the methodology shall allow an assessment of the knapping techniques utilised in the creation of the LCTs under study. Whilst utilising the same methodology for the analysis of LCTs from two distinct material culture categories (2 and 3) shall facilitate a comparative study on LCT form imposition and knapping techniques through temporal and geographic distance in order to assess changes over time and space. I shall now describe the methodology for analysing detached pieces (flakes and flake tools) and cores.

5.3 Flakes, flake tools and cores

Table 5.1 lays out a framework for the analysis of cores and flakes by relating core and flake artefact types to the relevant categories of material culture given in table 4.3, namely non-prepared core technology (Non-PCT) and PCT.

Category of Material Culture (modified after Clark 1969: 31)	Cores (after McNabb 2007: 320, Table 12.4)	Flakes and Flake Tools (modified after McNabb 2007: 320, Table 12.4)
2	**A**. Generic Non-PCT cores. No maintained flaking face and nor fixed perimeter: • Alternate (**A1**) • Mixture of episodes of alternate and parallel (**A2**) • Parallel either from 1 platform (**A3**) or multiple platforms (**A4**) • Single / multiple episodes of single (**A5**) • Mixture of any of above (**A6**) • Other generic non-PCT (**A7**) **B**. Non-PCT cores. A fixed perimeter only: • Dominated by centripetal alternate - biconical (**B1**) • Dominated by centripetal alternate - discoid (**B2**) • Other (**B3**)	Artefacts that fall within this category can be found throughout most material culture categories. The crucial difference between them is the way in which the original flake was knapped, i.e non-PCT or PCT. Contextual evidence and the method of knapping ultimately determine the material culture category: • Denticulated edge (**R1**) - non-PCT • Denticulated scraper (**R2**) - non-PCT • Side scraper - any form (**R3**) - non-PCT • End or traverse scraper (**R4**) - non-PCT and PCT • Flake with scraper retouch (**R5**) - non-PCT and PCT • Scraper used as a wedge (**R6**) - non-PCT • Retouched point *sensu* awl (**R7**) - PCT • Retouched point *sensu* projectile or weapon point (**R8**) - PCT • Retouched notch (**R9**) - non-PCT • Retouched non diagnostic (**R10**) - non-PCT and PCT • Flaked flake or flaked flake spall (burin) (**R11**) - non-PCT and PCT • Multiple tool (**R12**) - non-PCT and PCT • Unretouched flake used as a wedge (**R13**) - non-PCT and PCT • Utilised flake with no retouch (**R14**) - non-PCT and PCT • Flake with edge damage (**R15**) - non-PCT and PCT • Flake with no retouch (**R16**)
3	**C**. Cores knapped by PCT. A fixed perimeter related to a single maintained flaking face. Detachments parallel the fixed perimeter: • Radial (**C1**) • Convergent (**C2**) • Parallel / laminar (**C3**) • Simple prepared cores (**C3a**) • Other (**C4**)	
	PCT flakes: Radial (**G1**); Convergent (**G2**); Convergent / Laminar (**G3**); Laminar (**G4**)	

Table 5.1: Relating specific core and flake types to the categories of material culture given in table 4.3. PCT = prepared core technology. Artefact groups and types taken or adapted from McNabb 2007: 320, Table 12.4.

I shall now go through each of the artefact groups (**A**; **B**; **C**; **G** and **R**) from table 5.1 explaining what they pertain to and detailing what aspects shall be recorded to enable a statistical analysis, and how such information may be related back to the body. The broad group descriptions are derived from McNabb (2007: 324 – 341).

Cores

Given that the majority of cores are not the intended derived artefact product (core tools aside), the amount of analysis and features recorded for cores in relation to the overall aims of this thesis are greatly reduced. Therefore, cores shall be noted and classified in relation to their technology type (A, B or C) and their maximum proportions (Length, Width and Thickness) recorded. Core raw material and condition shall also be recorded.

Group A – material culture category 1 and 2: Generic Non-PCT cores are cores with no prepared flaking face, no maintained perimeter with the flakes being removed from any suitable knapping surface found on the core. The cores within Group A are classified by the flaking techniques (or combination of techniques) relating to the last stages of working (**A1 – A7**). Group A cores are found within the Lower Palaeolithic.

From table 4.3:

- The predictions relating to artefacts within this category of material culture are that there should be little or no evidence for standardisation or the deliberate imposition of form or shape on artefacts because the body acts as the primary canvas for social signalling and visual display.
- In order to test the predictions, investigations for standardisation and deliberate shape imposition must be implemented on the artefacts under study. Working on this premise the lack of deliberate shape imposition or standardised form means that it is unlikely that material culture plays a significant role in social signalling.

Therefore, all cores shall be classified according to table 5.1 in order to establish whether a preferred core type / typology was being produced (or not), through a standardised method of reduction (ascertained by classifying A type cores through McNabb's 2007 method – table 5.1 – which describe core reduction techniques) . In addition, the maximum length, breadth and thickness measurements were taken in order to ascertain whether there appears to be a standard size that cores are reduced to before discard.

Group B – material culture category 2: The cores within this group are Non-PCT cores with a fixed perimeter. The significance of this is that there is an element of shape brought to the core, caused by the style of flake removal – predominantly alternate. Alternate knapping around all or at least 60 per cent of the margin will qualify a core to be included within this group. The cores within Group B are classified by the flaking techniques (or combination of techniques) relating to the last stages of working (**B1 – B3**) and fall within the Lower Palaeolithic.

From table 4.3:

- The predictions relating to artefacts within this category of material culture are that there should be some imposition of deliberate form and shape to artefacts (bifaces forming an important component of material culture category 2 artefacts) however, the body still plays a predominant role in social signalling and visual display.
- In order to test the above predictions investigations for the extent of standardisation and deliberate shape imposition must be implemented on the artefacts under study. Working on the premise that the greater the degree of deliberate shape / form imposed on the core, the greater the degree of cultural influence on core morphology.

Therefore, all cores shall be classified according to table 5.1. By classifying the B type cores in such a way, it will be possible to ascertain whether there was a preferred core type being produced for each assemblage. In addition, the maximum length, breadth and thickness measurements are taken in order to ascertain whether there appears to be a standard size that cores are reduced to before discard.

Group C – material culture category 3: The cores within this group have a fixed perimeter related to a single maintained flaking face with detachments being parallel to the fixed perimeter. Cores worked by the Levallois method are a prime example of this type of PCT. The cores within Group C are classified by the flaking techniques (or combination of techniques) relating to the last stages of working (**C1 – C4**). Group C cores are generally assigned to the Middle Palaeolithic. With Group C cores, the desired end product focuses on the extracted flake blank, with no known or presumed cultural importance assigned to the core, therefore, the majority of analysis pertaining to this material culture category shall focus on the flake products of PCT (see table 5.1). For the PCT cores, recorded data shall include classification according to table 5.1 in order to establish whether preferred core type was being produced or not. In addition, the maximum length, breadth and thickness measurements are taken in order to ascertain whether there appears to be a standard size that cores are reduced to before discard.

Flakes and Flake Tools

Groups R and **G –** material culture categories 1, 2, 3, 4 and 5: The detached pieces of Group R and G are concerned with the intended end products of knapping. As such they span all material culture categories with the crucial distinction between tool types lying with the technology of knapping i.e. Non-PCT or PCT (Group G). Group G works as an additional classificatory system for PCT end products in that it describes the mode of production (and therefore technological form imposition).

Therefore, in line with the theoretical predictions of table 4.3:

- The predictions relating to Non-PCT artefacts are that there should be little evidence for deliberate shape imposition and standardisation on artefacts through retouch and shaping, with the body acting as the primary canvas for social signalling and visual display.
- PCT artefacts should have clear evidence for form imposition and standardisation with the body acting as the primary canvas for social signalling and visual display but incorporating material culture into the signal and identity propagation. With PCT artefacts, the degree of standardisation within PCT may be an inherent result of PCT blank creation with no cultural significance, therefore the degree of form imposition imposed on the flake blank through secondary shaping and working (i.e. retouch) shall be measured and recorded.

In order to test this idea, investigations for standardisation and deliberate shape imposition must be implemented on the artefacts under study. Therefore, all flakes within Groups R and G shall be classified according to table 5.1 in order to establish whether a preferred flake type was being produced or not. In addition, the maximum length, breadth and thickness measurements shall be taken in order to ascertain whether there are standard sizes of flake being produced in relation to the appropriate material culture category.

All flakes (both Non-PCT and PCT) shall have their edges divided into four, Left, Distal, Right and Proximal (figure 5.5) with the retouch type in terms of delineation, distribution, position and extent being recorded (see below) (figures 5.5 – 5.9).

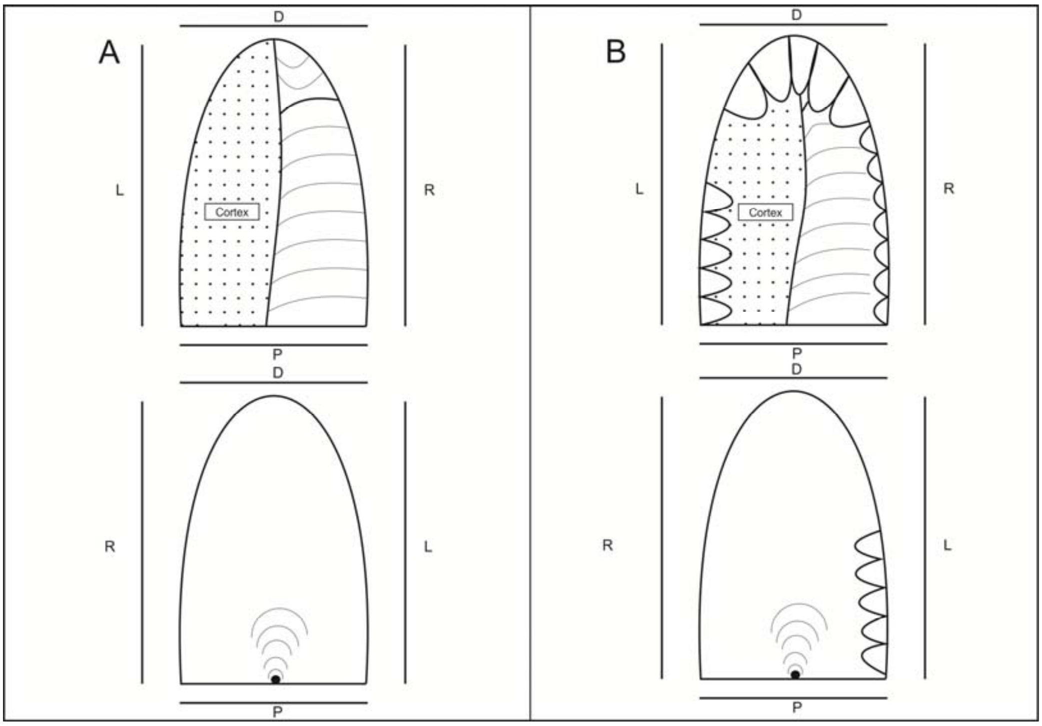


Figure 5.5: Illustrating a flake with no retouch (A) and a flake with retouch (B) in conjunction with the number of edges per flake. L = Left, D = Distal, R = Right and P = Proximal. The retouch shown in B shall be evaluated as described in more detail below but the example (given here for reference) would be:

		Retouch				
		Presence	Delineation	Distribution	Position	Extent
Flake Edge	Left	Yes	Regular	Partial	Bifacial	Long
	Distal	Yes	Convex	Total	Direct	Invasive
	Right	Yes	Convex	Total	Direct	Short
	Proximal	No	No	No	No	No

The purpose of recording retouch delineation, distribution, position and extent is to ascertain the attention to detail regarding deliberate form imposition or regularity, working on the premise that - the greater the degree of retouch along the flake edge = the greater extent to which the flake blank's morphology has been altered = the greater the degree of form and shape imposition on the flake tool. Retouch is defined as:

> "a removal or a series of specific removals carried out in order to obtain a tool. Retouching is thus the structuring, sculpting and intentional transformation of a blank" (Inizan *et al* 1992: 97).

Retouch delineation describes the outline of the edge created through retouch removals which can be described as (after Inizan *et al* (1992: 85) and exemplified in figure 5.6):

- Rectilinear (straight)
- Concave
- Convex
- Notched
- Denticulated
- Saw
- Cran
- Shoulder
- Nosed
- Tongue
- Tang
- Long narrow tang
- Irregular
- Regular

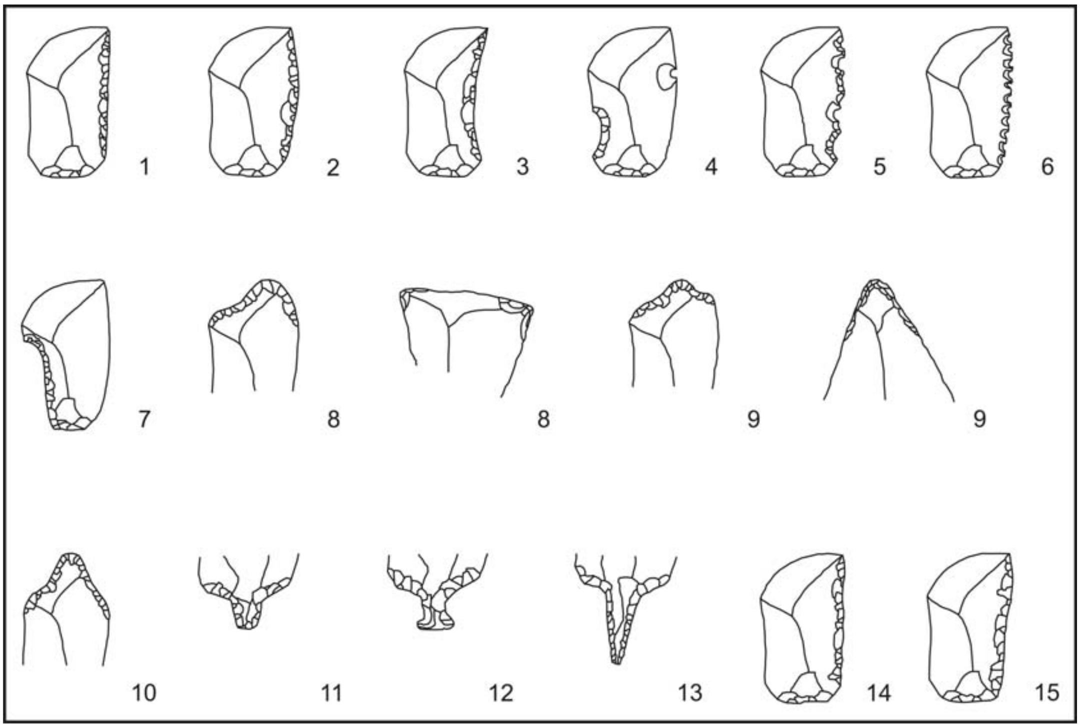


Figure 5.6: Illustrating retouch delineation – 1: rectilinear, 2: convex, 3: concave, 4: notched, 5: denticulated, 6: saw, 7: cran, 8: shoulder, 9: nosed, 10: tongue, 11 and 12: tang, 13: long narrow tang, 14: irregular and 15: regular. Image modified after Inizan *et al* 1992: 85, figure 35.

Retouch distribution shall be described according to three categories (figure 5.7) after Inizan *et al* (1992: 85 – 86):

- Discontinuous - if there are one or more interruptions between the retouch along a single edge.
- Total - where there is total retouch coverage along a single edge.
- Partial - when the extent of retouch does not occupy the entire length of an edge.

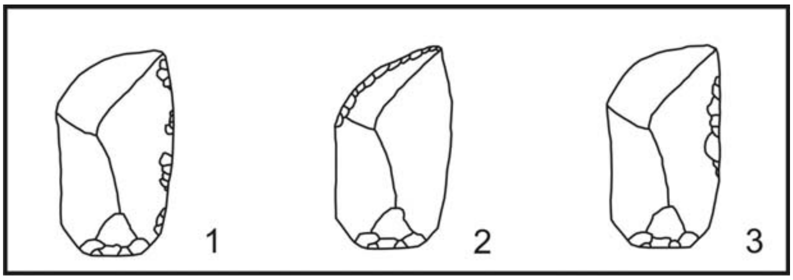


Figure 5.7: Illustrating the three categories of retouch distribution – 1: discontinuous, 2: total on the distal edge, 3: partial on the right edge. Image after Inizan *et al* 1992: 86, figure 36.

Retouch position relates to the position of the retouch removals in relation to the flake faces, these may be defined according to six categories (figure 5.8) after Inizan *et al* (1992: 94):

- Direct
- Inverse
- Alternate
- Alternating
- Bifacial
- Crossed

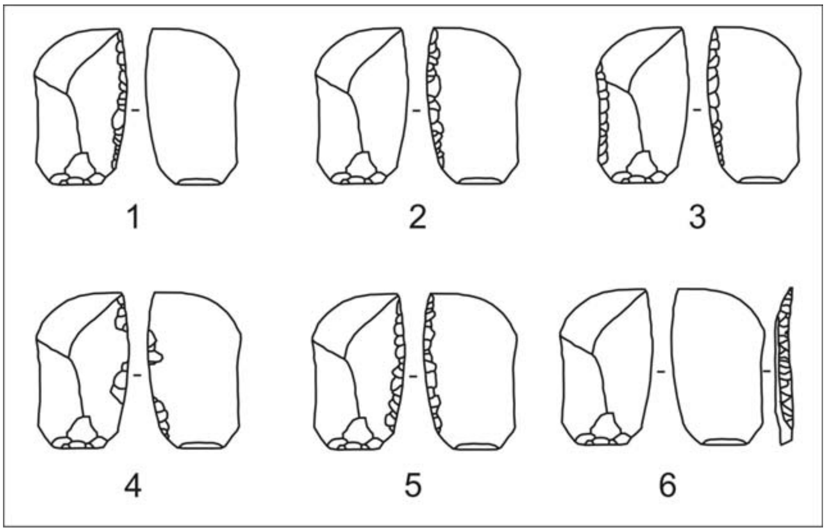


Figure 5.8: Illustrating the six categories of retouch position – 1: direct, 2: inverse, 3: alternate, 4: alternating, 5: bifacial, 6: crossed. Image after Inizan *et al* 1992: 94, figure 44.

Retouch extent shall be defined according to four categories (figure 5.9) after Inizan *et al* (1992: 86):

- Short - if the retouch scars affect a small surface along an edge.
- Long - if the retouch scars extend toward the centre of the artefact.
- Invasive - if the retouch scars cover a large part of the face of the artefact.
- Covering - if the retouch scars cover the entire surface of the artefact.

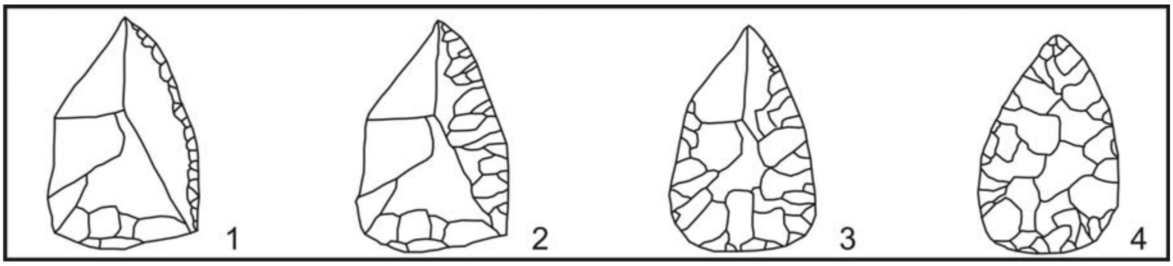


Figure 5.9: Illustrating the four categories of removal extent – 1: short, 2: long, 3: invasive, 4: covering. Image after Inizan *et al* 1992: 86, figure 37.

When examining the degree of deliberately imposed form or shape on flake tools within Non-PCT flakes, the assessing the retouch extent on a flake tool shall allow for a measure of extra shaping the knapper has imposed upon the flake once it has been detached from the core. However, with the introduction of PCT where flake blanks are inherently standardised through the knapping technique, evaluating the amount and extent of retouch should allow an assessment of how the shape of the original flake blank has been altered (if at all) by the knapper. If a high degree of retouch and edge-working is present on PCT flakes then it may indicate that the knapper is imposing deliberate shape and form onto the flake blank regardless of the degree of standardisation in flake proportion and morphology caused by the technological method of production.

5.4 Summary

As mentioned previously, I intend to evaluate data sets for a sense of continuity within *and* between techno-complexes (Non-PCT and PCT) using artefacts as the medium through which changing social relations and interactions are manifest in the context of action through time (Field 2005). In terms of exploring how the methodology outlined above relates to the use of the body and the evidence of identity construction and propagation in the Palaeolithic (across all the case studies), I summarise the main tenants below:

Aim: To explore the role of the body and material culture in social signalling and identity construction / propagation through visual display.

Premise: 1. The smaller the degree of form imposition on an artefact, the smaller the degree of social signalling embedded within the artefact, the greater the role the body plays in social signals and identity propagation. Social signalling in visual display must therefore be direct and context specific.

2. The greater the degree of intentional form imposition within an assemblage of artefacts, the greater the degree of social signalling embodied within the artefact, and the smaller the role the body plays in direct social signals and identity propagation. Through the use of material culture, visual display and social signalling involves the use of proxies allowing for a more flexible and complex context independent form of social communication.

<u>Artefact Analysis</u>: *LCT*s

- Assess the extent of standardisation in artefact form imposition through the imposition of symmetry, and tip shape.

- Assess the degree of standardisation in terms of artefact manufacture through initial and secondary working patterns.

- Assess the influence of raw material on size and degree of form imposition on LCTs, and whether this changes through time (i.e. material culture category 2 to 3) in order to ascertain whether patterns seen in relation to form imposition and standardisation are related to raw material or not.

Detached Pieces (Group R and G)

- Assess the effect of raw material on size in relation to degree of form imposition (extent and distribution of retouch) on flakes, and whether this changes through time (i.e. Non-PCT to PCT).

- Assess the extent, delineation, position and distribution of retouch on Non-PCT and PCT flakes to assess the degree of standardised form imposition.

- Assess the degree of standardisation (in terms of size) present within flake production both within and between Non-PCT and PCT assemblages.

Cores (Groups A, B and C)

- Assess the effect of raw material on core size and whether this changes in relation to time and geography, and Non-PCT to PCT in order to examine the possibilities of bias towards particular raw materials.

- Assess the degree of standardisation (in terms of size) present within the cores from all groups in order to assess changes through time.

The following chapter shall detail the site histories of the assemblages under examination for this thesis together with a summary of the lithic analysis.

Chapter 6 - Sites

Artefacts from a total of eleven sites were examined and recorded for the purposes of this thesis. Nine of the sites were located within the United Kingdom (figure 6.1), one site (Et Tabun) in the Middle East (figure 6.2), and a further site (the Cave of Hearths) in South Africa (figure 6.3).

Figure 6.1: Showing the location of the British Palaeolithic Sites.

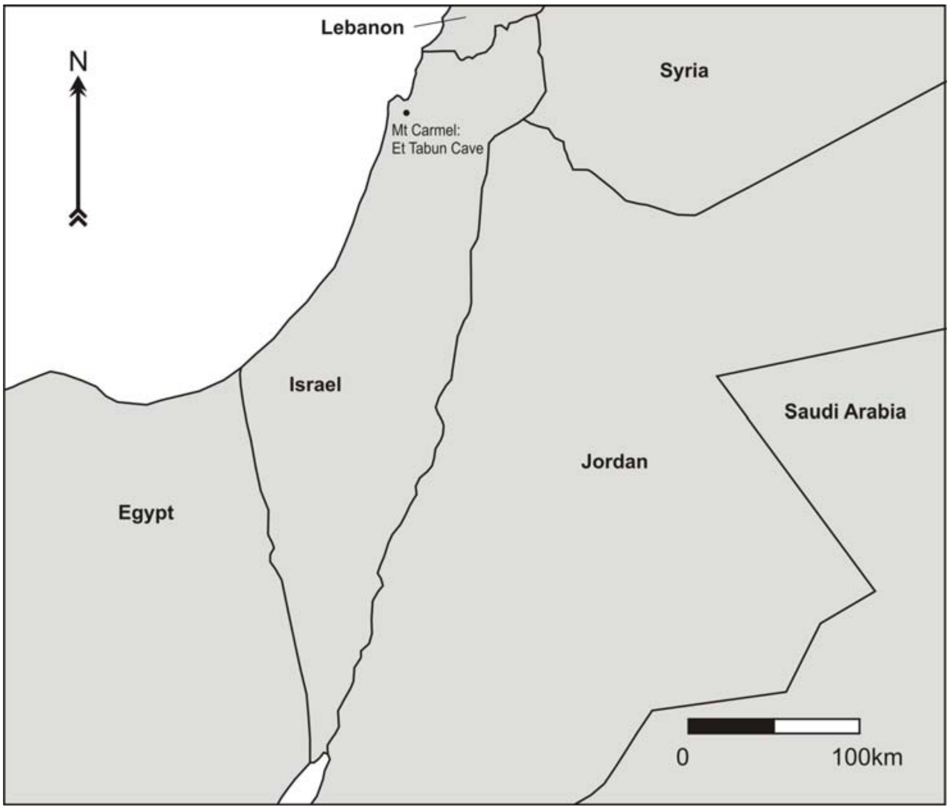


Figure 6.2: Showing the location of Et Tabun in the Middle East.

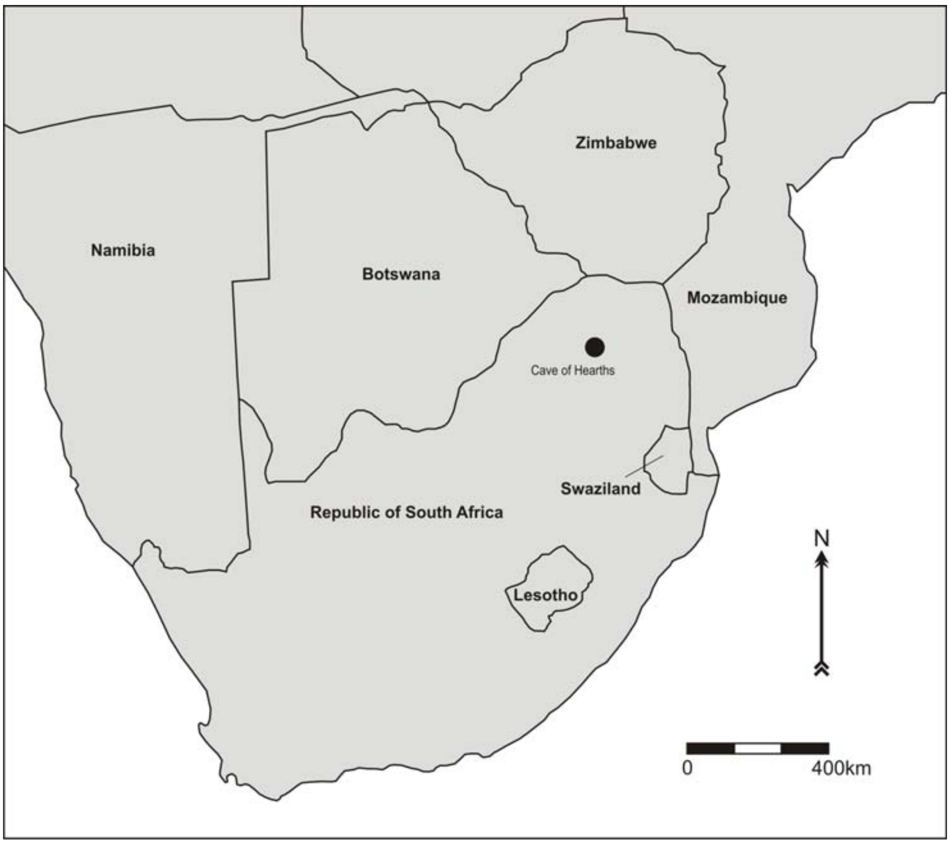


Figure 6.3: Showing the location of the Cave of Hearths in South Africa. Diagram after Wadley and McNabb 2009: 1, Figure 1.1.

The sites and assemblages were chosen in order to reflect a regional case study (the United Kingdom) reflecting a pattern of chronological interglacial occupation in order to allow an inter-site comparison through time covering the Lower to Middle Palaeolithic. This was done in order to test whether there were evolving patterns of hominin behaviour across a temporal range, such as whether evidence for artefact standardisation increased or not. The Cave of Hearths and Et Tabun were chosen as control sites where hominin behaviour on a species level could compared to the patterns reflected within the United Kingdom data. Furthermore, Et Tabun represents a site of almost continuous occupation from the Lower to Middle Palaeolithic and therefore it was thought that the site would allow for an interesting comparison to the regional scale United Kingdom data. The sites span a range of dates from Marine Isotope Stage (MIS) 13 to 3 (figure 6.4) encompassing a 500, 000 year period stretching from the Lower to Middle Palaeolithic.

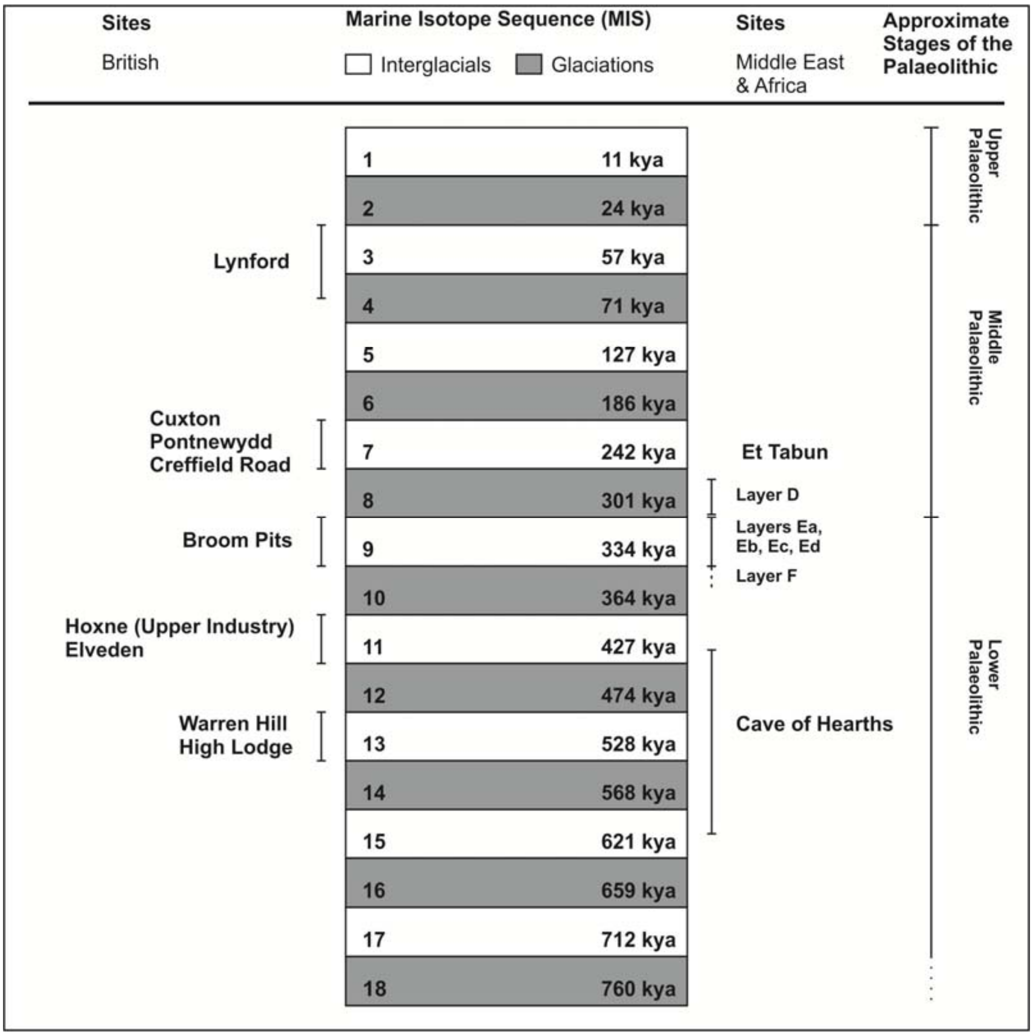


Figure 6.4: Showing the date ranges for the British, Middle East and African sites in relation to the Marine Isotope Stages (MIS) and approximate Palaeolithic stages. MIS dates and Palaeolithic stages taken after McNabb 2007: 17, Figure 1.5.

Given that the research aims of this thesis requires the use of the archaeological data as a proxy to examine broad behavioural trends on a species level in relation to hominin cognitive ability, detailed site histories examining every nuance relating to the formation processes were not deemed necessary in accessing such information. Therefore, below I shall offer a broad outline of important contextual information, positive dating, a summary of the site assemblage compositions accompanied by a brief raw material assessment, before detailing the results of the lithic analysis in Chapter 7.

It should be noted here that all artefact material was examined in person by the author for each assemblage / site listed with the exception of the Cave of Hearths and Broom Pits data where the data recording was conducted from high resolution photographs.

6.1 Site background information

United Kingdom

High Lodge

The site of High Lodge is located in the Breckland region of Suffolk in close proximity to Warren Hill, and Elveden near Mildenhall. High Lodge was the site of intense interest during the 1960s and late 1980s (Ashton *et al* 1992a) with the identification of archaeological layers dated to some 500,000 years ago, or MIS 13 (Asthon *et al* 1992b: 174). Faunal and sedimentological analysis relates the site of High Lodge to a temperate environment with a slow moving or still body of water (Asthon *et al* 1992b: 174; McNabb 2007: 114). There were three phases of artefact collection, those collected between 1870 and the early 1920s and artefacts recovered through the British Museum excavations from 1962 – 1968 and again in 1988 (Ashton 1992a: 124). For the purposes of this thesis, in order to limit sample sizes and allow for an analysis pertaining to a single broadly contemporary assemblage, I have focused on artefacts that have been interpreted as belonging to a single assemblage spread over four excavated contexts (Ashton 1992a: 129) – Beds C2, D, E and the sands and gravels (Bed F) – from the 1962 – 1968 excavations (figure 6.5).

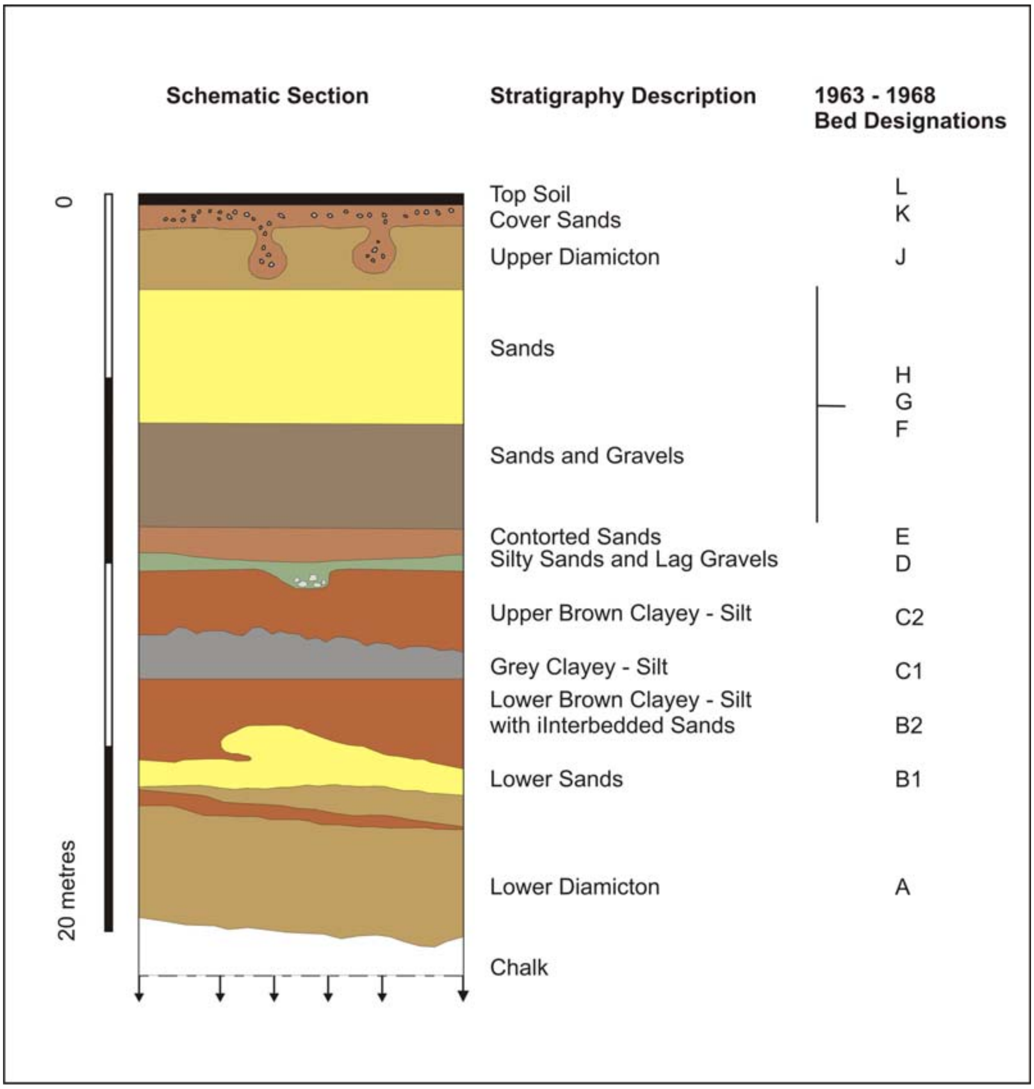


Figure 6.5: A schematic section of the High Lodge deposits showing the Bed designations from the 1963 – 1968 British Museum excavations. Diagram after Ashton 1992b: 39, Figure 2.13.

The artefacts from High Lodge do not represent an *in situ* assemblage in the traditional sense because it is believed that Anglian glaciers entered the area scraping out a raft of clay deposits (including Beds C2, D and E) from the flood plain and carried along in the body of the ice sheet (McNabb 2007: 114). The ice sheet then deposited the clays, still containing the relatively undisturbed archaeology, on top of a basal lodgement till, with a quantity of sands and gravels (containing bifaces – presumably the remains of another 'artefact litter' contained within the flood plain) then being deposited on top of the clay deposits (McNabb 2007: 114).

Two main independent lines of investigation suggest that the artefacts spread over Beds C2, D and E belong to a single assemblage; the first is that there is little difference in the technology of the artefacts, and secondly, there are at least two instances of refitting between Beds C2 and E, and at least one between C2 and D

(Ashton 1992a: 129). Furthermore, the condition of the artefacts was noted as being similar across the Beds, with distribution patterns of the artefacts not forming discrete layers (Ashton 1992a: 129).

A further 392 artefacts (flakes, LCT's and cores) were labelled as coming from Sands and Gravels relating to Bed F. However, given the wholesale movement of the clay deposits of Beds C2, D, E along with the sands and gravels, the fact that the condition and the technological make up are similar, coupled with the refitting evidence, leads me to believe that it is still valid to view the portion of the High Lodge artefacts examined within this thesis as two distinct, yet broadly contemporaneous assemblages (in the context of a floodplain), that can be subject to a single analysis that suits the scope of this thesis.

Therefore, the total number of artefacts examined and recorded from the four excavated contexts from High Lodge for this thesis lie at 1615 artefacts (table 6.1).

		Context / Level									
		Bed C2		Bed D		Bed E		Sand and Gravel		**Total**	
Artefact Type	LCT	0	*.0%*	0	*.0%*	0	*.0%*	16	*1.0%*	**16**	***1.0%***
	Flake	740	*45.8%*	236	*14.6%*	29	*1.8%*	284	*17.6%*	**1289**	***79.8%***
	Flake tool	47	*2.9%*	22	*1.4%*	1	*.1%*	45	*2.8%*	**115**	***7.1%***
	Debitage	24	*1.5%*	15	*.9%*	0	*.0%*	28	*1.7%*	**67**	***4.1%***
	Core	78	*4.8%*	23	*1.4%*	6	*.4%*	19	*1.2%*	**126**	***7.8%***
	Hammer Stone	1	*.1%*	1	*.1%*	0	*.0%*	0	*.0%*	**2**	***.1%***
	Total	**890**	***55.1%***	**297**	***18.4%***	**36**	***2.2%***	**392**	***24.3%***	**1615**	***100.0%***

Table 6.1: Showing the relationship between artefact type and context at High Lodge.

From table 6.1 it can be seen that there are a range of artefact types from all examined contexts at High Lodge. In regards to raw material figure 6.6 shows that the predominant raw material was flint for all artefact types except the two hammer stones which were cobbles of an unknown raw material type.

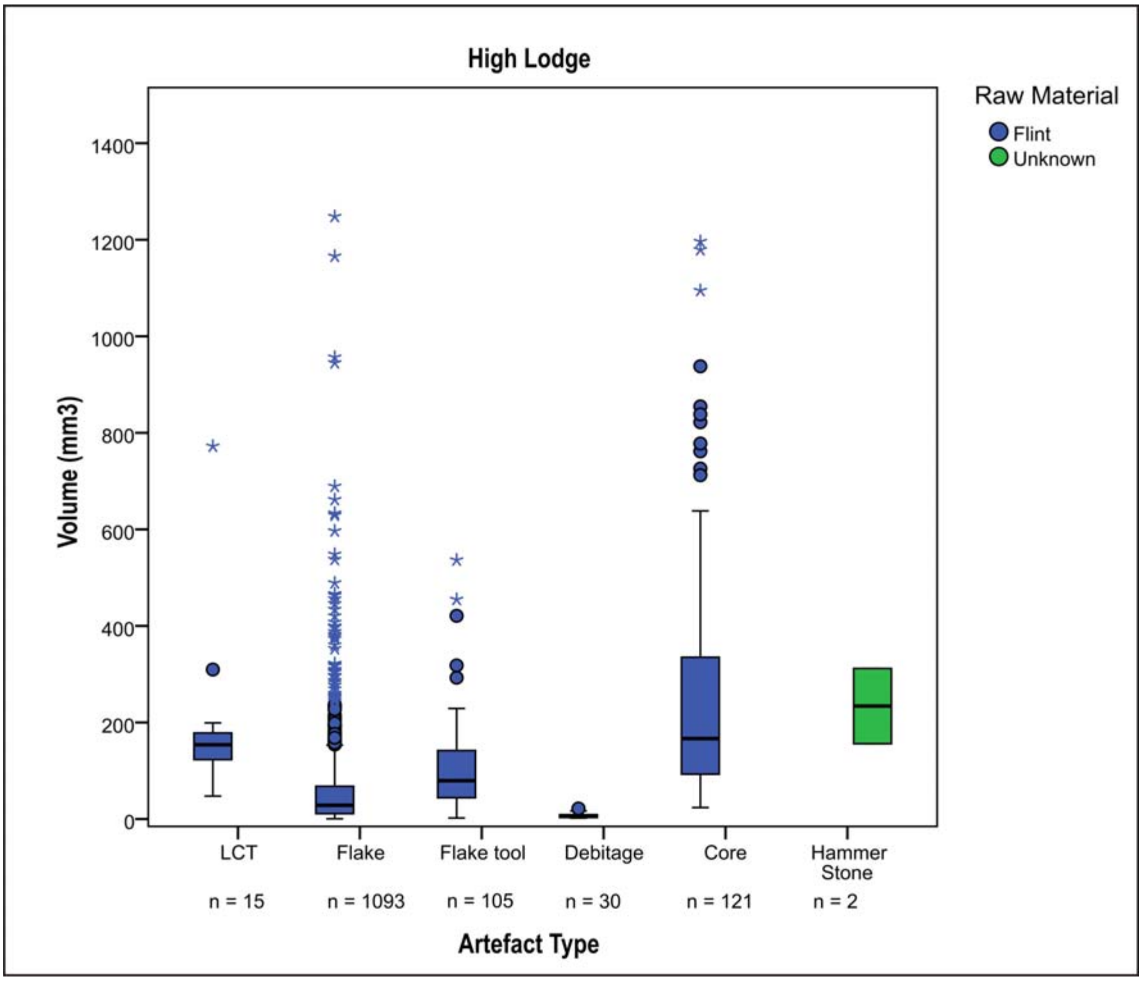


Figure 6.6: Showing the relationship between raw material type and artefact type and volume from High Lodge. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.6 further illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given a range of artefact sizes across all artefact types. Furthermore, within the context of the site, flint may be seen as a locally available raw material source (Ashton *et al* 1992a; Wymer 2001).

Warren Hill

The site of Warren Hill is located near Mildenhall, Suffolk (figure 6.1) and has an overall artefact count in the thousands (McNabb 2007: 114) containing two distinct LCT assemblages (rolled and fresh). Although relatively little has been written about the site of Warren Hill a useful site history can be gained from Roe (1981: 111 – 115) and Hosfield (2011). A further source of information comes from Solomon (1933) where he demonstrates that the Warren Hill gravel was not a fluvatile deposit, but an unstratified glaci-fluvial outwash. This was based on the observation of a tumbled appearance to the gravel and the presence of chalk clasts which would not have survived prolonged fluvatile transport (Roe 1981: 113; McNabb 2007: 114 – 115). Solomon's interpretation became the accepted version of events until recent work identified a more detailed sequence of atypical *fluvial* gravels, overlying a deposit of laminated sands and silts (thought to represent a low energy fluvial environment) in turn overlying chalk (bedrock) (Bridgland *et al* 1995; McNabb 2007: 115). Given the high degree of edge damage found on the artefacts, it has been suggested that most of the artefacts from Warren Hill were recovered from within the higher energy sands and gravels (Bridgland *et al* 1995; McNabb 2007: 115; Hosfield 2011). There would appear to be two distinct assemblages associated with the site of Warren Hill, a fresh assemblage and a lightly abraded / rolled assemblage which may represent an older occupation occurrence (see Appendix 2 for more details). In terms of dating the Warren Hill assemblage, there has been much controversy (Wymer *et al* 1991; Bridgland *et al* 1995; Lee *et al* 2004; McNabb 2007; Preece *et al* 2009; Hosfield 2011) with an MIS-14 date being put forward for the Bytham River terrace – and a subsequent MIS-15 date for the more abraded bifaces being reworked from the Bytham River terrace (Lee *et al* 2004). However there is a preferred date of MIS-12 for the gravels from which both assemblages were extracted, putting both biface assemblages into a MIS-13 date (Lewis *pers. comm.* cited in McNabb 2007: 115; Hosfield 2011). Given the difficulties in assemblage separation and as with High Lodge, I shall follow the preferred dating preferences at the time of writing, and analyse the two biface assemblages as broadly contemporaneous assemblages from a generally contemporary MIS-13 Lower Palaeolithic landscape in the main body of this thesis, although the analysis if Appendix 2 separates the two assemblages. However, given the difficulties in dating, the MIS date is open to change should further research clarify the dating sequence for the Warren Hill assemblages.

One of the most accessible collections from the site of Warren Hill is the Sturge Collection held at the British Museum consisting of many hundreds of bifaces and flakes. Solomon (1933) and Roe (1981) both looked at the Sturge Collection and confirmed a division within the assemblage consisting of a rolled and a distinct fresher assemblage. For the purposes of this thesis, I examined and recorded all bifaces from the Sturge Collection held at the British Museum (a total of 582 artefacts). My analysis suggests that such a division in artefact condition does exist within the data set, although it is not a distinct rolled versus fresh differentiation. On examining the condition of the LCTs from Warren Hill, I termed the majority of artefacts fresh or lightly abraded (see Appendix 2 page 333). The discrepancy between my analysis and those of Solomon (1933) and Roe (1981) arises from the fact that on a simple visual inspection of LCT condition the artefacts would appear to clearly fall between a fresh or abraded condition. However, this abraded look is more a consequence of patination than a true reflection of condition. Touching the flake arêtes (scar ridges) on the LCTs shows that even on pieces that look heavily abraded, the ridges are still sharp and clearly defined rather than being rounded and dulled if the artefact were truly abraded. Therefore, on closer inspection most of the LCTs from Warren Hill were lightly abraded, (flake scar ridges being slightly rounded and dulled) or fresh (flake scar ridges being clearly defined and sharp). As stated above, this difference in condition suggests the presence of two separate assemblages although it is probably best to infer that an older assemblage is interspersed with a fresher assemblage rather than trying to explicitly distinguish between the two when interpreting the site (McNabb 2007: 115). Therefore, to reiterate, given the scope of the analysis within this thesis, I have treated the Warren Hill assemblage as a single, broadly contemporaneous assemblage belonging to a MIS-13 landscape, rather than two distinct assemblages.

There is a significant difference in artefacts totals for handaxes for this thesis (582 – table 6.2) and those given by Solomon (703 handaxes) and Roe (816 handaxes).

		Completeness					
		Unbroken		Broken		**Total**	
LCT Type	Handaxe	524	***90.0%***	32	***5.5%***	**556**	***95.5%***
	Cleaver	17	***2.9%***	2	***.3%***	**19**	***3.3%***
	Knife	3	***.5%***	0	***.0%***	**3**	***.5%***
	Blank	4	***.7%***	0	***.0%***	**4**	***.7%***
	Total	**548**	***94.2%***	**34**	***5.8%***	**582**	***100.0%***

Table 6.2: Showing the total number of LCTs examined for Warren Hill.

Presuming that the current Warren Hill Sturge Collection present within the British Museum stores is the same as that studied by Solomon (1933) and Roe (1981) and the collection has not been divided up between several institutions, I propose that the difference lies in the fact that I examined and recorded only *bifacially* worked artefacts, and ignored the presence of flake tools and cores that bore a resemblance to handaxes present within the Sturge Collection. It is my opinion that both Solomon and Roe included the flake tools and cores within their handaxe count leading to the difference expressed above. I have excluded the flake tools and cores from my data collection on the grounds that there is no contextual evidence to directly link the flake tools and cores to the LCTs from Warren Hill. Therefore within this collected sample I am focusing purely on the bifacial LCT assemblages from Warren Hill despite mixing present within the data of an older assemblage being interspersed within a younger assemblage, within the broad scope of analysis within this thesis the two LCT assemblages do allow for an examination of hominin behaviour at a species level.

In regards to raw material, flint was the only raw material present within the LCTs studied (figure 6.7).

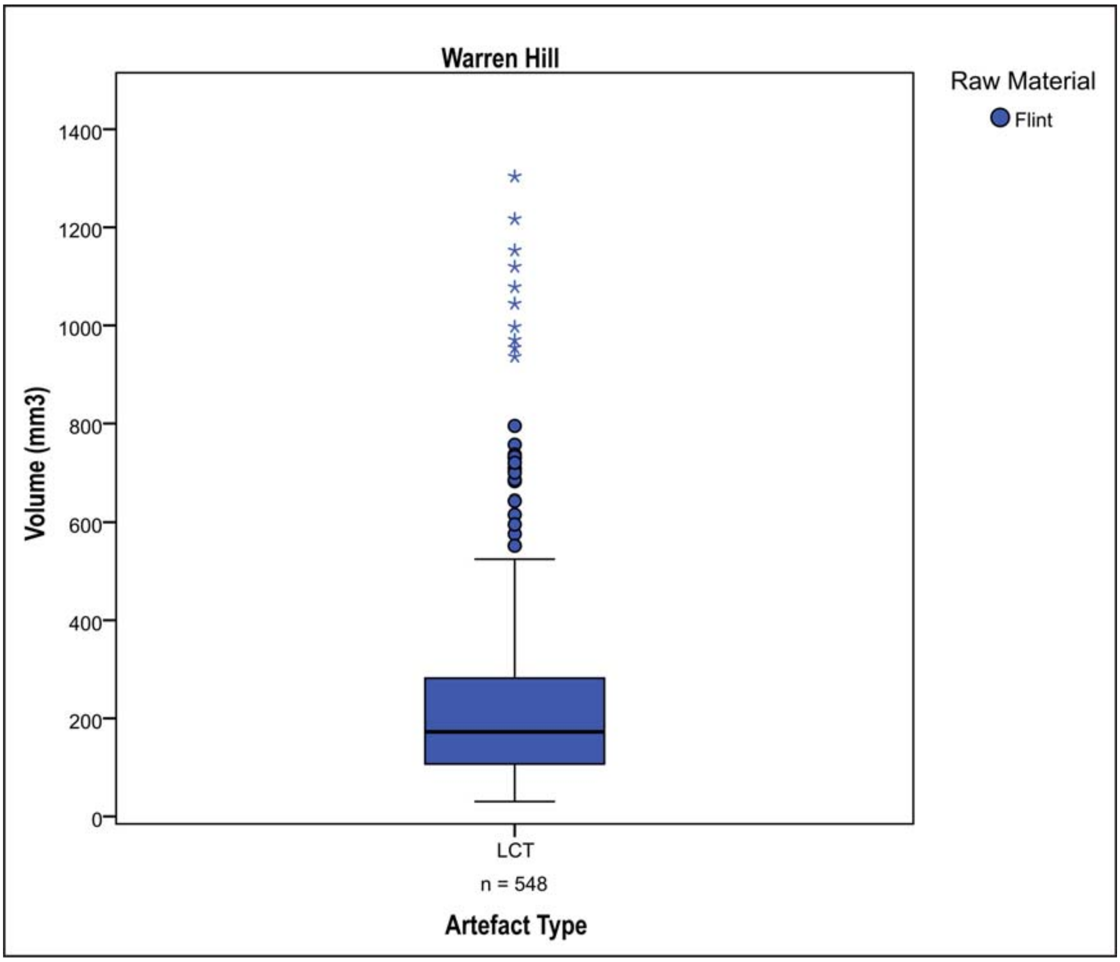


Figure 6.7: Showing the relationship between raw material type and artefact type and volume from Warren Hill. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.7 illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of LCT sizes. Furthermore, within the context of the site and time period, flint may be seen as a locally available raw material source (Wymer 2001).

Elveden

The site of Elveden located in the Breckland region in Suffolk located not far from Warren Hill and High Lodge (figure 6.1), has been the site of extended interest since the 1890s and dated securely to MIS-11 (Asthon *et al* 2005). The artefacts examined and recorded from Elveden consist solely of the bifaces held at the British Museum – some 63 in total. The primary collection examined were the bifaces of the Sturge Collection (44 in total) – collected from the original opening of the old pit opened in the 1890s primarily for the building of Elveden Hall completed in 1900 (Ashton *et al* 2005). Two further bifaces were examined from the Sieveking and Turner 1967 excavations (Turner 1973) which come from the same series of units as the artefacts from the more recent 1995 – 1999 British Museum (BM) excavations (12 handaxes in total) reported in Ashton *et al* (2005). The bifaces from the recent British Museum excavations come from all areas investigated (Areas 1 – 5) including eight artefacts from an *in situ* palaeo-landsurface and four from disturbed gravel deposits (Ashton *et al* 2005). A further five unprovenanced bifaces were examined, two bifaces are from an unknown collection, two from the Wellcome collection and one from the Fox collection all in a fresh condition. Given the nature of the investigation undertaken for this thesis, contextualised artefacts are always more desirable for research purposes and therefore, the five uncontextualised bifaces shall be excluded from the sample under study. The bifaces from the Sturge, Sieveking and Turner, and British Museum Collections shall all be examined together (58 artefacts in total) as they are likely to be broadly contemporaneous in MIS-11, and the condition analysis in Appendix 2 would seem to support this broad MIS based framework for interrogating the data (Ashton *et al* 2005) (table 6.3).

		Artefact Type		
		LCT		
		Completeness		
		Unbroken	Broken	**Total**
Collection	BM Excavation	4	8	**12**
	Fox Collection	1	0	**1**
	Sieveking Excavation 1967	2	0	**2**
	Sturge Collection	38	6	**44**
	Unknown Collection	2	0	**2**
	Wellcome Collection	2	0	**2**
	Total	**49**	**15**	**63**

Table 6.3: Showing the Collections and Completeness of the LCTs from Elveden. BM = British Museum.

In regards to raw material, flint was the only raw material present within the LCTs studied (figure 6.8).

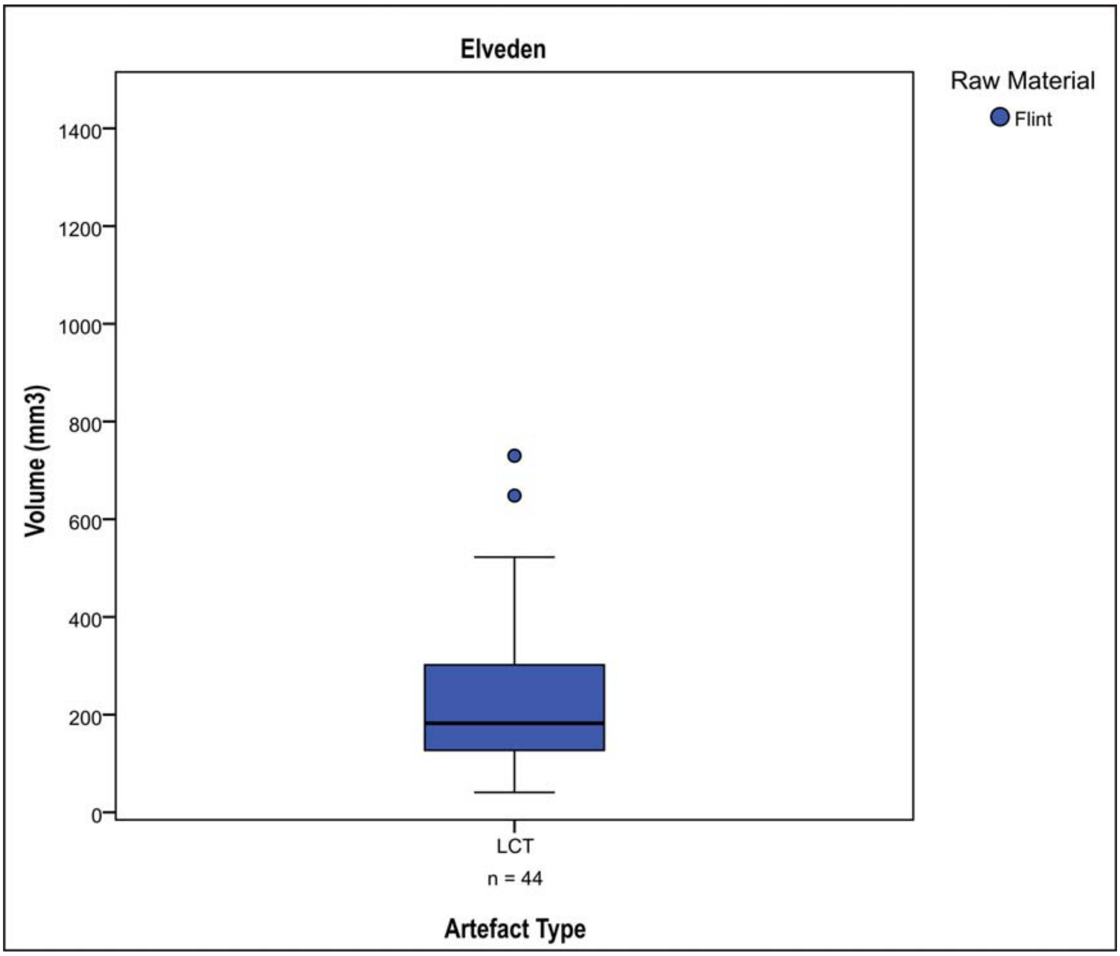
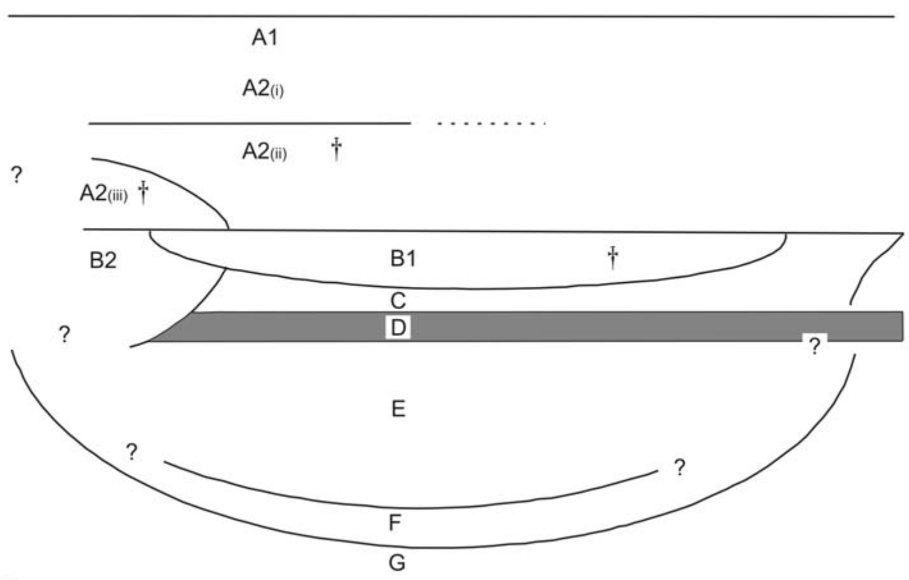


Figure 6.8: Showing the relationship between raw material type and artefact type and volume from Elveden. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.8 illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of LCT sizes. Furthermore, within the context of the site and time period, flint may be seen as a locally available raw material source (Ashton *et al* 2005).

Hoxne – Upper Industry

The site of Hoxne is located near the River Waveney on the border between the counties of Suffolk and Norfolk (Singer *et al* 1993: 1) and has been a site of intense interest and debate since the discovery of Lower Palaeolithic handaxes by Frere (1800 cited in Ashton *et al* 2008). Of all the many subsequent investigations at Hoxne (see Ashton *et al* 2008 for a brief overview) one of the most significant were those conducted by Ronald Singer and John Wymer for the University of Chicago from 1972 – 74 and 1978 (Singer *et al* 1993). The work carried out by Singer and Wymer provided the first properly excavated artefact assemblages representing two phases of occupation at the site: the first or ‘Lower Industry’ was found in fluvial sediments laid down during a temperate climate whilst the second or ‘Upper Industry’ was an *in situ* assemblage found in a layer termed Stratum A2(ii) alluvial sandy clay, with derived Upper Industry artefacts being found in colder climate solifluction gravels known as Stratum A2(i) Solifluction gravel – figure 6.9 - (Singer *et al* 1993: 74-128; McNabb 2007: 152– 153; Ashton *et al* 2008).



Key

Bed Name	Bed Description	Climatic Interpretation	Archaeology †
Stratum A1	Coversand	Cold	
Stratum A2(i)	Cryoturbated sand and gravel	Cold	
Stratum A2(ii) - Layer 7, 7a, 7b	Solifluction gravel	Cold	Derived Upper Industry
Stratum A2(iii) - Layer 6, 6x, 6b	Alluvial sandy clay	Warm	Upper Industry
Stratum B1	Fluvial sand, silt and clay	Warm	Lower Industry
Stratum B2	Fluvial chalky gravel	Warm	
Stratum C	Lacustrine sands and silts	Cold	
Hiatus			
Stratum D	Peat	Warm	
Stratum E	Lacustrine clay	Warm	
Stratum F	Lactustrine clay	Cool	
Stratum G	Till	Cool	

Figure 6.9: A schematic showing the location of the archaeological assemblages within the reinterpreted Hoxne stratigraphy. Diagram after McNabb 2007: 152, Figure 5.10; Ashton *et al* 2008: 22, Figure 6 and Ashton *et al* 2008: 27, Table 1.

Recent work by Ashton *et al* (2008) has led to a total reinterpretation of the site stratigraphy and the position of the two artefact assemblages within the site (exemplified in figure 6.9). Therefore, there is not much to be gained from going over the original Singer *et al* (1993) stratigraphic interpretation here, although researchers should be aware that the stratigraphy of Hoxne has been the repeat subject of reinterpretation (Evans *et al* 1896; West 1956; Singer *et al* 1993; Ashton *et al* 2008). I shall follow the interpretation offered by Asthon *et al* (2008) as it offers the most comprehensive and up to date understanding of the stratigraphic sequence at Hoxne, with important implications for the dating of the two assemblages found there.

One of the major changes to note is that Stratum C is now recognised as a cold climate deposit as first suggested by Reid (Evans *et al* 1896) and is not a warm weather deposit as suggested by West (1956). The other major implications of the Ashton *et al* (2008) work are that the archaeological assemblages of Hoxne have been securely provenanced to MIS-11 on the basis of a revised stratigraphy focussing on the relationship between Stratum C and the sediments containing the Lower and Upper Industries, new amino acid racemisation analysis (Penkman *et al* 2010) and biostratigraphic work. The new dating results ultimately show that Ashton *et al* (2008) highlighted an interstadial of MIS-11 previously unrecognised in Britain.

For the purposes of this thesis I have chosen to concentrate on the artefacts of the *in situ* ‘Upper Industry’ looking at all the artefacts (bar debitage flakes – those represented below are >20mm and recorded for presence only) from the Upper Industry found in a derived context (Bed 7 from Singer *et al* 1993: 8 or A2(ii) from Ashton *et al* 2008) and the primary context (Bed 6 from Singer *et al* 1993: 8 or A2(iii) from Ashton *et al* 2008). A total of 1583 artefacts were examined consisting mostly of flakes, although some flake tools, handaxes and cores were present (table 6.4).

		Context / Level							
		Layer 6	Layer 6-7	Layer 6b	Layer 6x	Layer 7	Layer 7a	Layer 7b	**Total**
Artefact Type	LCT	15	0	5	8	2	0	0	**30**
	Flake	569	6	69	111	343	41	46	**1185**
	Flake tool	50	2	27	38	56	8	3	**184**
	Debitage	46	1	0	8	56	18	24	**153**
	Core	4	0	1	1	6	2	2	**16**
	Hammer Stone	0	0	0	0	2	0	1	**3**
	Core tool	5	0	2	2	2	0	1	**12**
	Total	**689**	**9**	**104**	**168**	**467**	**69**	**77**	**1583**

Table 6.4: Showing the relationship between artefact type and context for the artefacts from the Hoxne Upper Industry.

It is worth noting here that although the assemblages were described as being *in situ*, there was a substantial amount of edge damage noticed on the flakes (often mimicking retouch) and some abrasion in condition (see Appendix 2) that may suggest some post depositional movement. However, the overall freshness in condition of the artefacts of the Upper Industry (see Appendix 2) would indicate that any post depositional movement would have been minimal.

In regards to raw material, flint was the only raw material present within the artefacts of the Hoxne Upper Industry (figure 6.10).

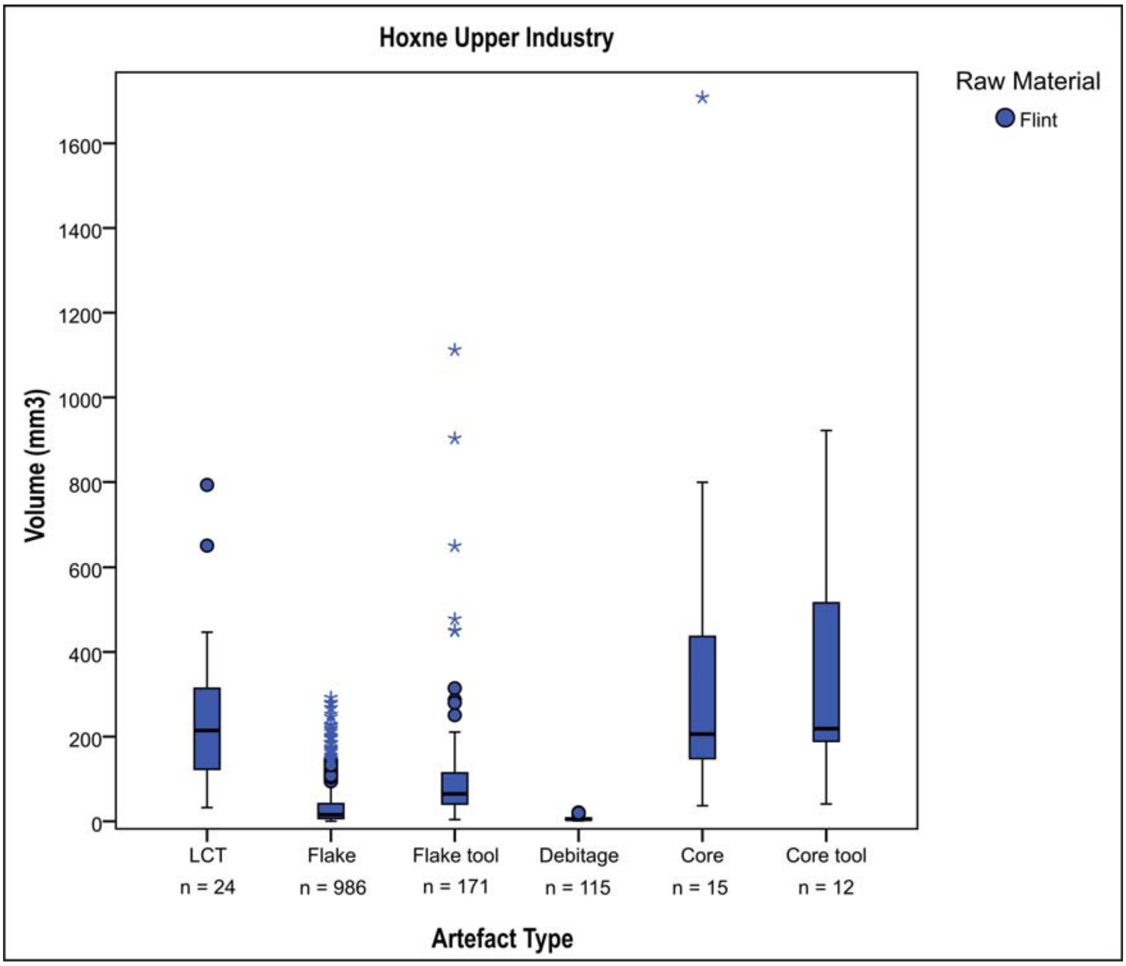


Figure 6.10: Showing the relationship between raw material type and artefact type and volume from the Hoxne Upper Industry. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.10 illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of artefact sizes present within the Hoxne Upper Industry. Furthermore, within the context of the site and time period, flint from the gravels may be seen as a locally available raw material source (Singer *et al* 1993).

Broom Pits

The site of Broom is located in the valley of the River Axe, situated on the border between Devon and Dorset in southern England (figure 6.1). Broom is important as it represents the largest collection of Lower Palaeolithic artefacts in south-west Britain

(Hosfield and Chambers 2003), some 1800 Acheulean artefacts as a minimum total, recovered from Middle Pleistocene terrace deposits of the River Axe (Hosfield and Chambers 2009). The artefacts collected from the Broom Pits were recovered from three commercially worked gravel pits: the Railway Ballast Pit, Pratt's New Pit and Pratt's Old Pit and mainly knapped from chert rather than flint due to the fact that the Axe River cuts through the Foxmould Chert Beds of Upper Greensand therefore allowing ready access to the chert (Wessex Archaeology 1993: 160-161). At Broom, the condition of LCTs range from fresh to abraded, but the presence of preserved polleniferous clays, combined with 'fresh' artefacts and a number of LCTs (more than thirty) found in close proximity to one another suggests the presence of intact deposits (Green 1988: 180 cited in Marshall 2001: 77).

The context of the Broom artefacts are complicated, however there appears to be recent agreement on the stratigraphy of the site best explained by Hosfield and Chambers (2009) but briefly summarised here. The stratigraphy of Broom consists of a tripartite deposit consisting of Lower 'flinty' gravels, a Middle Bed of clays, sandy-clays or loams with coarse open fabric gravel, and an Upper 'cherty' Gravel (Hosfield and Chambers 2009). Hosfield and Chambers (2004, 2009) favour a single terrace model for deposition with a temperate floodplain deposit 'sandwiched' between two cold climate gravels. The majority of artefacts are claimed to have come from the Middle Beds (Green 1988 cited in Hosfield and Chambers 2009) although there is a definite artefact presence to be found within the Upper Gravels. Due to the fact that the provenance of many of the Broom artefacts were not precisely recorded by the collectors / workmen, it is difficult to precisely contextualise the Broom assemblage. However, based on a detailed technological assessment of the Broom artefacts Hosfield and Chambers (2009) opt for a single phase occupation model for the site of Broom with limited later reworking. The presence of artefacts within two different contexts is explained through artefact deposition onto the floodplain (Middle Beds) during a single phase of hominin occupation, the artefacts were then either partly or wholly buried within the channel deposits of the Middle Beds with subsequent erosion and re-deposition of some artefacts into the Upper Gravels as a result of the migration of the River Axe across the floodplain (Hosfield and Chambers 2009). Certainly the condition analysis of the artefacts in Appendix 2 would support the notion that there was some post depositional movement given the mostly lightly abraded condition of the LCTs.

The Broom Pits handaxes may be seen to represent the extreme north-west extent of the Acheulean world, with finds further north and west being very small scale in comparison (Marshall 2001). For this thesis, I shall concentrate solely on the LCTs from the C.E. Bean collection and the sample from Exeter Museum totalling 975 bifaces (data courtesy of Dr R. Hosfield) predominantly knapped from Greensand chert with a few made from fine grained flint, and all either abraded or lightly abraded in condition. Recent dating work conducted at the Broom Pits has yielded a number of Optically Stimulated Luminescence (OSL) dates for the Broom Pits sediments that suggest that the Middle Beds were deposited during late MIS-9 and MIS-8 and the Upper Gravels were deposited during late MIS-9, MIS-8 and MIS-7, the Lower Gravels were unable to be dated at the time of work (Hosfield and Chambers 2009). Given the single occupation interpretation offered by Hosfield and Chambers (2009) it is proposed that the artefacts date to the interglacial conditions of MIS-9 (Hosfield and Chambers 2009).

It should be noted here that there were some difficulties during the application of the lithic analysis strategy for large cutting tools described in Chapter 5 for the Broom Pits data. Due to photograph resolutions and the nature of the raw material (predominantly chert as opposed to flint) it was sometimes difficult to make out the flake scars on the bifaces under study. However, it was deemed that the sample size of 975 LCTs (table 6.5) was large enough that the broad trends within the data would still be evident despite difficulties with individual pieces.

		Completeness					
		Unbroken		Broken		**Total**	
LCT Type	Handaxe	894	*91.7%*	63	*6.5%*	**957**	***98.2%***
	Cleaver	18	*1.8%*	0	*.0%*	**18**	***1.8%***
	Total	**912**	***93.5%***	**63**	***6.5%***	**975**	***100.0%***

Table 6.5: Showing the relationship between LCT type and artefact completeness for the site of Broom Pits.

In regards to raw material, figure 6.11 shows that there are a range of raw materials found within the Broom Pits assemblage, chert (a common raw material found within the Axe valley - Wessex Archaeology 1993: 160-161), flint, and intriguingly one LCT was knapped from Quartz which was possibly brought into the Axe Valley from elsewhere, displaying a behavioural trait of curation and a degree of forward planning.

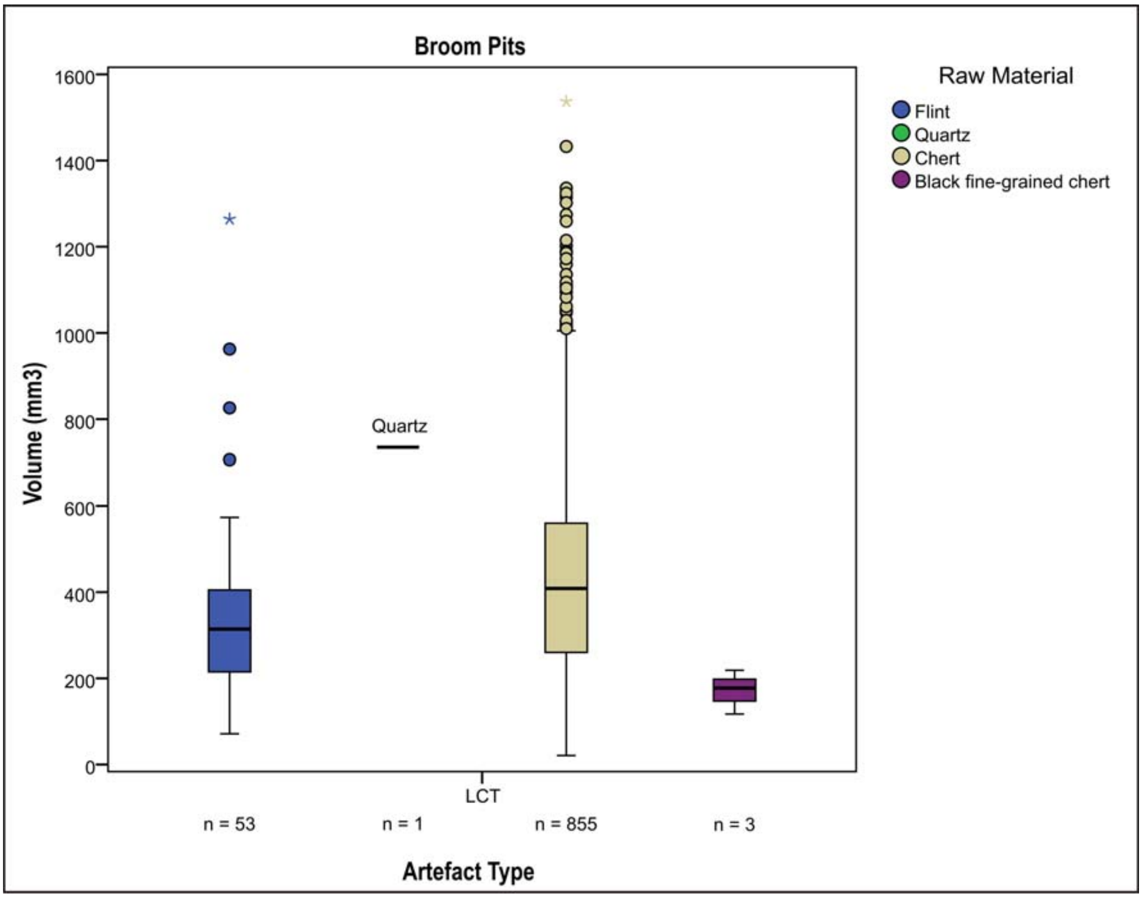


Figure 6.11: Showing the relationship between raw material type and artefact type and volume from the Broom Pits. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.11 illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of artefact sizes present within the Broom Pits assemblage. Flint artefacts appear to be reduced to a greater extent than the chert LCTs, and the single Quartz LCT may appears to have not been reduced to any great extent however, the fact that there is only one quartz artefact within the assemblage makes it unclear how significant this relationship truly is. In addition, given the small range in volume for the black fine-grained chert LCTs seen figure 6.11, this may suggest that the black fine-grained chert nodules were available on smaller nodules than the more common chert and flint nodules, or just reduced to a greater extent than other raw material types.

Creffield Road: Acton – The Sturge / Brown Collection

The site of Creffield Road, Acton, London (figure 6.1), is a Levallois site located on gravels correspondent to the Lynch Hill gravels (McNabb 2007: 197). The main collector of artefacts for the Creffield Road area was a John Allen Brown (1887; Wymer 1991; Scott 2010), who discovered a number of Levallois artefacts from a series of pits (1-4) at the corner of Green Lane and Creffield Road next to St Barnards vicarage. The sediments from the pits comprised of a fluvial gravel overlain by brickearth and contorted gravels, with the fluvial gravel interrupted by three artefact bearing black seams (that Brown believed to represent Palaeo-landsurfaces - figure 6.12) (Bazely *et al* 1991; White *et al* 2006). The uppermost black seam contained the greatest accumulation of artefacts on the surface of the gravel immediately below the brickearth (Brown 1887: 55 – 61 cited in White *et al* 2006: 528) (figure 6.12).

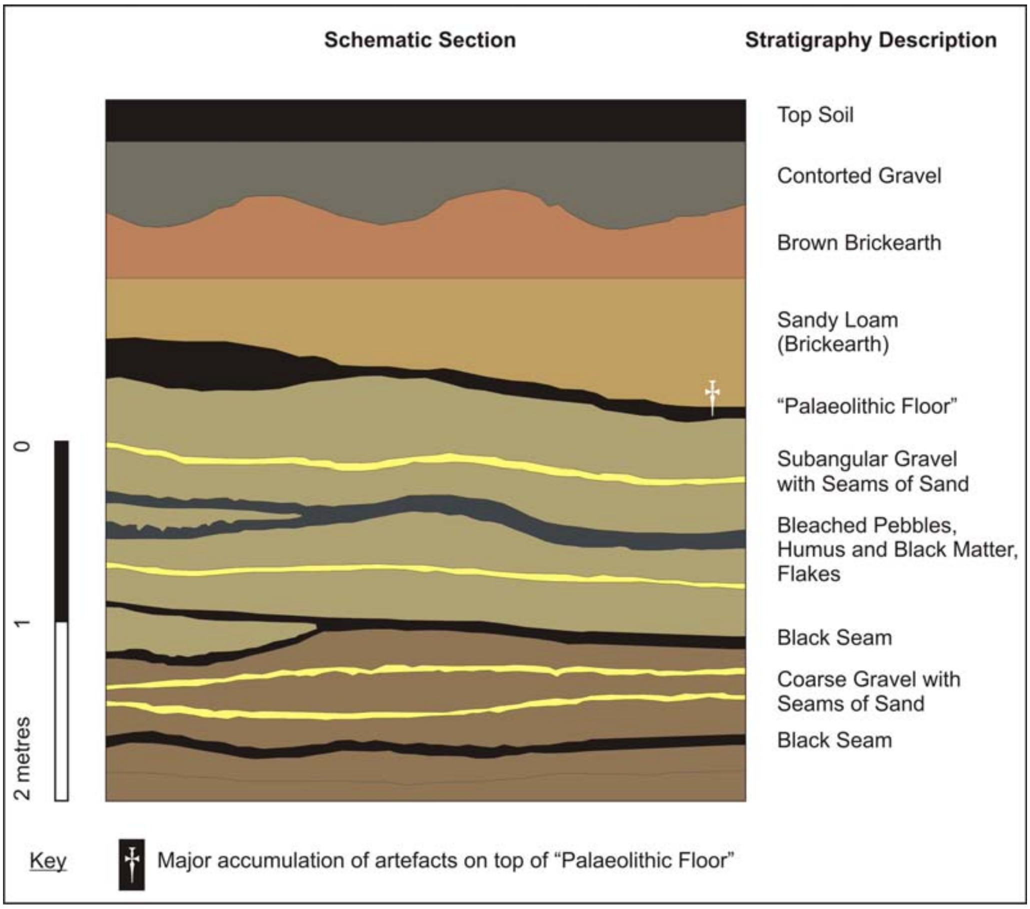


Figure 6.12: Schematic Section showing the deposits and main archaeological horizons of the Lynch Hill formation at Creffield Road. Diagram after Brown 1887 illustrated in White *et al* 2006: 528, Figure 3.

Brown also carried out investigations from other locations along both sides (north and south) of Creffield Road (Scott 2010) such as the Haberdashers' Aske Girls School site on Creffield Road between 1899 and 1901 (Bazely *et al* 1991; Scott 2010). This was investigated again through later excavations of the London and Middlesex Archaeological Society directed by G de G Sieveking in 1974 – 5 (Bazely *et al* 1991) and by the Museum of London's Department of Greater London Archaeology in 1988 (Bazely *et al* 1991) (figure 6.13).

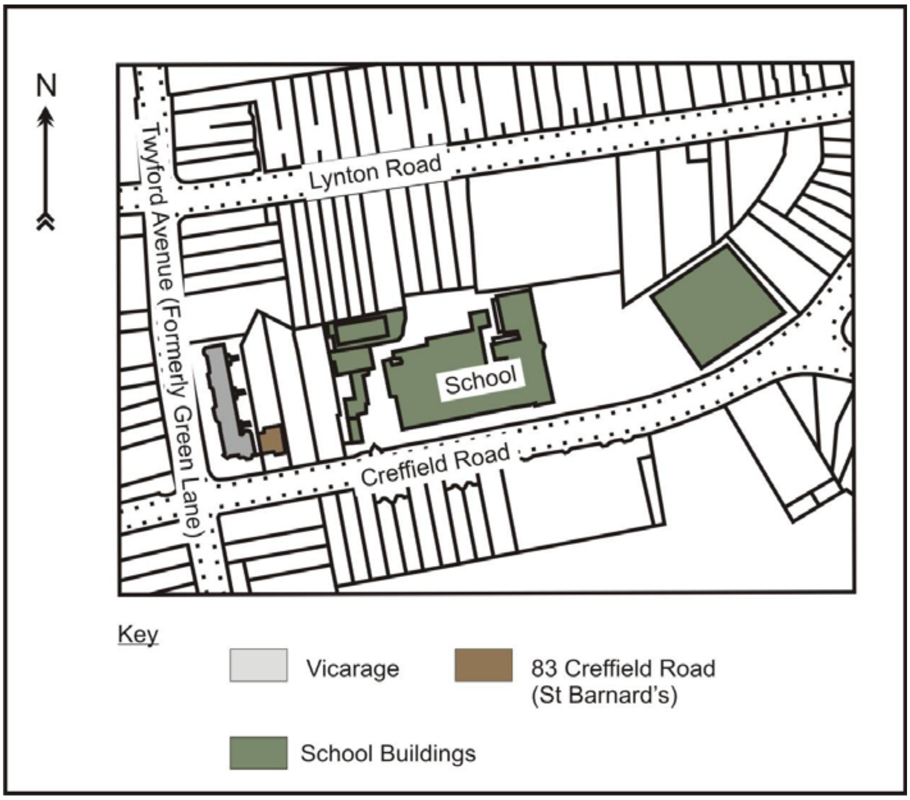


Figure 6.13: Relative locations of St. Barnard's and School Sites on Creffield Road. Based on OS County Series 1:2500 1854-1949: 2nd Revision 1906-1939.

The results of the School excavations, although interesting in their own right do not bear a direct relevance to the context of this thesis because, the largest collection of Levallois artefacts from Creffield Road still fall within the original Brown St Barnards excavations (Brown 1887; White *et al* 2006; Scott 2010). Brown's Creffield Road collection passed to George Lawrence on the advent of Brown's death who subsequently sold it to Sturge in its entirety and it is currently held by the British Museum (Scott 2010). Despite Brown's careful recording and labelling of artefacts, only the artefacts labelled Green Lane and Pit 3 can be securely relocated and therefore provenanced with any degree of certainty to the Palaeo-floor (Scott *pers. comm.* - figure 6.12), and the artefacts examined and recorded for this thesis consist of all the artefacts labelled Green Lane and Pit 3 from the Sturge / Brown collection held at the British Museum, totalling 209 artefacts dated to early MIS 7 (Scott 2010) (table 6.6).

		Site Subdivision								
		Green Lane			Pit 3			Total		
		Completeness			Completeness			Completeness		
		Unbroken	Broken	**Total**	Unbroken	Broken	**Total**	Unbroken	Broken	**Total**
Artefact Type	Flake	32	38	**70**	49	70	**119**	81	108	**189**
	Flake tool	7	1	**8**	3	1	**4**	10	2	**12**
	Core	1	0	**1**	7	0	**7**	8	0	**8**
	Total	**40**	**39**	**79**	**59**	**71**	**130**	**99**	**110**	**209**

Table 6.6: Showing the number of artefacts, their completeness and provenance for Creffield Road.

The condition of the artefacts as noted in Appendix 2 as lightly abraded or fresh would further suggest that there was minimal post depositional movement and that all artefacts examined belonged to the same assemblage. The current interpretation for the Creffield Road site follows the view that the site may represent a hunting stand or a so called ‘tooling up’ location where hunters came to repair equipment by bringing in previously curated and exhausted cores and end products, discarding them at Creffield Road where they were replaced by separate cores prepared on the spot and then taken away (White *et al* 2006; McNabb 2007: 198; Scott 2010). Based on the detailed lithic analysis in Appendix 2 (page 394) such an interpretation is agreed with and shall be followed here.

In regards to raw material, flint was the only raw material present within the artefacts of the Creffield Road (figure 6.14).

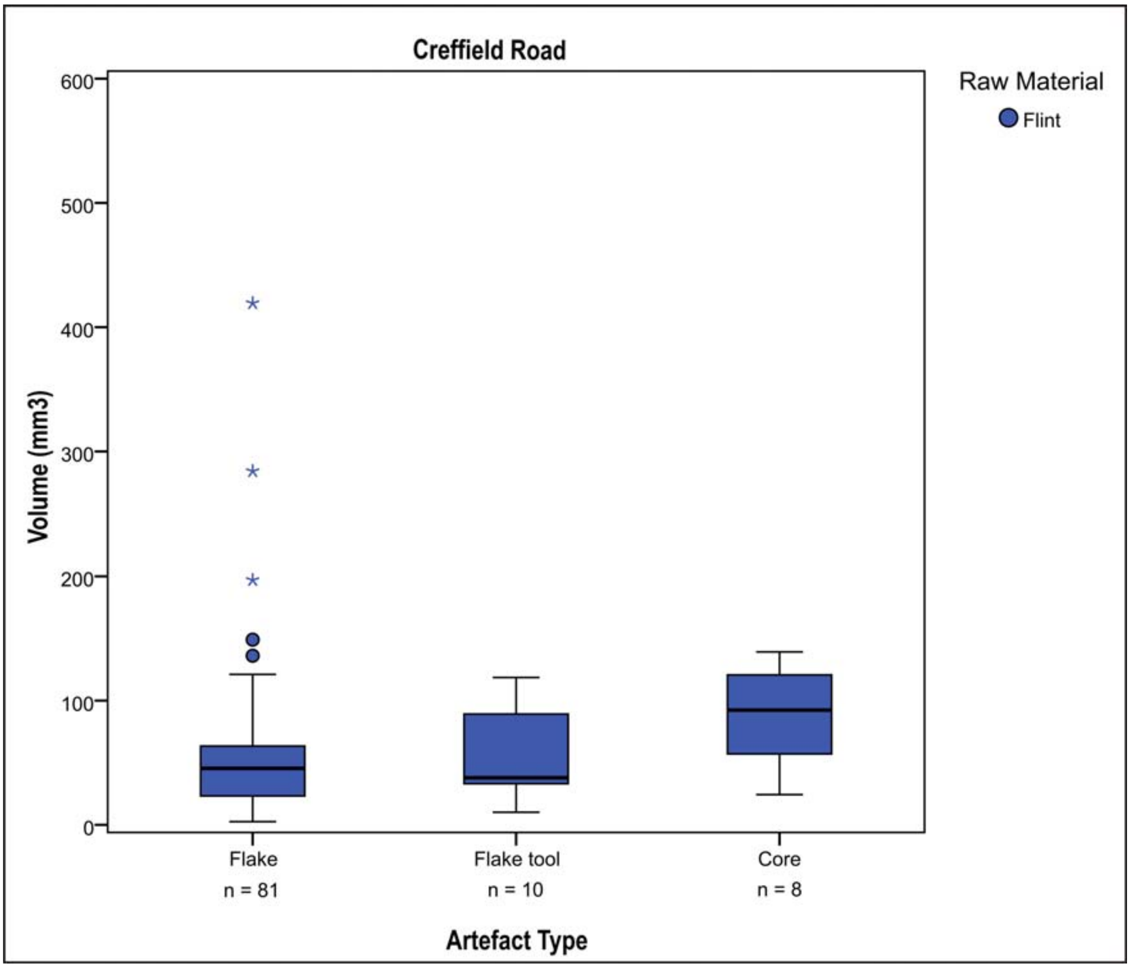


Figure 6.14: Showing the relationship between raw material type and artefact type and volume from Creffield Road. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.14 illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of artefact sizes present within the Creffield Road assemblage. Furthermore, within the context of the site, time period and assemblage composition, it is thought that previously curated cores near to exhaustion were brought into the area with used end-products and discarded to be replaced by cores prepared on the spot (White *et al* 2006). However, the total excavation area was relatively small and the vagaries of collection and taphonomy are not understood sufficiently to make a more solid inference on raw material exploitation at Creffield Road (White *et al* 2006).

Pontnewydd Cave

The site of Pontnewydd Cave is located in northern Wales approximately ten kilometres south of the coastal town of Rhyl, 90 metres above sea level, in the Elwy Valley (Green

1984). Pontnewydd Cave has been excavated on and off between 1978 – 1995 (figure 6.15), where a plethora of lithic artefacts and hominin remains (teeth) were discovered(Green 1984; Aldhouse-Green 1995; Aldhouse-Green 1998; McNabb 2007: 210) with the artefact layers now securely provenanced to MIS-7 or 225,000 years BP (Before Present) (Aldhouse-Green 1995; McNabb 2007: 210).

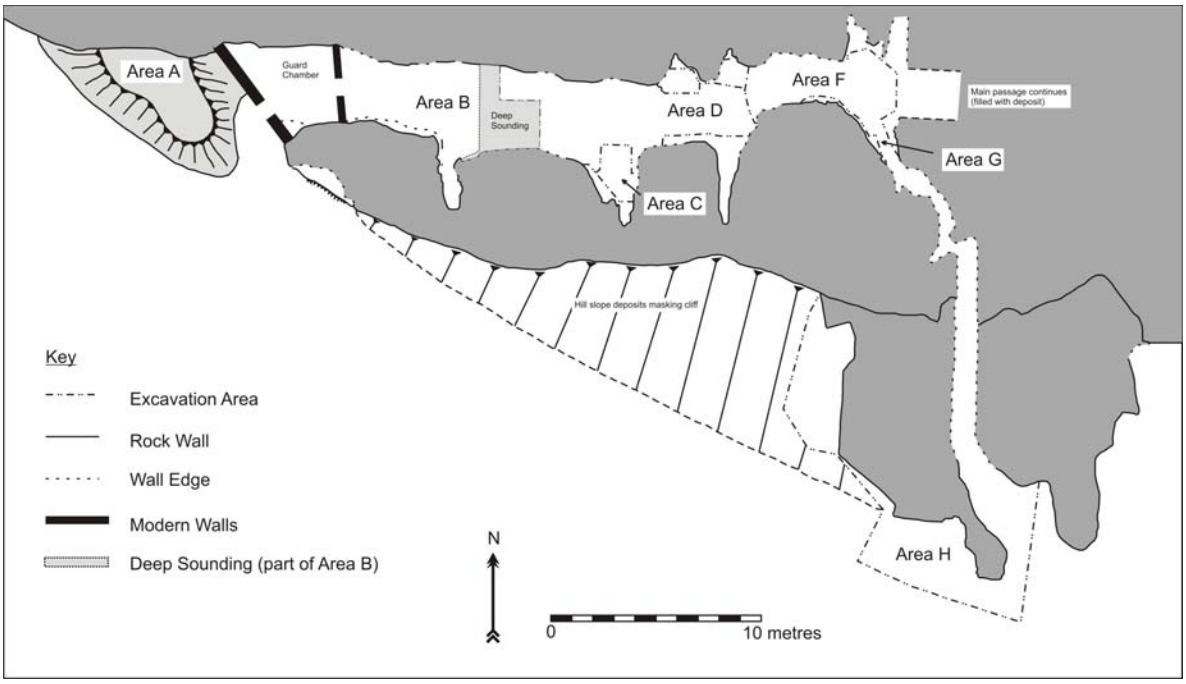


Figure 6.15: Cave plan of Pontnewydd Excavations 1978 – 1995, showing the areas where lithic artefacts were recovered. Based on Green 1984: 16 - 18 Figure 1.6 and Figure 1.7; Aldhouse-Green 1995: 39, Figure 2 and Walker *pers comm*.

The cave itself was not occupied, but the debris from tool making, and the tools themselves were washed into the cave through holes in the roof to be incorporated into the cave sediments particularly the Intermediate Complex and the overlying Lower Breccia in the Main Cave (Aldhouse-Green 1998; McNabb 2007: 210 – 211). Excavations between 1987 and 1995 revealed a New Entrance which produced artefacts held within a Limestone Scree unit emplaced by debris flow action dated to between 214,000 and 179,000 years BP suggesting a possible second later occupation for the cave site (Aldhouse-Green 1998; McNabb 2007: 211). It should be noted at this point that Pontnewydd Cave was also excavated by Professor Boyd Dawkins and colleagues in 1870 (1874: 286 – 287 cited in Green 1984: 12) when they found no lithic artefacts, but did find faunal remains. However, Boyd Dawkins and colleagues left no plan or section drawings of their work making the extent of their original investigation impossible to judge. In 1940 Pontnewydd Cave was used as a munitions store where the guard chamber was constructed (figure 6.15), the floor levelled and covered with gravel and duck boards and a dump of material associated with the levelling was deposited outside the old entrance to the cave (Green 1984: 19). The importance of these two uncontrolled excavations within Pontnewydd Cave became relevant during the 1978 excavations, where it was discovered that the Boyd Dawkins spoil heap was located directly underneath the World War II spoil heap, with both sets of spoil containing Palaeolithic artefacts (Green 1984: 12).

One of the most interesting aspects to the Pontnewydd Cave assemblage is the tremendous range of raw material that has been exploited (McNabb 2007: 211). Flint is present only in very small quantities and all artefacts in this raw material are small and worked almost to exhaustion (McNabb 2007:211; personal observation). The most common raw material are rocks of volcanic origin with Levallois artefacts occurring throughout the common range of raw materials, implying that imposition of deliberate and shape and form were not limited to raw material types, but prevalent in the minds of the knappers (McNabb 2007: 211). There is a range of conditions present within the artefacts with the majority being abraded or lightly abraded with a small minority of fresh artefacts (see Appendix 2). This is not surprising given the palimpsestual nature of the context of deposition and reinforces the appropriateness of the scale of analysis conducted here as taking the Pontnewydd Cave assemblage as an example of a broad MIS 7 marker of hominin behaviour.

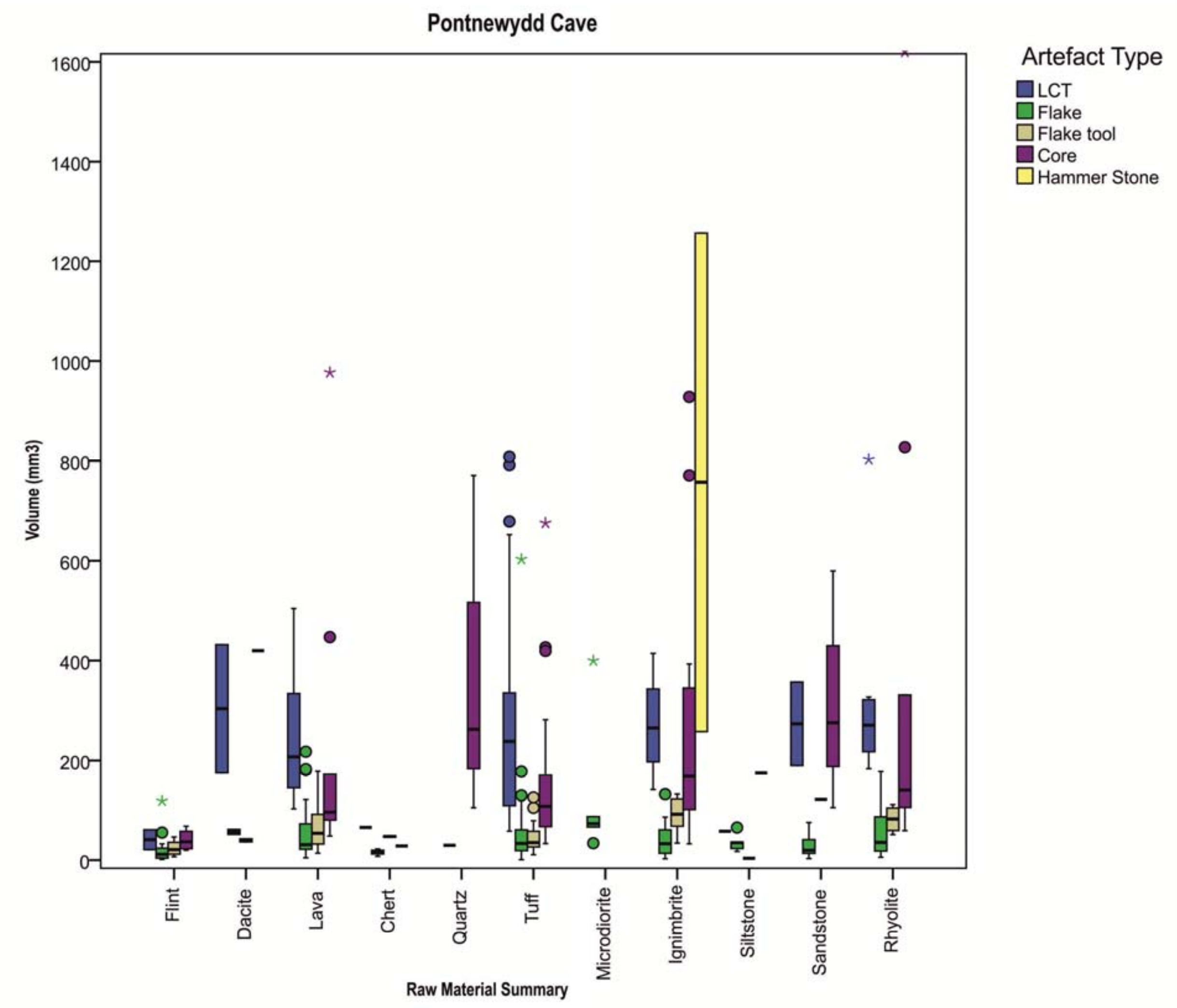
For the purposes of this thesis, a total of 619 artefacts (table 6.7) were examined and recorded from the Pontnewydd assemblage held at the National Museum of Wales in Cardiff.

		Site Sub-dividsion							
		Site A	Site B	Site C	Site D	Site F	Site G	Site H	**Total**
Artefact Type	LCT	22	6	6	25	13	0	10	**82**
	Flake	57	25	14	77	78	2	118	**371**
	Flake tool	10	11	4	28	6	0	12	**71**
	Core	18	9	6	25	10	0	21	**89**
	Unclear	0	0	0	3	1	0	0	**4**
	Hammer Stone	0	0	0	0	2	0	0	**2**
	Total	**107**	**51**	**30**	**158**	**110**	**2**	**161**	**619**

Table 6.7: Showing the relationship between artefact type and excavated site sub-division for Pontnewydd Cave.

Debitage flakes were not included within this study for reasons previously explained. The assemblage has been divided up into seven discreet components based upon their area of excavation (figure 6.15). All artefacts (except debitage pieces) from the areas of controlled excavation - Areas B, C, D, F, G and H - were examined and recorded, whilst due to time constraints, a representative sample of circa 50% of the artefacts (excluding debitage pieces) found within Area A (corresponding to the Boyd Dawkins and WWII spoil heaps) were recorded. Due to the palimpsest nature of the Pontnewydd assemblage it is impossible to tease out the majority of separate occupation sequences. However, there was a differentiation in LCT condition and Levallois artefacts from the New Entrance and the original assemblage (Scott *pers. comm.*; personal observation), which may hint at a series of site occupations within a broad MIS period. Given the palimpsest that constitutes the majority of the Pontnewydd assemblage and the scale of the analysis undertaken within this thesis, it is acceptable to treat the artefacts as a broadly contemporaneous assemblage from MIS 7.

In terms of raw material, figure 6.16 shows that there are a range of raw materials found within the Pontnewydd Cave assemblage. Figure 6.16 (although see Chapter 7 and Appendix 2 for more a detailed and artefact category specific raw material analyses) illustrates that within the large range of raw materials present at Pontnewydd Cave, raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of artefact sizes present across a range of raw material types. The only exception to this would be the greatly reduced sizes of flint and chert artefacts which could reflect that initial nodule sizes were smaller in comparison to other raw material types, but may more likely reflect that hominins favoured the versatile knapping nature inherent within flint and chert in comparison to other available raw material types. The greatly reduced pattern to the flint and chert artefacts may additionally reflect the possibility that flint and chert were in short supply at the site, so subsequently reduced to a higher degree than other, more abundant raw materials.



		Raw Material Summary																						
		Flint		Dacite		Lava		Chert		Quartz		Tuff		Microdiorite		Ignimbrite		Siltstone		Sandstone		Rhyolite		Total	
Pontnewydd Cave	LCT	2	.5%	2	.5%	11	2.6%	1	.2%	0	.0%	22	5.2%	0	.0%	8	1.9%	1	.2%	2	.5%	8	1.9%	57	13.4%
	Flake	19	4.5%	2	.5%	41	9.7%	3	.7%	1	.2%	102	24.1%	5	1.2%	29	6.8%	5	1.2%	11	2.6%	22	5.2%	240	56.6%
	Flake tool	4	.9%	2	.5%	12	2.8%	2	.5%	0	.0%	21	5.0%	0	.0%	8	1.9%	1	.2%	1	.2%	4	.9%	55	13.0%
	Core	4	.9%	1	.2%	9	2.1%	1	.2%	3	.7%	22	5.2%	0	.0%	14	3.3%	1	.2%	5	1.2%	10	2.4%	70	16.5%
	Hammer Stone	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	2	.5%	0	.0%	0	.0%	0	.0%	2	.5%
	Total	29	6.8%	7	1.7%	73	17.2%	7	1.7%	4	.9%	167	39.4%	5	1.2%	61	14.4%	8	1.9%	19	4.5%	44	10.4%	424	100.0%

Figure 6.16: Showing the relationship between raw material type and artefact type and volume from the Pontnewydd Cave.

- Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000.
- Raw material types shown here have been grouped for ease of reference. For example, all Tuff types (such as Tuff, Rhyolitic Tuff, Crystal Tuff, Silicic Tuff and Fine Silicic Tuff) have been grouped under the single heading ‘Tuff’, the same applies to the ‘Lava’ and ‘Chert’ headings. Also excluded from this graph were raw materials with one artefact (Pumice, Limestone, Mudstone, Feldspar Porphyry, Baked Shale, Burnt flint) and two artefacts (Quartzite, Basalt, Andesite). See Appendix 2: tables A2.59 (page 415), A2.70 (page 430) and figure A2.41 (page 446) for a full list of raw materials in relation to artefact types.
- Table numbers reference the number of unbroken artefacts.

At this point I must direct further attention to the raw material analysis found in Appendix 2 where it is shown that all artefact types are produced on a wide range of raw materials found within the cave. This would suggest that although some fine grained raw materials such as chert and flint may be generally more conducive to knapping, the hominins exploiting the environs around Pontnewydd Cave in MIS 7 were versatile enough in their knapping strategies to apply the same techniques and *chaîne opératoires* to a range of raw materials. Based on this premise, I believe it is acceptable to continue the data analysis of the Pontnewydd Cave assemblage with a view that although minor raw material constraints may be evident within the data at a small scale, the versatility of the knapping strategies of the hominins under study would suggest that any constraints were short lived and negotiated through the use of more conducive raw materials. Indeed this would fit with Green's (1981) interpretation of the site as being a transitory settlement where local raw materials were manipulated for *ad hoc* toolkits. Therefore I shall continue the data analysis in the main body of this thesis for Pontnewydd Cave under the premise that raw material constraints played a relatively minor role in defining hominin behaviour from this site.

Cuxton – The Tester Collection

The site of Cuxton is located in the Medway Valley in Kent (figure 6.1) and has been the focus of three main excavations (Tester 1965; Cruse *et al* 1987; Wenban-Smith 2004) (figure 6.17), all producing a wealth of artefactual material.

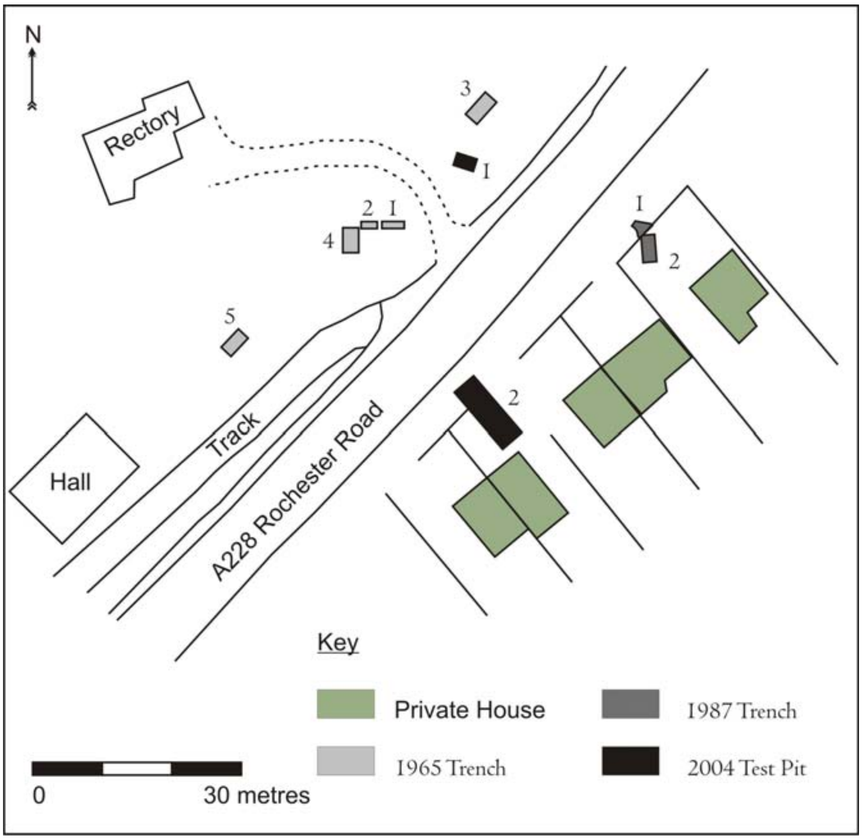


Figure 6.17: Showing the location of the archaeological investigations at Cuxton. Diagram after Wenban-Smith 2004: 13, Figure 1.

The site of Cuxton rectory first came to prominence in the early 1960s with excavations conducted by Tester (1965) (figure 6.17) who excavated five trenches revealing the presence of a thin body of fluvial gravel overlying a chalk terrace located within the rectory grounds adjacent to the A228. This gravel proved to be extremely rich in artefacts with over 200 bifaces being recorded (Tester 1965; Wenban-Smith 2004). The original dating of the Cuxton site was done on primarily typological considerations by Tester who concluded that the site was contemporary with the Middle Gravels at Swanscombe (now dated to MIS-11 – Stringer and Hublin 1999) completely ignoring the large difference in elevation between the two sites, and the lack of ficrons and cleavers (common at Cuxton) at Swanscombe (Wenban-Smith 2004).

The second stage of work took place in the 1980s on the opposite side of the A228 (figure 6.17 - Cruse *et al* 1987) where a deeper sequence of fluvial sands and gravels were found overlying chalk bedrock. During this second investigation, the lower beds contained flakes, cores and flake-tools, whilst the upper beds contained handaxes and far fewer flake-tools and cores and were all deemed similar to those found by Tester and taken as a continuation of the deposits seen at the Rectory site (Cruse *et al* 1987; Wenban-Smith 2004). However, this investigation did little to clarify the dating problems for the site with a thermoluminescence (TL) date of the loam capping the fluvial deposits coming out at 100,000 years BP (Cruse *et al* 1987). A lithological analysis assigned the fluvial deposits as being laid down by the Medway and correlating to the Binney Gravel on the Hoo (then) dated to 45,000 years BP (Cruse *et al* 1987; Wenban-Smith 2004). Such a date for this assemblage does however seem very unlikely as the third set of investigations (below) exemplify.

The third investigation into the Cuxton assemblages took place in 2004 by Francis Wenban-Smith as part of the Aggregates Levy *Medway Valley Palaeolithic Project* (figure 6.17 - Wenban-Smith 2004). Two test pits were dug during two days of investigation, Test Pit One being located near to Tester's (1965) Trench Three, and Test Pit Two at 21 Rochester Road directly opposite the Rectory (Wenban Smith 2004a). Nothing was found in Test Pit One, but Test Pit Two revealed two extraordinary bifaces, a giant ficron and a giant cleaver, and an additional twenty odd handaxes discussed in detail elsewhere (Wenban-Smith 2004). Crucially for this discussion, Wenban-Smith took an Optically Stimulated Luminescence (OSL) date from the second test pit resulting in a date for the Cuxton assemblage of 200 – 230,000 years BP or MIS-7 (Wenban-Smith *et al* 2007 – figure 6.17).

For the purposes of this thesis, in order to limit sample size and to facilitate data collection, I have concentrated solely on the Tester Collection at Cuxton examining 730 artefacts (table 6.8) in total held by the British Museum. As a result of the artefact condition analysis shown in Appendix 2 where the majority of artefacts were lightly abraded or fresh with a small percentage of abraded, it is appropriate to scale the analysis of the data to using the Cuxton assemblage as an example of broadly MIS 7 hominin behaviour.

		Site Sub-dividsion								
		Spoil Heap	T.H.	TR 1	TR 2	TR 3	TR 4	TR 5	Unknown	**Total**
Artefact Type	LCT	0	1	52	62	7	121	1	1	**245**
	Flake	1	0	32	71	23	181	4	41	**353**
	Flake tool	0	0	2	4	5	37	3	3	**54**
	Debitage	0	0	1	3	1	9	0	33	**47**
	Core	0	0	8	2	4	11	3	2	**30**
	Unclear	0	0	0	0	1	0	0	0	**1**
	Total	**1**	**1**	**95**	**142**	**41**	**359**	**11**	**80**	**730**

Table 6.8: Showing the relationship between artefact type and site sub-division for Cuxton.

In regards to raw material, flint was the only raw material present within the artefacts of the Cuxton Tester Collection (figure 6.18).

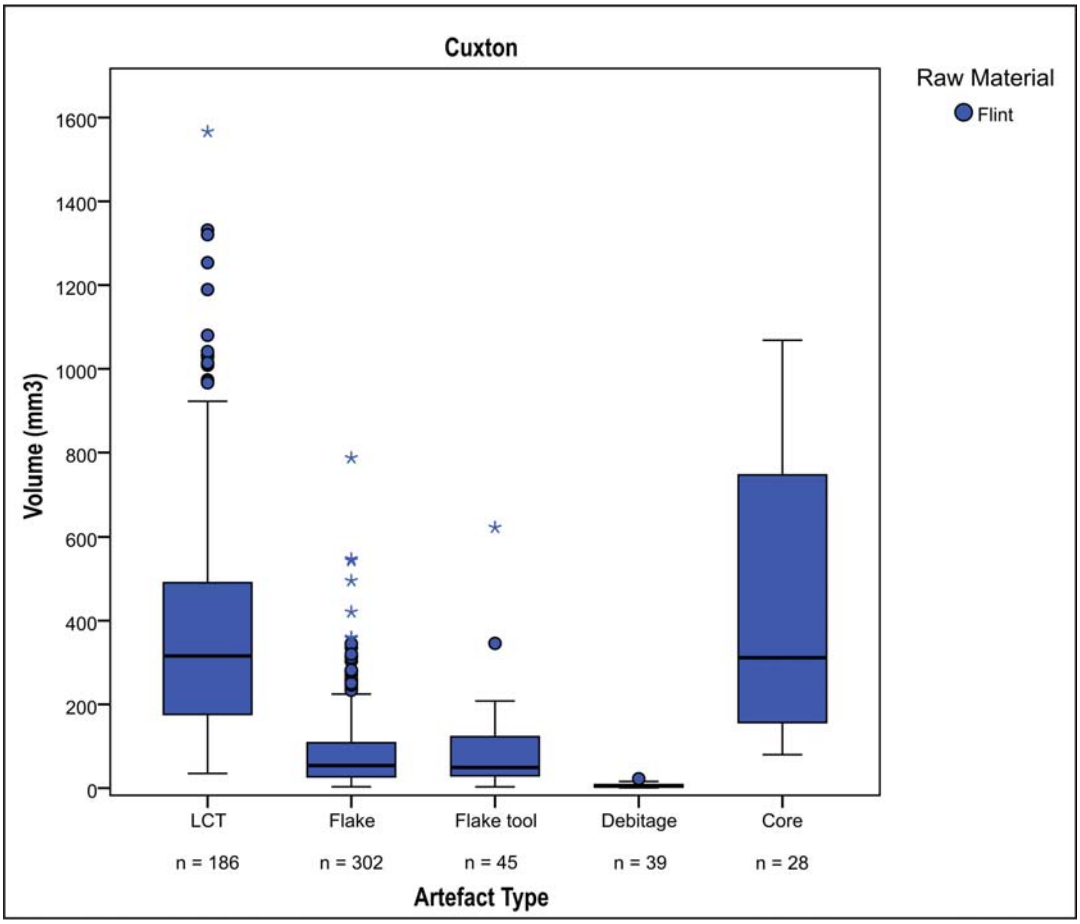


Figure 6.18: Showing the relationship between raw material type and artefact type and volume from Cuxton. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.18 illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of artefact sizes present within the Cuxton Tester Collection assemblage. However, original nodule shape may play a role in determining the final LCT form as demonstrated by Shaw and White (2003) where the large narrow LCTs from Cuxton were found to be worked on elongated burrow flint nodules. However, it is still the opinion of the author that given the range of shaping extent witnessed on the Cuxton LCT's that even if original nodule form bounded the initial LCT blank morphology (Shaw and White 2003), the hominins were versatile enough in their knapping strategies to work the nodules in such a way as to fulfil the functional requirements of the artefact (see Chapter 7 and 8). Furthermore, the skilful working and reduction of the giant Cuxton handaxes (Wenban-Smith 2004) would seem to indicate that the hominins had a versatile knapping ability to impose particular forms upon LCT manufacture irrespective of any constraints that may have been imposed by original nodule morphology. Therefore the discussions relating to LCT morphology and manufacture in Chapters 7 and 8 shall proceed with this premise in mind.

Lynford Quarry

The site of Lynford Quarry located near Mundford, Norfolk (figure 6.1), represents a rare example of an open-air Middle Palaeolithic site possibly marking the initial appearance of Neanderthals in Britain at the end of MIS-4 and the beginning of MIS-3 (Boismier *et al* 2003). The site consists of a segment of a major palaeochannel filled with organic deposits, *in situ* mammoth remains and associated lithic tools and debitage excavated by the Norfolk Archaeological Trust (Boismier *et al* 2003).

The stratigraphy of the site can be divided up into three main sections: firstly, bedrock and lower deposits consisting of gravel and fluvial sand filled features dated by OSL to 83,000 ± 8000 years BP (Boismier *et al* 2003). Secondly, main palaeochannel deposits consisting of a thin bed of light grey brown sandy clay with gravel inclusions overlain by a thin bed of brown silty sand overlain again by a 'patchy' deposit of soft greenish-brown clayey silt with inclusions of white sand and gravel all deposited in standing or gently flowing water conditions (Boismier *et al* 2003). On top of these deposits was a wedge shaped bed of coarse pale grey sand with plentiful inclusions of medium to coarse gravel, probably as a result of mass movement such as a debris or mudflow of material slumping down the sides of channel (Boismier *et al* 2003).

The slumped deposits were in turn overlain by an organic sediment deposit that formed the major component of the channel fill and contained the majority of artefactual and faunal material from the site (Boismier *et al* 2003). A further erosive event left an eroded undulating surface consisting of coarse sand and gravel across the top of the organic layer as a result of a lag formed by high-energy fluvial events within the palaeochannel, overlain by a final depositional sequence of laminated sand and organic sediments deposited under still or gently flowing water condition (Boismier *et al* 2003). Two of the deposits for the main palaeochannel were dated through OSL and produced dates of 64,000 ± 5000 years BP and 67,000 ± 5000 years BP respectively (Boismier *et al* 2003). Thirdly, the upper deposits consist of a flood deposit of channel fill beds comprised of sand, gravel and silt with a later channel cut consisting of gravel, sand and organic beds deposited under low energy moving water conditions OSL dated to 55,000 ± 4000 years BP (Boismier *et al* 2003).

Amongst the plethora of faunal remains found at Lynford, the large mammals represented were woolly mammoth, woolly rhinoceros, reindeer, horse, bison, wolf, red or arctic fox and brown bear. Coupled with the palaeo-environmental evidence collected from the site, it has been suggested that at the time of hominin occupation, Lynford was a cool, open grassland site surrounded by the channel in an oxbow lake environment (Boismier *et al* 2003). Most of the artefacts from the site are in a lightly abraded and fresh condition however, there is a high instance of edge damage often mimicking retouch (Boismier *et al* 2003) and confirmed through my own observations. Despite the slumping occurring around the depositional context of the artefacts from Lynford, the lack of abrasion and the presence of microdebitage suggests that the assemblage was largely *in situ* or at least close to *in situ* with minimal post-depositional interference (Boismier *et al* 2003). The edge damage on the artefacts would suggest some post-depositional disturbance probably caused by deposit compaction, trampling by large animals or debris flows being the main possible proponents for this damage pattern (Boismier *et al* 2003).

A total of 427 artefacts consisting mostly of flakes, handaxes, cores and a relatively small number of retouch tools were examined from the site (table 6.9).

		Artefact Type					
		LCT	Flake	Flake tool	Core	Hammer Stone	**Total**
Completeness	Unbroken	51	190	23	8	1	**273**
	Broken	4	143	7	0	0	**154**
	Total	**55**	**333**	**30**	**8**	**1**	**427**

Table 6.9: Showing the relationship between artefact completeness and artefact type for Lynford.

No debitage or micro-debitage flakes were included within this study for reasons previously stated. In regards to raw material, flint was the only raw material present within the artefacts of the Lynford assemblage, with the exception of a supposed single Quartzite hammer stone (figure 6.19).

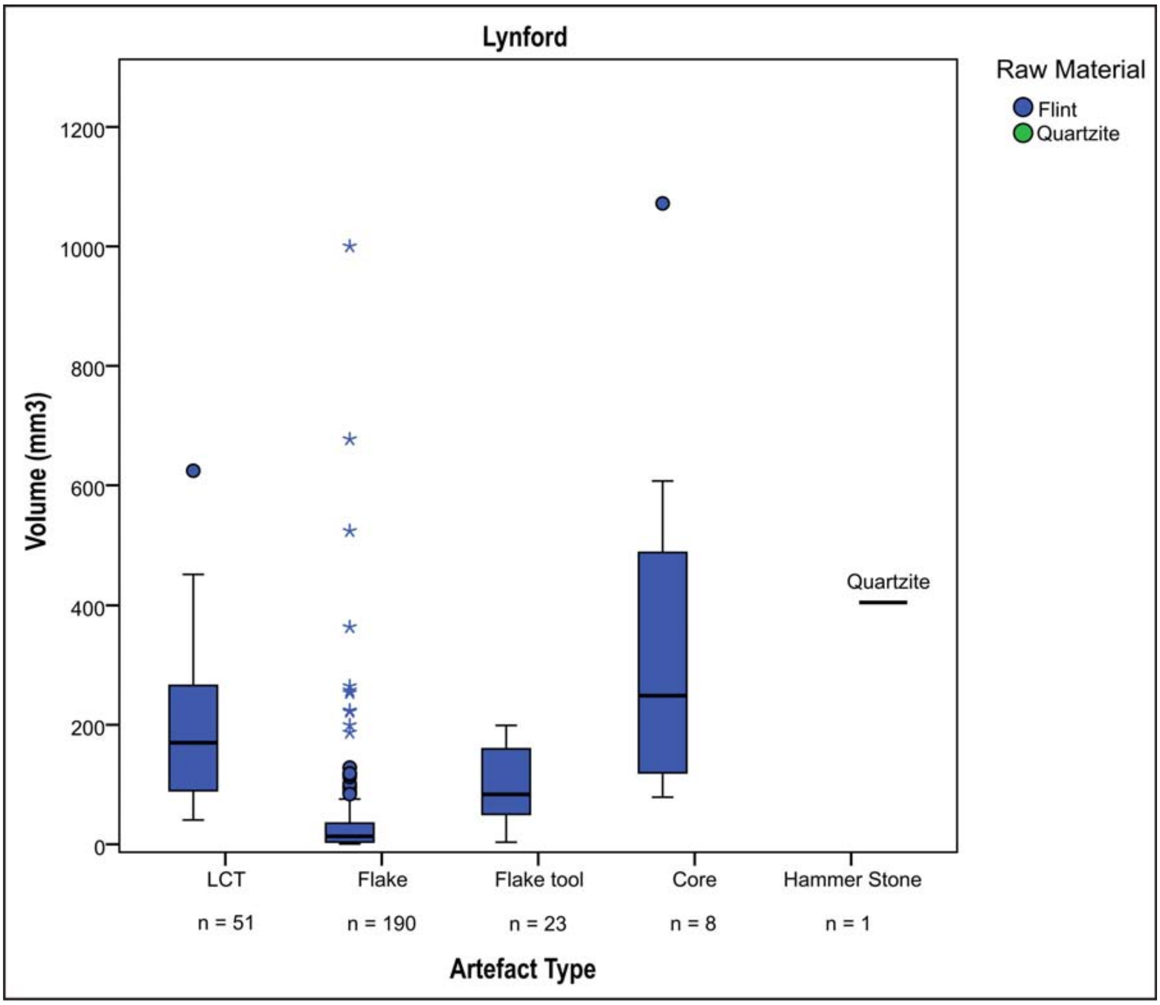


Figure 6.19: Showing the relationship between raw material type and artefact type and volume from Lynford. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.19 illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of artefact sizes present within the Lynford assemblage.

Africa and the Middle East

Below I shall describe two further sites included within the analysis for this thesis, the Cave of Hearths from South Africa, and Et Tabun from Israel. The reason for the inclusion of these two non-British Lower and Middle Palaeolithic sites within the data set presented here are to serve as two external control or reference sites in relation to patterns seen within the British data set. The Cave of Hearths was chosen as an Acheulean or material culture category 2 comparative site in order to preliminarily ascertain whether general hominin behavioural trends seen within the British Lower Palaeolithic LCT data were present elsewhere. Similarly Et Tabun was chosen as a comparative site because Et Tabun offers an almost uninterrupted occupational sequence from +330,000 – 260,000 years before present. Within the Et Tabun data are a category 2 assemblage, a category 2 / 3 assemblage and a category 3 assemblage. Such a data set from a single site will provide a useful heuristic in order to establish whether any continuities may run between the two material culture category types, and the site provides a further comparative source when examining hominin behavioural trends for the British Lower and Middle Palaeolithic.

Cave of Hearths

The Cave of Hearths is located near Mokopane (formerly Potgietersrus) in the Limpopo Province (formerly Northern Province or Transvaal) of the Republic of South Africa (McNabb *et al* 2004; McNabb and Sinclair 2009; figure 6.3). Located on a southern slope of the Mwaridzi valley, the Cave of Hearths is a multi-period occupation site yielding archaeological evidence spanning the Early Stone Age (ESA), Middle Stone Age (MSA), Later Stone Age (LSA) and Iron Age (McNabb *et al* 2004; McNabb and Sinclair 2009). For the context of this thesis, it is the ESA that is of interest. I will limit the analysis to the large cutting tools (226 in total, data courtesy of Dr J. McNabb). For detailed histories of the Cave of Hearths site see McNabb *et al* (2004), and especially McNabb and Sinclair (2009). A brief summary follows.

The Cave of Hearths was first discovered in 1937 by Van Riet Lowe with a first phase of archaeological work being carried out between 1947 and 1949 by Guy Gardner and James Kitchen (McNabb *et al* 2004). Hominin remains were found at the site during this time from Bed 3 and attributed to *H. rhodesiensis* (Tobias 1971), and contentiously reattributed to *H. sapiens* with a small number of archaic features dated to +600, 000 years (Curnoe 2009). However such an early date seems unlikely, and it is currently impossible to tell exactly how old the mandible really is (McNabb *et al* 2009). A second phase of work began in 1953 – 1954 under the direction of Revil Mason in which the long cultural sequences from the ESA to the Iron Age were revealed (McNabb *et al* 2004). During these investigations, the ESA Acheulean levels were divided into three beds with Bed 1 being the oldest and Bed 3 the youngest, each bed being separated by dark ash-like sediments interpreted as hearth debris (Mason 1988; McNabb *et al* 2004) although recent studies now suggest that the presence of hearth layers between Beds 1 and 2 may no longer be the case (Herries and Latham 2009). One of the most hotly debated topics concerning the Cave of Hearths is the dating of the ESA beds, with Mason assigning them to between 250,000 (Bed 1) and 200,000 years BP (Bed 3) (Mason 1988; McNabb *et al* 2004) with recent studies placing the ESA Beds between 600,000 and 400,000 years BP (McNabb *et al* 2009).

The 226 LCTs (table 6.10) examined within this case study are not confined to a particular Bed, yet seem to be an accumulation over time, and as such represents a range of hominin behavioural variation present over a prolonged period (McNabb 2009: 75).

		LCT Type							
		Handaxe		Cleaver		Unclear		**Total**	
Completeness	Unbroken	70	*31.0%*	141	*62.4%*	12	*5.3%*	**223**	***98.7%***
	Broken	2	*.9%*	1	*.4%*	0	*.0%*	**3**	***1.3%***
	Total	**72**	***31.9%***	**142**	***62.8%***	**12**	***5.3%***	**226**	***100.0%***

Table 6.10: Showing the relationship between LCT type and artefact completeness for the Cave of Hearths.

However, the sample is still comparable to other British sites as a firm Acheulean assemblage with no evidence of prepared core technology present at the Cave of

Hearths (McNabb 2009). In regards to raw material, the raw material present at the Cave of Hearths were simply classified as Quartzite or Non-Quartzite (figure 6.20).

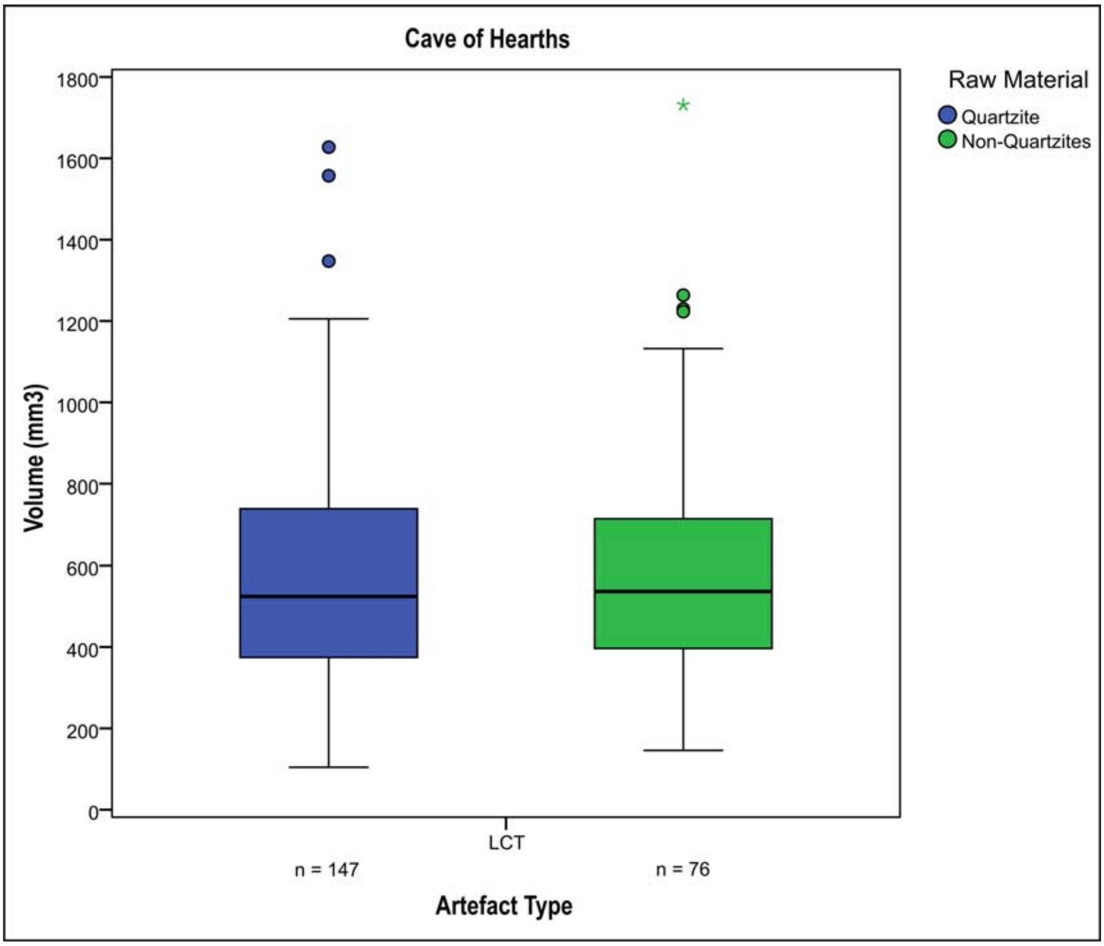


Figure 6.20: Showing the relationship between raw material type and artefact type and volume from the Cave of Hearths. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. n = number of unbroken artefacts.

Figure 6.20 illustrates that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of artefact sizes present within the Cave of Hearths assemblage, a conclusion first stated by McNabb *et al* (2004) and McNabb (2009). Furthermore, both raw material types were locally available, although Quartzite appears to have been the most common raw material (McNabb 2009).

Et Tabun Cave (Layers D – F)

Et Tabun Cave is located approximately twenty kilometres south of Haifa in Israel (figure 6.2). The cave entrance is forty-five metres above the current sea-level facing northwest, overlooking the Mediterranean coastal plain. Et Tabun Cave is recognised as having the longest stratigraphic sequence of its kind in the Levant, stretching from the Lower Palaeolithic through to historic times (Albert *et al* 1999) and is one of the major reference sections for the lithic industries of the Lower and Middle Palaeolithic Levant (Rink *et al* 2004). Archaeological investigations at Et Tabun Cave began in 1929 -1934 conducted by Dorothy Garrod (Garrod and Bate 1937) and were continued by Jelinek from 1967 – 1972 (Jelinek *et al* 1973; Jelinek 1975, 1981). During Garrod's excavations a detailed stratigraphic sequence was uncovered within which seven distinct horizons were defined as Layers A – G (Garrod and Bate 1937: 6-27; Marshall *et al* 2002). Of particular interest within the context of this thesis are Layers D – F. Layer D has been assigned to the Levantine Mousterian (Middle Palaeolithic – Rink *et al* 2004) whilst layer Ea has been assigned to the Amudian, Eb, Ec and Ed to the Acheulo-Yabrudian and F to the Upper Acheulean (Gisis and Ronen 2006) (table 6.11).

Elevation in metres	Layer	Cultural Assignment	Date (kyr)
- 5.00	D	Mousterian	270 - 263
	Ea	Amudian	330 - 306
- 6.00	Eb	Acheulo - Yabrudian	
- 7.00	Ec		
- 8.00	Ed		
- 9.00			
- 10.00			
- 11.00	F	Upper Acheulean	+ 330
- 12.00			
- 13.00			
- 14.00			

Table 6.11: Showing the stratigraphy of Layers D – F from Et Tabun. kyr = thousands of years. Table based on Gisis and Ronen 2006: 140, Table 1 - (c) Equinox Publishing Ltd 2006 - and dates from Mercier *et al* 1995: 501, Table 2.

The dating of Tabun has been mired in contradiction and confusion for many years and the absolute dates for the site are still uncertain (Garrod and Bate 1937; Jelinek 1982; Jelinek 1990; Mercier *et al* 1995; Bar-Yosef 1998; Valladas *et al* 1998; Albert *et al* 1999; Rink *et al* 2004; Gisis and Ronen 2006). However, a recent electron spin resonance (ESR) date from the bottom of layer Ed (387^{+49}_{-36} 000 years ago - Rink *et al* 2004) seems to forge an agreement with previous thermoluminescence (TL) dates (Mercier *et al* 1995) suggesting that layers Ed – Ea date from 330 – 306,000 years BP and layer D from 270 – 263,000 years BP. Layer F must consequently have a date of +330,000 years BP. The artefacts studied from Et Tabun for this thesis therefore span a time depth lasting from late MIS-10 to late MIS-7 (figure 6.4) allowing for an interesting comparison to be made between the British Lower Palaeolithic and the corresponding sequence in the Levant.

For the purposes of this thesis I examined artefacts collected by Garrod and held by the Cambridge Museum of Archaeology and Anthropology, and the British Museum. I began my data collection by looking at the handaxes associated with Layers Ea, Eb, Ec, Ed and F held by the Cambridge Museum of Archaeology and Anthropology (190 in total) and made publicly available via the Marshall *et al* (2002) database. In addition I examined all artefacts from Layers D, Ea and F, however, due to time constraints, only a representative sample from layers Eb, Ec and Ed were assessed from the Cambridge Museum of Archaeology and Anthropology making 818 artefacts in total. Further to this I examined and recorded all the artefacts (registered and unregistered) from layers D, Ea, Eb, Ec, Ed and F held by the British Museum (1899 in total) making a grand total of 2892 artefacts examined for the site of Et Tabun. Within the sample of 2892 artefacts, a number were labelled as originating from terraces (D, E, Ea, Eb, Ec, Ed), as these artefacts were not able to be confidently related to the artefacts excavated from the cave layers (labelled either as the context of origin such as D, Ea etc or with the prefix T.) Due to the uncertain contextual relationship to the cave layers I did not include them within this lithic analysis, making the total number of artefacts analysed 2761 (table 6.12).

		Artefact Type						
		LCT	Flake	Flake tool	Core	Hammer Stone	Core tool	**Total**
Context	D	5	1	91	14	0	1	**112**
	Ea	95	3	246	7	1	0	**352**
	Eb	68	11	358	33	2	1	**473**
	Ec	18	1	123	6	0	1	**149**
	Ed	53	1	218	11	0	4	**287**
	F	12	1	95	7	0	0	**115**
	T.D	1	0	0	0	0	0	**1**
	T.Ea	21	4	90	2	0	1	**118**
	T.Eb	113	2	195	16	1	3	**330**
	T.Ec	18	0	57	9	0	0	**84**
	T.Ed	180	2	351	35	0	0	**568**
	T.F	79	2	60	30	0	1	**172**
	Total	**663**	**28**	**1884**	**170**	**4**	**12**	**2761**

Table 6.12: Showing the relationship between context and artefact type for Et Tabun.

I shall interrogate the artefacts from Et Tabun along the dating lines, rather than typological: Layer F (+330,000 years BP); Layers Ed, Ec, Eb, Ea (330 – 306,000 years BP) and Layer D (270 – 263,000 years BP). Unfortunately, Garrod did not preserve all the artefacts excavated (some 45,000), and distributed those kept amongst the many different institutions which had supported her work. Therefore, the sample examined here offers an extremely biased and limited glimpse of the overall total amount excavated.

In regards to raw material, figures 6.21 – 6.23 illustrate a range of raw material types found within the three primary site divisions at Et Tabun.

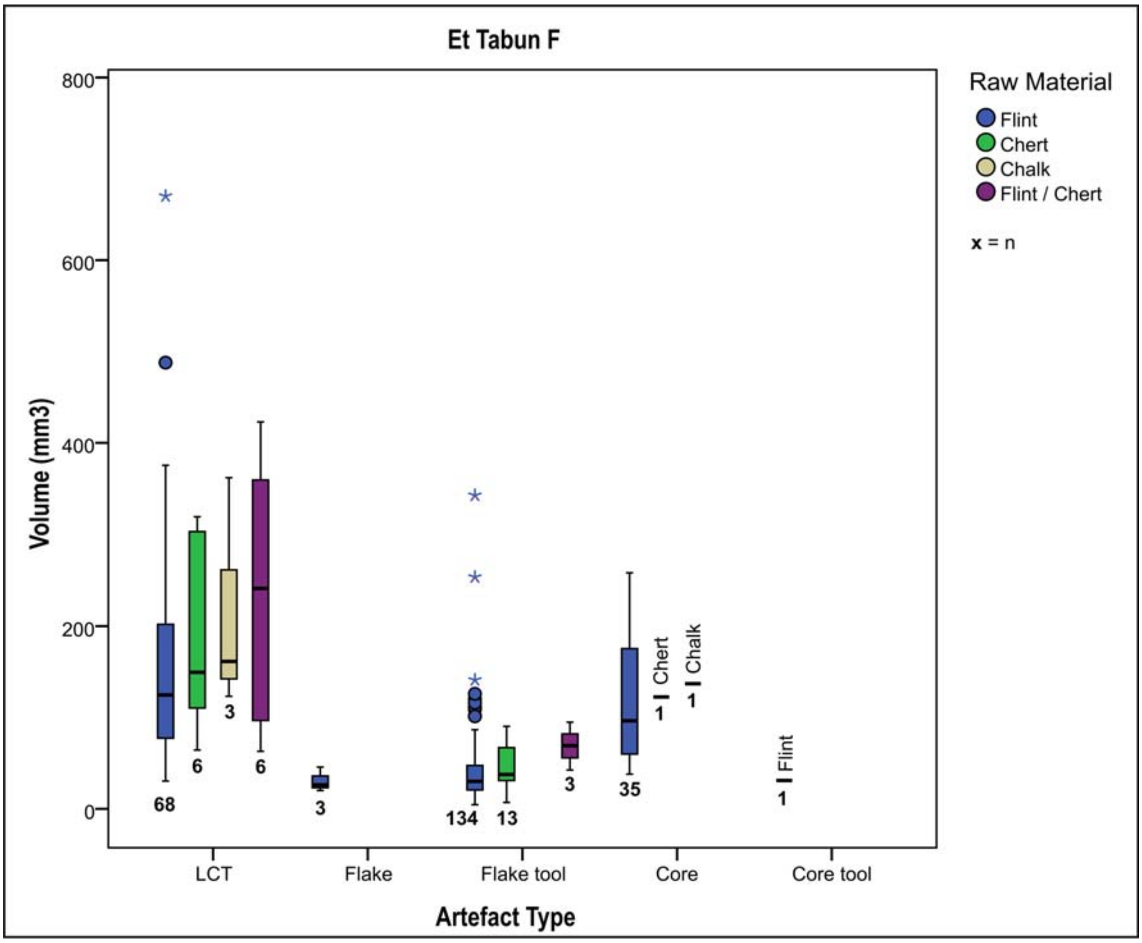


Figure 6.21: Showing the relationship between raw material type and artefact type and volume from the Et Tabun Layer F assemblage. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. **n** = number of unbroken artefacts.

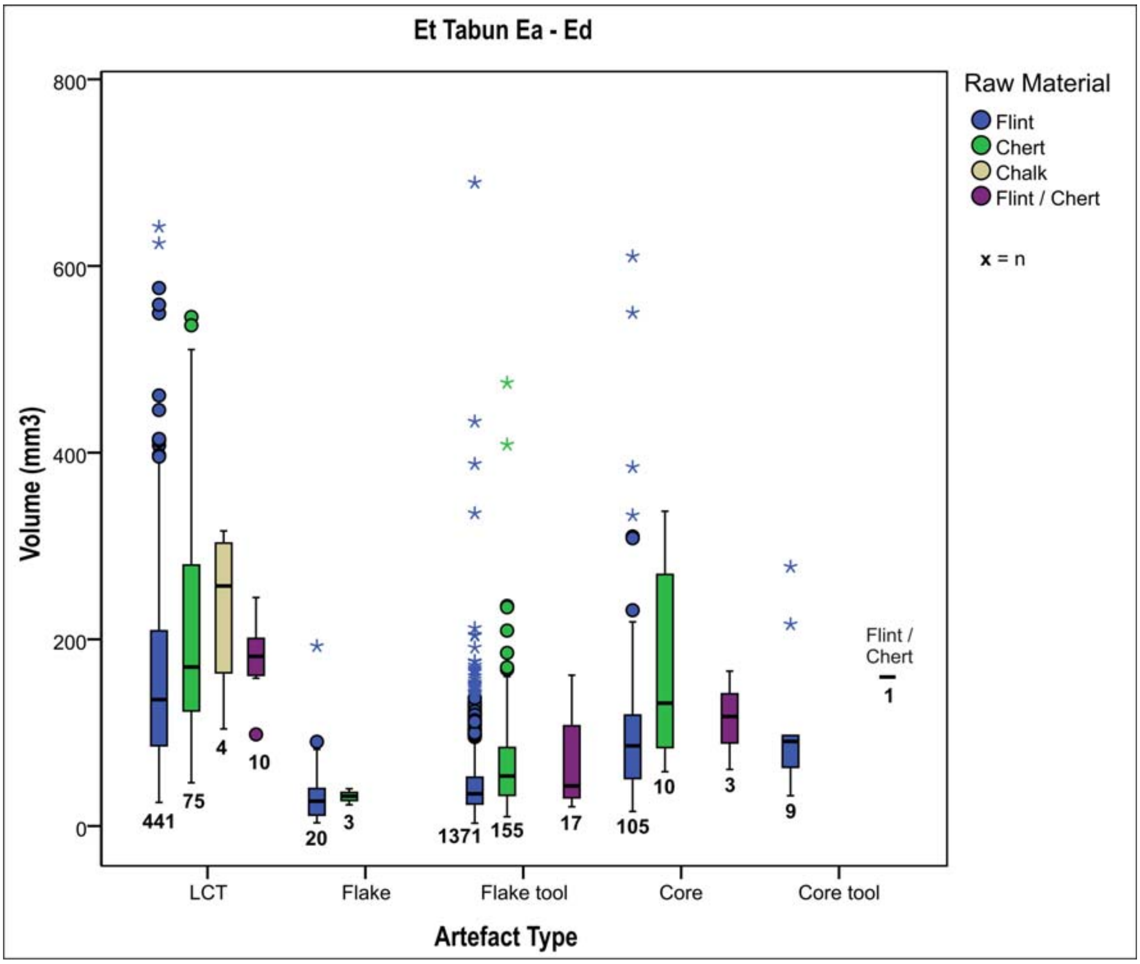


Figure 6.22: Showing the relationship between raw material type and artefact type and volume from the Et Tabun Layer Ea-Ed assemblage. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. **n** = number of unbroken artefacts.

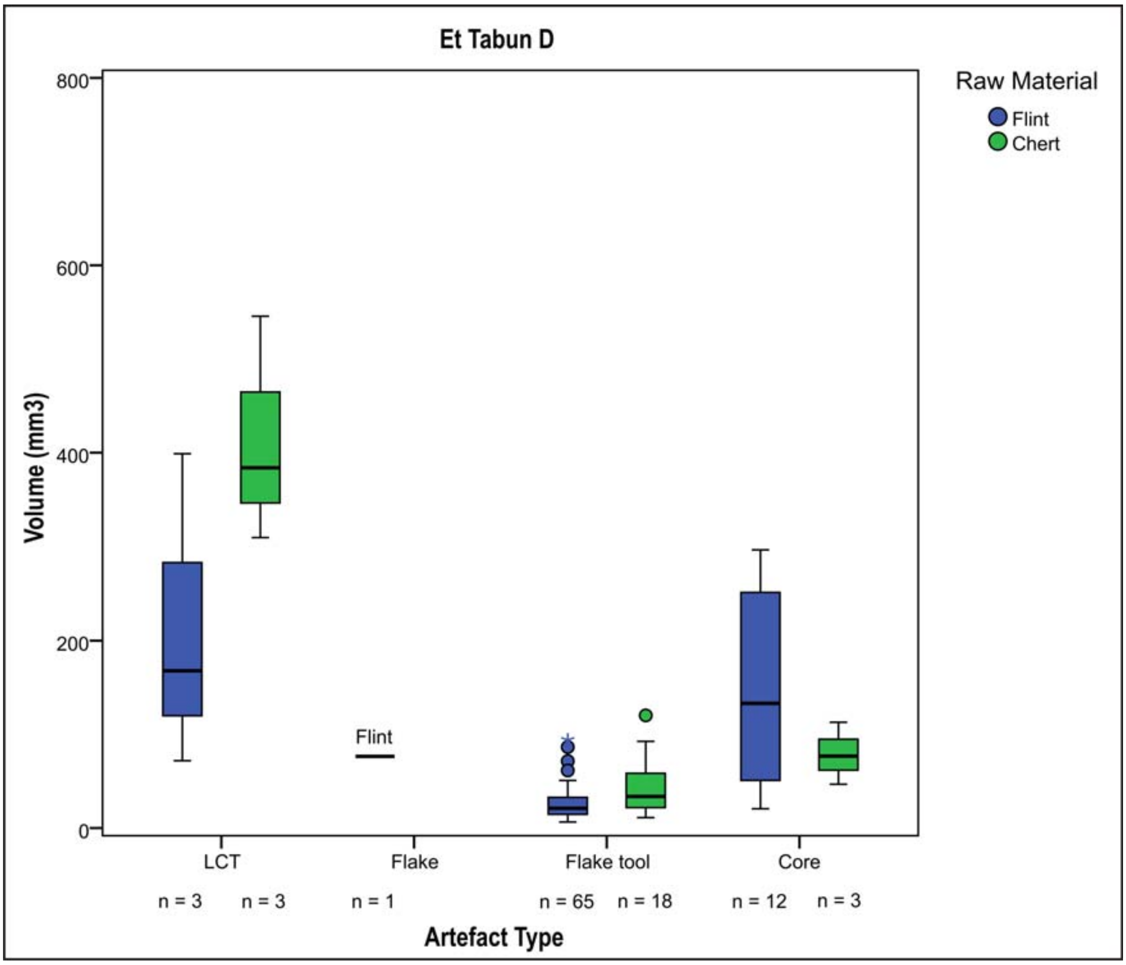


Figure 6.23: Showing the relationship between raw material type and artefact type and volume from the Et Tabun Layer D assemblage. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. **n** = number of unbroken artefacts.

Figures 6.21 – 6.23 show that raw material did not appear to affect artefact production (if volume is accepted as a proxy for overall artefact size) given the wide range of artefact sizes present within all of the Et Tabun assemblages across a range of artefact types. There is however a general trend for flint artefacts to be reduced to a greater extent than the other raw materials present, and Et Tabun layer D displays a greatly reduced range in raw material and artefact size range, although this may be an artifice of a smaller sample size when compared to the other Et Tabun layers.

6.2 Site Assemblage Overview

As mentioned previously during the site histories above, a detailed site by site lithic analysis may be found in Appendix 2 and a synopsis in Chapter 7, what follows within this section is a brief site assemblage overview as an overall précis for the individual site assemblage tables presented above with the aim of clarifying final artefact counts used in the lithic analysis for each of the sites.

The artefact totals, type and distribution in relation to site can be seen in table 6.13.

		Site											
		High Lodge	Warren Hill	Elveden	Hoxne Upper Industry	Broom Pits	Creffield Road	Pontnewydd Cave	Cuxton	Lynford	Cave of Hearths	Et Tabun	**Total**
Artefact Type	LCT	16	582	58	30	975	0	82	245	55	226	663	**2932**
	Flake	1289	0	0	1185	0	189	371	353	333	0	28	**3748**
	Flake tool	115	0	0	184	0	12	71	54	30	0	1884	**2350**
	Debitage	67	0	0	153	0	0	0	47	0	0	0	**267**
	Core	126	0	0	16	0	8	89	30	8	0	171	**448**
	Unclear	0	0	0	0	0	0	4	1	0	0	0	**5**
	Hammer Stone	2	0	0	3	0	0	2	0	1	0	4	**12**
	Core tool	0	0	0	12	0	0	0	0	0	0	11	**23**
	Total	**1615**	**582**	**58**	**1583**	**975**	**209**	**619**	**730**	**427**	**226**	**2761**	**9785**

Table 6.13: Showing the artefact totals in relation to artefact type and site.

Table 6.13 shows that a total of 9785 artefacts were examined during the data collection process for this thesis following the methodology laid out in Chapter 5. Table 6.14 shows the relationship between artefact type and completeness for the sites understudy for this thesis.

		Artefact Type								
		LCT	Flake	Flake tool	Debitage	Core	Unclear	Hammer Stone	Core tool	**Total**
High Lodge	Unbroken	15	1093	105	30	121	0	2	0	**1366**
	Broken	1	196	10	37	5	0	0	0	**249**
	Total	**16**	**1289**	**115**	**67**	**126**	**0**	**2**	**0**	**1615**
Warren Hill	Unbroken	548	0	0	0	0	0	0	0	**548**
	Broken	34	0	0	0	0	0	0	0	**34**
	Total	**582**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**582**
Elveden	Unbroken	44	0	0	0	0	0	0	0	**44**
	Broken	14	0	0	0	0	0	0	0	**14**
	Total	**58**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**58**
Hoxne Upper Industry	Unbroken	24	986	171	115	15	0	2	12	**1325**
	Broken	6	199	13	38	1	0	1	0	**258**
	Total	**30**	**1185**	**184**	**153**	**16**	**0**	**3**	**12**	**1583**
Broom Pits	Unbroken	912	0	0	0	0	0	0	0	**912**
	Broken	63	0	0	0	0	0	0	0	**63**
	Total	**975**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**975**
Creffield Road	Unbroken	0	81	10	0	8	0	0	0	**99**
	Broken	0	108	2	0	0	0	0	0	**110**
	Total	**0**	**189**	**12**	**0**	**8**	**0**	**0**	**0**	**209**
Pontnewydd Cave	Unbroken	58	245	55	0	76	4	2	0	**440**
	Broken	24	126	16	0	13	0	0	0	**179**
	Total	**82**	**371**	**71**	**0**	**89**	**4**	**2**	**0**	**619**
Cuxton	Unbroken	186	302	45	39	28	1	0	0	**601**
	Broken	59	51	9	8	2	0	0	0	**129**
	Total	**245**	**353**	**54**	**47**	**30**	**1**	**0**	**0**	**730**
Lynford	Unbroken	51	190	23	0	8	0	1	0	**273**
	Broken	4	143	7	0	0	0	0	0	**154**
	Total	**55**	**333**	**30**	**0**	**8**	**0**	**1**	**0**	**427**
Cave of Hearths	Unbroken	223	0	0	0	0	0	0	0	**223**
	Broken	3	0	0	0	0	0	0	0	**3**
	Total	**226**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**226**
Et Tabun	Unbroken	619	27	1772	0	170	0	4	11	**2603**
	Broken	44	1	112	0	1	0	0	0	**158**
	Total	**663**	**28**	**1884**	**0**	**171**	**0**	**4**	**11**	**2761**
Total	Unbroken	2680	2924	2181	184	426	5	11	23	**8434**
	Broken	252	824	169	83	22	0	1	0	**1351**
	Total	**2932**	**3748**	**2350**	**267**	**448**	**5**	**12**	**23**	**9785**

Table 6.14: Showing the relationship between artefact type and artefact completeness and site.

In order to remain consistent throughout my data collection and in accordance with the methodology discussed in Chapter 5, all broken and unclear artefacts are noted for presence only and therefore not included throughout the rest of this analysis, making the number of artefacts analysed from all the sites combined, 8429.

Table 6.15 below shows the relationship between artefact type and condition. Fresh artefacts are those that had clear and sharp arêtes between flake scars indicating little to no post-depositional movement. Lightly abraded artefacts displayed a slight rounding of the arêtes between flake scars which indicate a minor degree of post-depositional movement, whilst abraded artefacts had extremely rounded arêtes between flake scars indicating a large degree of post depositional movement.

Appendix 2 shows in greater detail the breakdown of artefact type and condition by specific context on a site by site basis however, table 6.15 below serves as a general overview of the assemblage conditions for the sites examined for this thesis. In regards to artefact condition, it is worth stating here that given the broad scope of this thesis in identifying large species based behavioural trends, artefact condition did not affect the overall assemblage analysis for each site in terms dividing sites with varying artefact conditions into separate assemblages (such as would be required if a more in-depth and site specific analysis were conducted on Warren Hill, High Lodge, Elveden and Pontnewydd). Rather, all the unbroken artefacts from each site were grouped and analysed as single broadly contemporaneous assemblages (see individual site histories above and Appendix 2 for further details and justifications) based on the MIS time scale of analysis.

		Artefact Type							
		LCT	Flake	Flake tool	Debitage	Core	Hammer Stone	Core tool	**Total**
High Lodge	Abraded	4	36	8	2	2	0	0	52
	Fresh	5	906	72	27	97	0	0	1107
	Lightly Abraded	6	151	25	1	22	2	0	207
	Total	**15**	**1093**	**105**	**30**	**121**	**2**	**0**	**1366**
Warren Hill	Abraded	2	0	0	0	0	0	0	2
	Fresh	179	0	0	0	0	0	0	179
	Lightly Abraded	367	0	0	0	0	0	0	367
	Total	**548**	**0**	**0**	**0**	**0**	**0**	**0**	**548**
Elveden	Abraded	0	0	0	0	0	0	0	0
	Fresh	24	0	0	0	0	0	0	24
	Lightly Abraded	20	0	0	0	0	0	0	20
	Total	**44**	**0**	**0**	**0**	**0**	**0**	**0**	**44**
Hoxne Upper Industry	Abraded	0	30	2	4	2	0	0	38
	Fresh	20	659	136	79	5	2	8	909
	Lightly Abraded	4	297	33	32	8	0	4	378
	Total	**24**	**986**	**171**	**115**	**15**	**2**	**12**	**1325**
Broom Pits	Abraded	62	0	0	0	0	0	0	62
	Fresh	0	0	0	0	0	0	0	0
	Lightly Abraded	850	0	0	0	0	0	0	850
	Total	**912**	**0**	**0**	**0**	**0**	**0**	**0**	**912**
Creffield Road	Abraded	0	0	0	0	0	0	0	0
	Fresh	0	20	4	0	4	0	0	28
	Lightly Abraded	0	61	6	0	4	0	0	71
	Total	**0**	**81**	**10**	**0**	**8**	**0**	**0**	**99**
Pontnewydd Cave	Abraded	39	128	22	0	46	0	0	235
	Fresh	2	20	5	0	3	0	0	30
	Lightly Abraded	17	97	28	0	27	2	0	171
	Total	**58**	**245**	**55**	**0**	**76**	**2**	**0**	**436**
Cuxton	Abraded	7	11	1	0	0	0	0	19
	Fresh	69	42	9	4	2	0	0	126
	Lightly Abraded	110	249	35	35	26	0	0	455
	Total	**186**	**302**	**45**	**39**	**28**	**0**	**0**	**600**
Lynford	Abraded	0	11	0	0	0	0	0	11
	Fresh	51	137	21	0	7	1	0	217
	Lightly Abraded	0	42	2	0	1	0	0	45
	Total	**51**	**190**	**23**	**0**	**8**	**1**	**0**	**273**
Cave of Hearths	Abraded	0	0	0	0	0	0	0	0
	Fresh	0	0	0	0	0	0	0	0
	Lightly Abraded	223	0	0	0	0	0	0	223
	Total	**223**	**0**	**0**	**0**	**0**	**0**	**0**	**223**
Et Tabun	Abraded	2	0	0	0	0	1	0	3
	Fresh	537	22	1544	0	144	1	8	2256
	Lightly Abraded	80	5	228	0	26	2	3	344
	Total	**619**	**27**	**1772**	**0**	**170**	**4**	**11**	**2603**
Total	Abraded	116	216	33	6	50	1	0	422
	Fresh	887	1806	1791	110	262	4	16	4876
	Lightly Abraded	1677	902	357	68	114	6	7	3131
	Total	**2680**	**2924**	**2181**	**184**	**426**	**11**	**23**	**8429**

Table 6.15: Showing the relationship between artefact type and artefact condition for all the sites.

6.3 Summary

Chapter 6 has been concerned with providing background information pertaining to each site assemblage studied within the scope of this thesis. The site histories set the perspective for each site assemblage in terms of discovery, relevant contextual information, and general assemblage composition. Within the background information for each site I also presented a brief raw material analysis. The majority of the British sites only had one raw material type (flint) present within their assemblages, which, based on the range of artefact sizes across a range of artefact types, raw material did not appear to adversely affect artefact production. Where a range of raw materials were present (Broom Pits, Pontnewydd Cave, Cave of Hearths and Et Tabun) there did not appear to be any adverse raw material constraints evident within the data sets given the wide range of artefact sizes across a range of artefact types and raw materials from each site. Therefore, within the broad scope of this thesis, it would appear that raw material did not seem to have adversely affected artefact production from any site assemblage studied.

In the following chapter I shall focus on the main points concerning artefact form imposition and changing patterns of hominin behaviour seen within the inter-site comparisons.

Chapter 7 - Lithic Analysis

Within this chapter I present a summary of the more detailed site by site lithic analysis presented in Appendix 2 conducted using the methodology described in Chapter 5. I shall concentrate on describing the results of the inter-site comparative lithic analysis by main artefact grouping: LCTs, flakes / flake tools, and cores. The inter-site assemblage comparisons shall focus on relating the results of the lithic analysis undertaken to answer the main research questions posed for each artefact grouping in Chapter 5 in regards to testing the predictions given in table 4.3 in relating the Identity Model to the archaeological record. Chapter 8 shall present the discussion of the results shown below in relation to the predictions of table 4.3.

7.1 Large Cutting Tools (LCT's)

The research questions posed of the LCT data in Chapter 5 were as follows:

- To what extent is there an imposition of standardisation in size within assemblages.
- To what extent is there a standardised imposition of form and shape through the presence of symmetry and tip shape.
- To what extent are standardised methods of artefact manufacture imposed on the LCTs under study through the degree of secondary or shaping flaking and edge working.
- Do the above criteria change in relation to time.

The answers to these questions will require an analysis of LCT artefact proportion, symmetry, tip shape and flaking patterns for the sites given in Chapter 6 through the methodology given in Chapter 5.

From table 6.19 above it can be seen that there are 2680 unbroken LCTs under examination. The first principle to be scrutinised in regards to imposed regularity on LCT manufacture is symmetry. The assumption being that a high degree of regularity in LCT appearance / symmetry reflects a standardisation in manufacture and form imposition, which in turn serves as a proxy for culturally agreed standards in material culture production (McNabb *et al* 2004; McNabb 2009). Table 7.1 below assesses the regularity of imposed form through symmetry and tip shape (following the McNabb *et al* (2004) methodology described in Chapter 5) upon the LCTs within a chronological frame work of oldest to youngest as per figure 6.4 (above).

		Symmetry by Eye									
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	Pdf[a]	Total
Cave of Hearths	Markedly Convergent	1.3%	2.2%	1.8%	.4%	.0%	3.1%	.4%	.9%	.0%	10.3%
N = 223	Convergent with a Square Tip	.9%	1.3%	1.8%	.0%	1.8%	6.7%	.0%	.4%	.0%	13.0%
	Convergent with an Oblique Tip	.0%	.0%	.0%	.4%	1.3%	1.3%	1.3%	.0%	.0%	4.5%
	Convergent with a Generalised Tip	.4%	1.3%	1.3%	.4%	.9%	14.8%	3.1%	.4%	.0%	22.9%
	Wide or Divergent	.4%	4.0%	2.7%	.4%	.0%	20.2%	1.8%	.0%	.0%	29.6%
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.9%	1.3%	8.5%	3.1%	.0%	.0%	13.9%
	Wide with Convex Tip	.0%	.0%	.9%	.4%	.4%	4.0%	.0%	.0%	.0%	5.8%
	Total	**3.1%**	**9.0%**	**8.5%**	**3.1%**	**5.8%**	**58.7%**	**9.9%**	**1.8%**	**.0%**	**100.0%**
High Lodge	Markedly Convergent	.0%	6.7%	6.7%	6.7%	.0%	.0%	.0%	.0%	.0%	20.0%
N = 15	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	.0%	6.7%	.0%	.0%	.0%	6.7%
	Convergent with a Generalised Tip	.0%	.0%	13.3%	20.0%	.0%	26.7%	.0%	.0%	.0%	60.0%
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	6.7%	.0%	.0%	.0%	6.7%
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	6.7%	.0%	.0%	.0%	.0%	.0%	6.7%
	Total	**.0%**	**6.7%**	**20.0%**	**33.3%**	**.0%**	**40.0%**	**.0%**	**.0%**	**.0%**	**100.0%**
Warren Hill	Markedly Convergent	.9%	2.2%	1.8%	.5%	.9%	4.4%	.7%	.9%	.2%	12.6%
N = 548	Convergent with a Square Tip	.5%	1.1%	.5%	.4%	.5%	3.3%	.0%	.2%	.0%	6.6%
	Convergent with an Oblique Tip	.0%	.0%	.2%	1.5%	.9%	4.2%	.5%	.0%	.0%	7.3%
	Convergent with a Generalised Tip	3.5%	4.0%	3.8%	3.8%	4.0%	22.1%	1.6%	1.5%	.2%	44.5%
	Wide or Divergent	.9%	.4%	1.1%	.9%	.9%	4.4%	.4%	.0%	.0%	8.9%
	Wide with Convex Tip	.9%	2.7%	2.6%	.9%	.7%	11.3%	.5%	.2%	.2%	20.1%
	Total	**6.8%**	**10.4%**	**10.0%**	**8.0%**	**8.0%**	**49.6%**	**3.8%**	**2.7%**	**.5%**	**100.0%**
Elveden	Markedly Convergent	2.3%	.0%	4.5%	2.3%	.0%	9.1%	.0%	.0%	.0%	18.2%
N = 44	Convergent with a Square Tip	.0%	.0%	.0%	.0%	.0%	4.5%	.0%	.0%	.0%	4.5%
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	2.3%	2.3%	.0%	.0%	.0%	4.5%
	Convergent with a Generalised Tip	.0%	2.3%	9.1%	6.8%	4.5%	36.4%	.0%	4.5%	.0%	63.6%
	Wide with Convex Tip	.0%	.0%	2.3%	.0%	.0%	2.3%	.0%	.0%	.0%	4.5%
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	4.5%	.0%	.0%	.0%	4.5%
	Total	**2.3%**	**2.3%**	**15.9%**	**9.1%**	**6.8%**	**59.1%**	**.0%**	**4.5%**	**.0%**	**100.0%**
Hoxne Upper Industry	Markedly Convergent	.0%	12.5%	8.3%	.0%	4.2%	25.0%	4.2%	.0%	.0%	54.2%
N = 24	Convergent with a Square Tip	.0%	.0%	4.2%	4.2%	.0%	4.2%	.0%	.0%	.0%	12.5%
	Convergent with an Oblique Tip	.0%	.0%	.0%	4.2%	4.2%	.0%	.0%	.0%	.0%	8.3%
	Convergent with a Generalised Tip	.0%	.0%	.0%	.0%	.0%	4.2%	.0%	.0%	.0%	4.2%
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	8.3%	.0%	.0%	.0%	8.3%
	Wide with Convex Tip	.0%	.0%	.0%	.0%	.0%	12.5%	.0%	.0%	.0%	12.5%
	Total	**.0%**	**12.5%**	**12.5%**	**8.3%**	**8.3%**	**54.2%**	**4.2%**	**.0%**	**.0%**	**100.0%**

a.Parallel distinctive features

Table 7.1: Showing a broadly chronological relationship between LCT tip shape, symmetry and the sites under study.

		Symmetry by Eye									
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	Pdf[a]	Total
Et Tabun F N = 83	Markedly Convergent	6.0%	3.6%	4.8%	2.4%	.0%	21.7%	.0%	.0%	.0%	38.6%
	Convergent with a Square Tip	.0%	1.2%	2.4%	.0%	.0%	4.8%	.0%	.0%	.0%	8.4%
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	1.2%	3.6%	.0%	.0%	.0%	4.8%
	Convergent with a Generalised Tip	.0%	3.6%	2.4%	.0%	.0%	10.8%	1.2%	.0%	.0%	18.1%
	Wide or Divergent	.0%	.0%	.0%	.0%	1.2%	6.0%	.0%	.0%	.0%	7.2%
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Wide with Convex Tip	.0%	1.2%	1.2%	.0%	.0%	16.9%	1.2%	2.4%	.0%	22.9%
	Total	**6.0%**	**9.6%**	**10.8%**	**2.4%**	**2.4%**	**63.9%**	**2.4%**	**2.4%**	**.0%**	**100.0%**
Et Tabun Ea - Ed N = 530	Markedly Convergent	2.6%	6.0%	10.6%	.8%	1.5%	7.9%	.6%	.8%	.0%	30.8%
	Convergent with a Square Tip	.4%	.6%	2.3%	.6%	.6%	5.5%	.6%	.2%	.0%	10.6%
	Convergent with an Oblique Tip	.0%	.0%	.2%	.2%	.2%	4.2%	.8%	.0%	.0%	5.5%
	Convergent with a Generalised Tip	1.1%	1.1%	4.2%	.8%	1.3%	16.8%	.9%	.4%	.0%	26.6%
	Wide or Divergent	.0%	.6%	.6%	.6%	.4%	3.0%	.0%	.0%	.0%	5.1%
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	.2%	.0%	.0%	.0%	.2%
	Wide with Convex Tip	.8%	1.9%	4.0%	1.1%	.6%	11.5%	.8%	.0%	.0%	20.6%
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	.8%	.0%	.0%	.0%	.8%
	Total	**4.9%**	**10.2%**	**21.7%**	**4.0%**	**4.5%**	**49.8%**	**3.6%**	**1.3%**	**.0%**	**100.0%**
Broom Pits N = 912	Markedly Convergent	2.3%	2.9%	3.0%	.8%	.5%	5.3%	.2%	.3%	.0%	15.2%
	Convergent with a Square Tip	.4%	.3%	.5%	.7%	.7%	3.9%	.4%	.1%	.0%	7.1%
	Convergent with an Oblique Tip	.0%	.0%	.1%	.8%	.7%	7.0%	.4%	.0%	.0%	9.0%
	Convergent with a Generalised Tip	1.2%	2.2%	5.0%	4.2%	3.4%	33.9%	1.1%	1.6%	.0%	52.6%
	Wide or Divergent	.0%	.4%	.3%	.5%	.0%	1.6%	.1%	.0%	.0%	3.1%
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.1%	.0%	1.0%	.2%	.0%	.0%	1.3%
	Wide with Convex Tip	.3%	.4%	1.2%	.7%	.3%	6.5%	.5%	.2%	.0%	10.2%
	Profoundly Asymmetrical	.0%	.0%	.0%	.3%	.1%	1.0%	.0%	.0%	.0%	1.4%
	Total	**4.3%**	**6.3%**	**10.2%**	**8.0%**	**5.7%**	**60.2%**	**3.1%**	**2.3%**	**.0%**	**100.0%**
Et Tabun D N = 6	Markedly Convergent	.0%	.0%	.0%	.0%	16.7%	.0%	16.7%	.0%	.0%	33.3%
	Convergent with a Square Tip	.0%	.0%	16.7%	.0%	.0%	.0%	.0%	.0%	.0%	16.7%
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	16.7%	16.7%	.0%	.0%	.0%	33.3%
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	16.7%	.0%	.0%	.0%	16.7%
	Total	**.0%**	**.0%**	**16.7%**	**.0%**	**33.3%**	**33.3%**	**16.7%**	**.0%**	**.0%**	**100.0%**

a.Parallel distinctive features

Table 7.1 continued: Showing a broadly chronological relationship between LCT tip shape, symmetry and the sites under study.

		Symmetry by Eye									
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	Pdf[a]	Total
Pontnewydd Cave N = 58	Markedly Convergent	1.7%	.0%	1.7%	.0%	.0%	8.6%	.0%	.0%	.0%	12.1%
	Convergent with a Square Tip	.0%	.0%	3.4%	.0%	.0%	5.2%	.0%	.0%	.0%	8.6%
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	.0%	3.4%	.0%	.0%	.0%	3.4%
	Convergent with a Generalised Tip	.0%	3.4%	10.3%	3.4%	.0%	46.6%	.0%	.0%	.0%	63.8%
	Wide or Divergent	.0%	.0%	3.4%	.0%	.0%	3.4%	.0%	.0%	.0%	6.9%
	Wide with Convex Tip	.0%	.0%	.0%	.0%	.0%	3.4%	.0%	.0%	.0%	3.4%
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	1.7%	.0%	.0%	.0%	1.7%
	Total	**1.7%**	**3.4%**	**19.0%**	**3.4%**	**.0%**	**72.4%**	**.0%**	**.0%**	**.0%**	**100.0%**
Cuxton N = 186	Markedly Convergent	1.6%	3.2%	3.2%	.5%	.0%	8.1%	.0%	.5%	.0%	17.2%
	Convergent with a Square Tip	.0%	.5%	.5%	.0%	.0%	3.2%	.0%	.0%	.0%	4.3%
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	.0%	4.3%	.5%	.0%	.0%	4.8%
	Convergent with a Generalised Tip	.5%	1.1%	11.8%	.0%	1.6%	41.4%	1.1%	.5%	.0%	58.1%
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	2.7%	.0%	.0%	.0%	2.7%
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	1.6%	.0%	.0%	.0%	1.6%
	Wide with Convex Tip	.5%	.5%	1.6%	.0%	.0%	5.9%	.5%	.0%	.0%	9.1%
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	2.2%	.0%	.0%	.0%	2.2%
	Total	**2.7%**	**5.4%**	**17.2%**	**.5%**	**1.6%**	**69.4%**	**2.2%**	**1.1%**	**.0%**	**100.0%**
Lynford N = 51	Markedly Convergent	2.0%	3.9%	.0%	5.9%	2.0%	9.8%	2.0%	2.0%	.0%	27.5%
	Convergent with a Square Tip	.0%	2.0%	.0%	2.0%	.0%	.0%	.0%	.0%	.0%	3.9%
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	.0%	5.9%	.0%	.0%	.0%	5.9%
	Convergent with a Generalised Tip	5.9%	2.0%	5.9%	5.9%	5.9%	21.6%	5.9%	2.0%	.0%	54.9%
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	3.9%	.0%	.0%	.0%	3.9%
	Wide with Convex Tip	.0%	.0%	.0%	.0%	.0%	2.0%	.0%	.0%	.0%	2.0%
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	2.0%	.0%	.0%	.0%	2.0%
	Total	**7.8%**	**7.8%**	**5.9%**	**13.7%**	**7.8%**	**45.1%**	**7.8%**	**3.9%**	**.0%**	**100.0%**

Total N = 2680
a.Parallel distinctive features

Table 7.1 continued: Showing a broadly chronological relationship between LCT tip shape, symmetry and the sites under study.

Table 7.1 illustrates that completely symmetrical LCTs (those classed in the yes,yes,yes category) do not seem to hold a strong degree of significance for the knappers at any of the sites examined for this thesis. Fully symmetrical LCTs were clearly capable of being produced, however the frequency of occurrence within each assemblage through time remained at a consistently low level (less than 8% of any assemblage). This in turn would indicate that the imposition of perfect or true symmetry on LCT form was not an important factor in LCT manufacture (the question of near symmetry categories are explored further below). Furthermore, the degree of fully symmetrical LCTs for each assemblage would not appear to follow a clear pattern of presence - such as increasing through time - rather they seem to fluctuate randomly from 0% to a maximum of 7.8% of the assemblage (table 7.1) across the whole data set.

Conversely, completely non-symmetrical LCTs were universally the most common LCT form found within all sites under study which may indicate that although specific forms were being imposed on LCTs (as reflected in the range of tip shapes – table 7.1), there was no preference for symmetrical form to any large degree through time. In order to establish whether symmetry may have been a significant factor in LCTs with near symmetrical aspects, table 7.2 (below) shows the percentage of each assemblage that contained LCTs with a symmetrical characteristic to their tip form.

		Symmetry by Eye				
		yes,yes,yes	yes,yes,no	yes,no,no	yes,no,yes	**% of TA**
Cave of Hearths N = 50 *TA N* = 223	Tips with a symmetrical element	3.1%	9.0%	8.5%	1.8%	**22.4%**
High Lodge N = 4 *TA N* = 15	Tips with a symmetrical element	.0%	6.7%	20.0%	.0%	**26.7%**
Warren Hill N = 164 *TA N* = 548	Tips with a symmetrical element	6.8%	10.4%	10.0%	2.7%	**29.9%**
Elveden N = 11 *TA N* = 44	Tips with a symmetrical element	2.3%	2.3%	15.9%	4.5%	**25.0%**
Hoxne Upper Industry N = 6 *TA N* = 24	Tips with a symmetrical element	.0%	12.5%	12.5%	.0%	**25.0%**
Et Tabun F N = 24 *TA N* = 83	Tips with a symmetrical element	6.0%	9.6%	10.8%	2.4%	**28.8%**
Et Tabun Ea - Ed N = 202 *TA N* = 530	Tips with a symmetrical element	4.9%	10.2%	21.7%	1.3%	**38.1%**
Broom Pits N = 210 *TA N* = 912	Tips with a symmetrical element	4.3%	6.3%	10.2%	2.3%	**23.1%**
Et Tabun D N = 1 *TA N* = 6	Tips with a symmetrical element	.0%	.0%	16.7%	.0%	**16.7%**
Pontnewydd Cave N = 14 *TA N* = 58	Tips with a symmetrical element	1.7%	3.4%	19.0%	.0%	**24.1%**
Cuxton N = 49 *TA N* = 186	Tips with a symmetrical element	2.7%	5.4%	17.2%	1.1%	**26.4%**
Lynford N = 13 *TA N* = 51	Tips with a symmetrical element	7.8%	7.8%	5.9%	3.9%	**25.4%**

TA = Total LCT Assemblage

Table 7.2: Showing the relationship between site and tips with a symmetrical element. Symmetry categories correspond to this seen in table 7.1 and the McNabb *et al* (2004) methodology described in Chapter 5.

As can be seen, if tips with a symmetrical component are combined together, symmetry presence in tip form does seem to compose a significantly higher proportion of each assemblage (almost 25% as an average across the data set). However, the presence of symmetry within LCT tip form continues the trend in table 7.1 by not following any clear patterns of distribution (such as increasing through time) ranging from a magnitude of 16.7% to 38.1% of the respective assemblages. In order to test whether the presence of tips with a symmetrical aspect represents a genuine intention of symmetry, table 7.3 (below) shows the relationship between LCTs with a convergent element to their tip shape versus LCTs with a symmetrical element to their form.

		Symmetry by Eye				
		yes,yes,yes	yes,yes,no	yes,no,no	yes,no,yes	**% of TA**
Cave of Hearths N = 32 *TA N* = 223	Tips with a convergent element	2.6%	4.8%	4.9%	1.8%	**14.1%**
High Lodge N = 4 *TA N* = 15	Tips with a convergent element	.0%	6.7%	20.0%	.0%	**26.7%**
Warren Hill N = 116 *TA N* = 548	Tips with a convergent element	4.9%	7.3%	6.3%	2.6%	**21.1%**
Elveden N = 10 *TA N* = 44	Tips with a convergent element	2.3%	2.3%	13.6%	4.5%	**22.7%**
Hoxne Upper Industry N = 6 *TA N* = 24	Tips with a convergent element	.0%	12.5%	12.5%	.0%	**25.0%**
Et Tabun F N = 20 *TA N* = 83	Tips with a convergent element	6.0%	8.4%	9.6%	.0%	**24.0%**
Et Tabun Ea - Ed N = 161 *TA N* = 530	Tips with a convergent element	4.1%	7.7%	17.3%	1.3%	**30.4%**
Broom Pits N = 183 *TA N* = 912	Tips with a convergent element	3.9%	5.4%	8.6%	2.0%	**19.9%**
Et Tabun D N = 1 *TA N* = 6	Tips with a convergent element	.0%	.0%	16.7%	.0%	**16.7%**
Pontnewydd Cave N =12 *TA N* = 58	Tips with a convergent element	1.7%	3.4%	15.4%	.0%	**20.5%**
Cuxton N = 44 *TA N* = 186	Tips with a convergent element	2.1%	4.8%	15.5%	1.0%	**23.4%**
Lynford N = 13 *TA N* = 51	Tips with a convergent element	7.8%	7.8%	5.9%	3.9%	**25.4%**

TA = Total LCT Assemblage

Table 7.3: Showing the relationship between site, tips with a convergent element and symmetry.

Tables 7.2 and 7.3 show that the overwhelming bulk of LCTs that display a symmetrical element to their tip also appear to have a corresponding convergent component to tip morphology. This in turn would suggest that the majority of tip symmetry present with the assemblages studied may actually be an artifice of the extra knapping required to construct a convergent tip, rather than a deliberately intended outcome of symmetry. This result would support the original conclusion drawn from table 7.1 that symmetry of any kind (full or near) does not seem to play a significant role in LCT production from any site or time period studied within this thesis.

Tables 7.1 and 7.3 above further suggests that tip shape with a convergent element, regardless of corresponding symmetry values, would seem to be the favoured tip form from all sites under examination. Whether this is a deliberate result of intended form imposition or a result of a functional adaptation is unclear, but shall be explored further below.

Figure 7.1 below examines the relationship between symmetry and artefact size from each site. The purpose for examining the relationship between LCT size and symmetry is to establish two things: 1) Are the LCTs within each assemblage studied made to a similar, preferred or standardised size. 2) Is the presence of symmetry on LCTs within each assemblage linked to a particular size of artefact (large or small) or found through a range of artefact sizes. By ascertaining if LCTs are made to a preferred size or not, it would be possible to see if standardisation in LCT manufacture is expressed through artefact size, rather than deliberately imposed form (table 7.1 would suggest that deliberately imposed form through symmetry and particular tip shape would not appear to be important). In addition, by establishing whether the presence of symmetry is related to LCT size or not, it should be possible to assess whether hominins are adaptable enough in their knapping skills and conceptions of LCT form to apply symmetry over a range of artefact sizes, or whether they are only imposing a degree of symmetry on specific artefacts of a particular size (large or small) within each assemblage. Appendix 2 shows a more detailed breakdown of symmetry categories and LCT size on a site by site basis than that represented in figure 7.1 below.

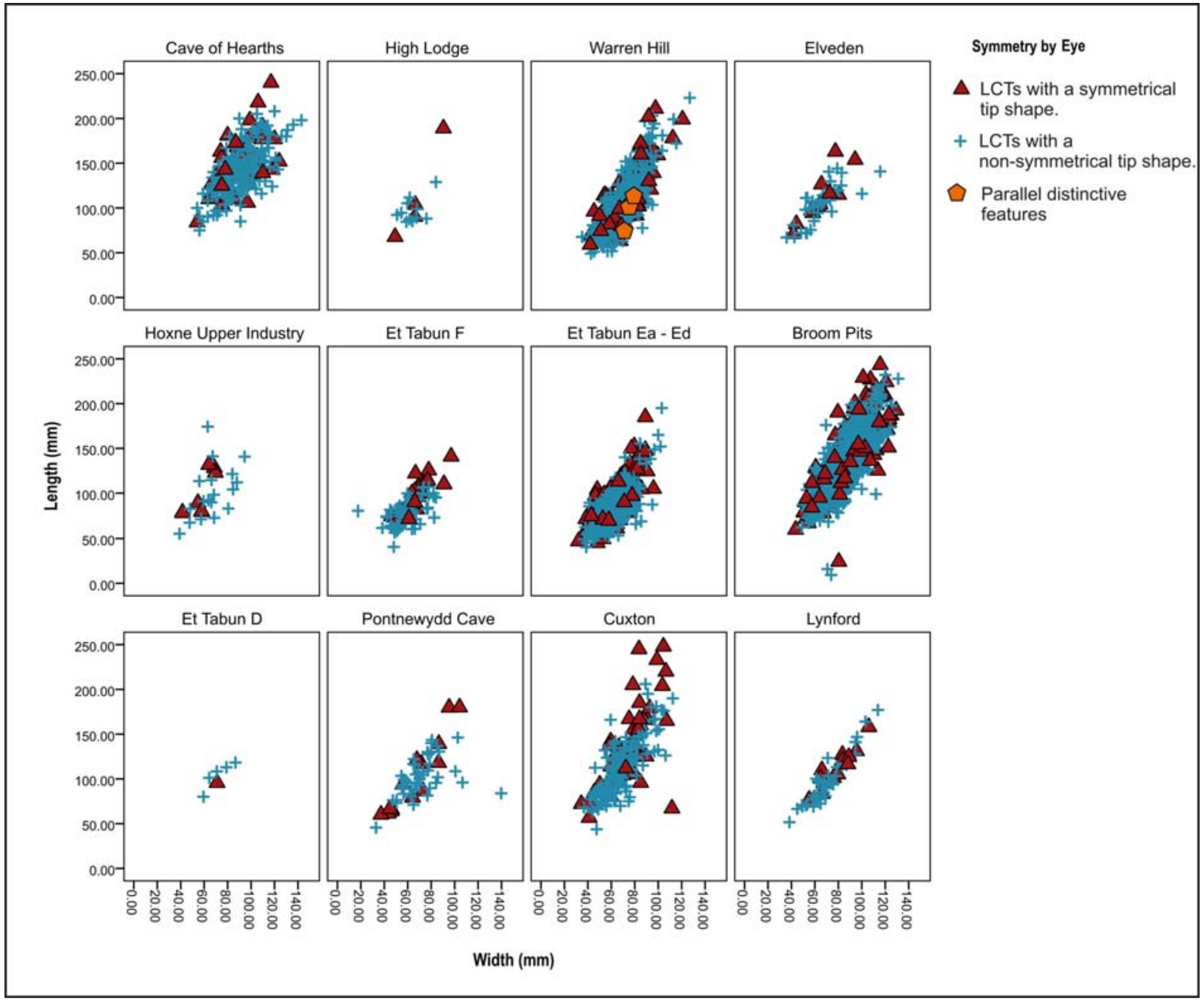


Figure 7.1: Showing the relationship between LCT size and symmetry for the sites under study, emphasising the relationship between LCTs with a symmetrical tip shape versus a non-symmetrical tip shape in relation to artefact size.

Figure 7.1 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT size. A general observation that may be made from figure 7.1 is that the larger LCTs from each site would appear to be associated with symmetrical aspects to their form, whilst purely non-symmetrical LCTs would appear to be generally smaller in nature. Although it must be acknowledged that there symmetrical and non-symmetrical LCTs are present through the entire range of artefact sizes for the majority of the assemblages studied in this thesis. This in turn may suggest that the relationship between symmetry presence and LCT size may not be a significant one.

In order to interrogate the relationship between LCT size and symmetry further, a Kruskal Wallis H Test (Ebdon 1977:68) – to 0.05 significance - was conducted between LCT length, width and thickness and symmetry for each site. A Kruskal Wallis H Test is a statistical test that allows a comparison between three or more samples with no assumptions as to a parametric distribution and as such is more appropriate for examining the data presented here than statistical tests that do assume a normal distribution such as ANOVA. The reason for this being that a normal distribution cannot be assumed for LCT size or symmetry presence. By interrogating the data through the Kruskal Wallis H Test to 0.05 significance any results that come out as 0.05 or below indicate a statistically significant relationship between the variables under interrogation, in this instance LCT size and symmetry. This is to test the apparent association seen in figure 7.1 that the larger the LCT the more symmetrical it may be, therefore if there is a positive correlation in the Kruskal Wallis H Tests given below, it should correlate to a positive relation between LCT size and symmetry presence. The results of the Kruskal Wallis H Test may be seen in table 7.4 below.

	Kruskall Wallis H Test Length (mm) vs Symmetry			Kruskall Wallis H Test Width (mm) vs Symmetry			Kruskall Wallis H Test Thickness (mm) vs Symmetry		
	x^2	df	*p*	x^2	df	*p*	x^2	df	*p*
Cave of Hearths *N = 223*	18.092	7	**0.012**	4.092	7	**0.769**	9.431	7	**0.223**
High Lodge *N = 15*	0.792	3	**0.851**	0.465	3	**0.927**	1.032	3	**0.794**
Warren Hill *N = 548*	13.642	8	**0.092**	12.476	8	**0.131**	6.931	8	**0.544**
Elveden *N = 44*	6.301	6	**0.390**	4.195	6	**0.650**	6.725	6	**0.347**
Hoxne Upper Industry *N = 24*	5.208	5	**0.391**	8.918	5	**0.112**	2.580	5	**0.764**
Et Tabun F *N = 83*	20.119	7	**0.05**	9.498	7	**0.219**	6.975	7	**0.432**
Et Tabun Ea - Ed *N = 530*	24.416	7	**0.001**	6.654	7	**0.466**	4.936	7	**0.668**
Broom Pits *N = 912*	17.004	7	**0.017**	10.443	7	**0.165**	17.815	7	**0.013**
Et Tabun D *N = 6*	3.857	3	**0.277**	3.571	3	**0.312**	0.857	3	**0.836**
Pontnewydd Cave *N = 58*	2.723	4	**0.605**	4.358	4	**0.360**	2.335	4	**0.674**
Cuxton *N = 186*	29.369	7	**0.000**	19.144	7	**0.008**	10.011	7	**0.188**
Lynford *N = 51*	14.612	7	**0.041**	14.376	7	**0.045**	5.360	7	**0.616**

Table 7.4: Showing the results of a Kruskal Wallis H Test on LCT length, width and thickness versus symmetry for the sites under study.

Table 7.4 shows that the majority of LCT proportions (L, W, T) have no statistically significant relationship with symmetry. However, where there does appear to be a statistically relevant correlation between symmetry and artefact size at the Cave of Hearths, Et Tabun F, Et Tabun Ea – Ed, Broom Pits, Cuxton and Lynford, it would appear to reflect the general pattern seen in figure 7.1 where the larger LCTs seem to have symmetrical aspects to their form, whilst purely non-symmetrical LCTs would appear to be smaller. This in turn may suggest that the larger the original LCT blank, the easier it was to impose a degree of symmetry upon the artefact.

However, this pattern is also replicated in the High Lodge, Elveden and Pontnewydd Cave data (figure 7.1) where there is no statistically significant relationship between LCT size and symmetry imposition. Furthermore, Lynford shows that the smaller LCTs tend to be more symmetrical in form than the larger LCTs (figure 7.1). Therefore, although there may be a statistically significant relationship present within the data between symmetry and artefact length or width, there may not be an archaeologically significant relationship.

Table 7.4 further suggests that a statistically significant relationship for the site of Broom Pits between symmetry presence and LCT thickness, however, figure 7.2 below insinuates that there is no clear relationship between LCT thickness and symmetry at Broom Pits given that LCTs with a symmetrical component to artefact form are as thick as non-symmetrical LCTs.

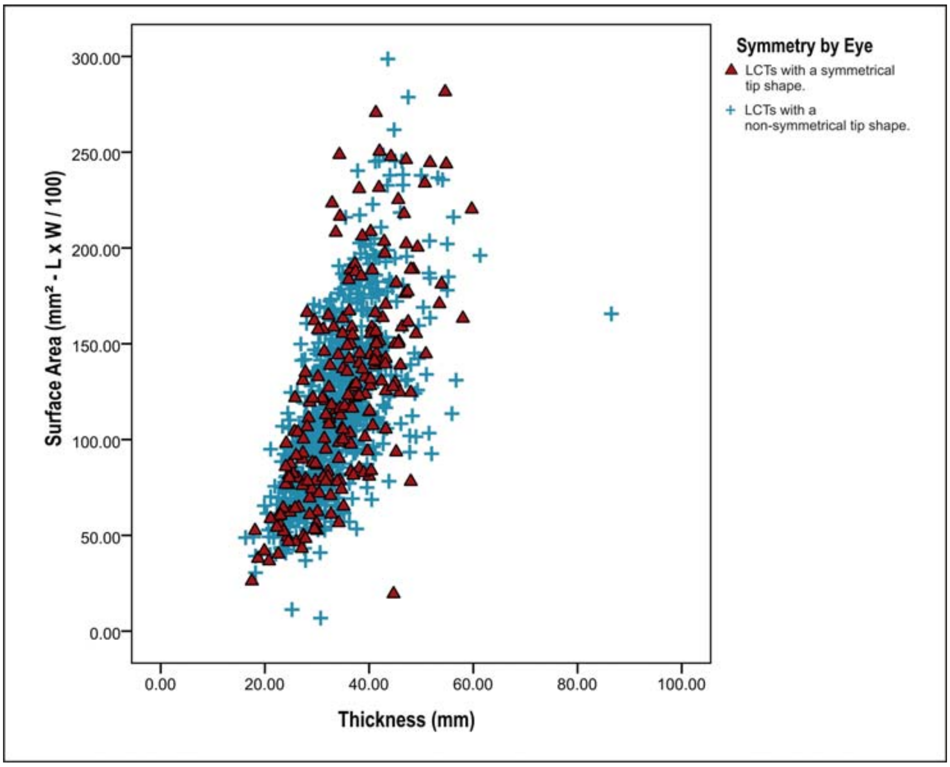


Figure 7.2: Showing the relationship between LCT surface area, thickness and symmetry at Broom Pits. Surface area calculated as artefact **L**ength (mm) x **W**idth (mm) / 100.

This would suggest that although a statistically significant relationship may exist between the presence of LCT symmetry and LCT thickness at Broom Pits, there may not be an archaeologically significant relationship to be explored. Indeed, on a broader scale, figures 7.1 and 7.2 do not seem to suggest any clear relationships between the presence of symmetry and LCT size. The only possible exception to this rule may be the Cuxton LCTs where archaeologically, there would appear to be a greater degree of symmetry present on larger LCTs, which may be supported statistically as demonstrated in table 7.4.

In order to investigate the relationship between LCT size and tip shape, figure 7.3 below demonstrates the correlation between site, tip shape and artefact size. The purpose for examining the relationship between LCT size and tip shape is to establish whether the presence of convergent versus non-convergent tips shapes on LCTs within each assemblage are linked to a particular size of artefact (large or small) or found through a range of artefact sizes. By ascertaining whether the presence of particular tip-shapes are related to LCT size or not, it should be possible to assess whether hominins are adaptable enough in their knapping skills and conceptions of LCT form to apply varying tip shapes over a range of artefact sizes, or whether they are only imposing particular tip forms on artefacts of a particular size (large or small) within each assemblage. As with LCT symmetry above, Appendix 2 illustrates a more detailed break down of individual tip shape categories and LCT proportions on a site by site basis than the broad convergent / non-convergent categories represented in figure 7.3 below.

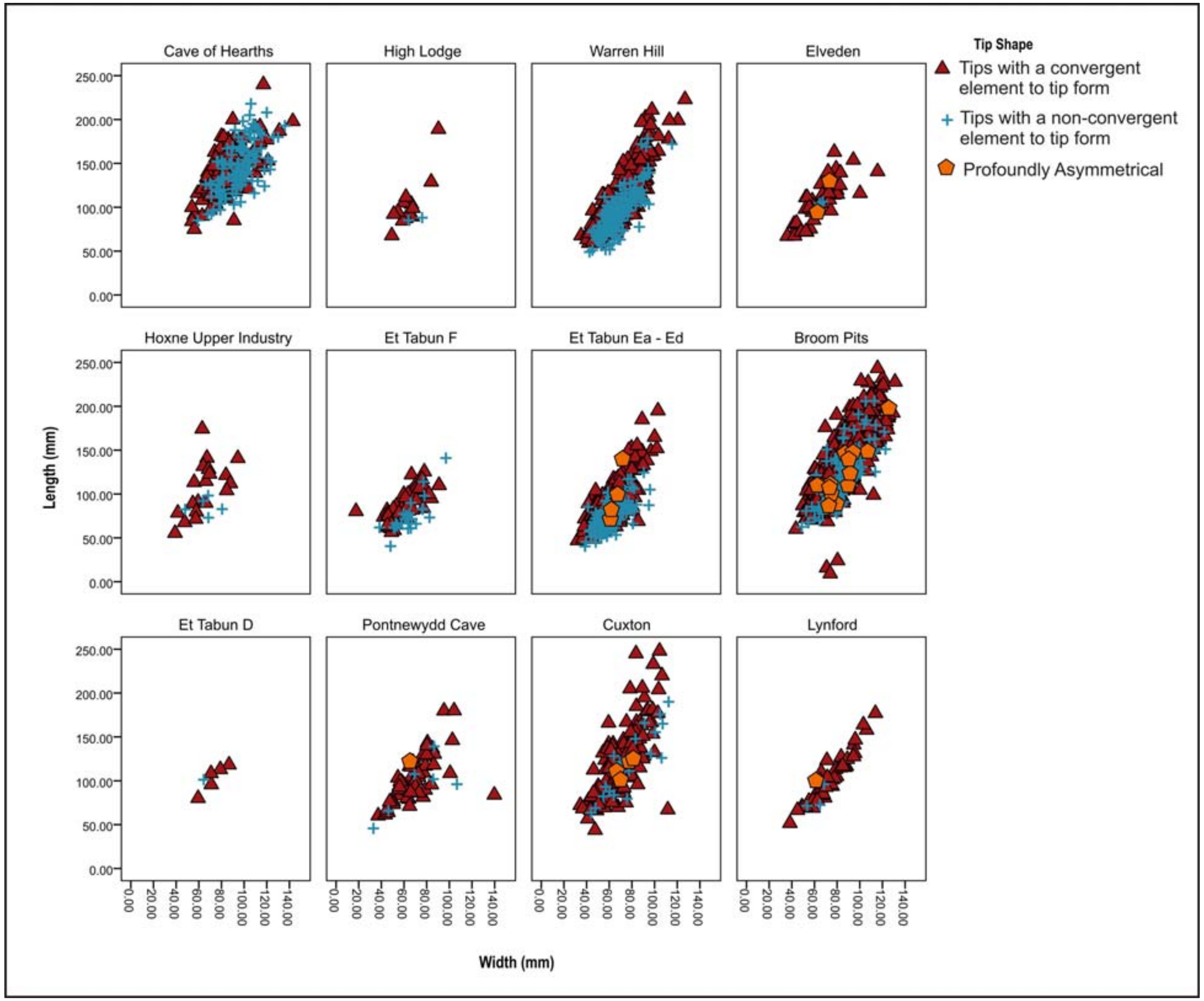


Figure 7.3: Showing the relationship between LCT proportion and tip shape for the sites understudy, emphasising the relationship between LCTs with a convergent versus non-convergent tip shape in relation to artefact size.

Figure 7.3 shows a general correlation between length and width (the longer the LCT, the wider it is) although this is again, unlikely to reflect any degree of standardisation in LCT size. Intriguingly, figure 7.3 does seem to suggest that there may be an interesting relationship between LCT size and convergent tip form across the majority of the sites, where the larger LCTs appear to have a convergent element to their tip shape. However, it is important to note that convergence in tip shape is present throughout the entire range of LCT sizes, so there may not be a specific relationship between LCT size and tip convergence. The pattern in the data may simply reflect an overall preference for LCTs with a convergent tip over LCTs with a non-convergent tip. As shown in tables 7.2 and 7.3, there would also appear to be a positive correlation between LCTs with a symmetrical element to their tip shape (figure 7.1), and LCTs with a convergent element to their tip shape (figure 7.3) in relation to LCT size. Profoundly asymmetrical tip shapes (as defined in Chapter 5, page 89) were present in sufficient numbers to allow a comparison would also appear to be represented through a range of LCT sizes, suggesting that they are not constrained to particular LCT proportions.

In order to interrogate the relationship between LCT size and tip shape further, a Kruskal Wallis H Test (Ebdon 1977:68) – to 0.05 significance - was conducted between LCT length, width and thickness and tip shape for each site (table 7.5 below). This is to test the apparent association seen in figure 7.3 that the larger the LCT the more convergent the tip form may be, therefore if there is a positive correlation in the Kruskal Wallis H Tests given below, it should correlate to a positive relation between LCT size and convergent tip presence.

	Kruskall Wallis H Test Length (mm) vs Tip Shape			Kruskall Wallis H Test Width (mm) vs Tip Shape			Kruskall Wallis H Test Thickness (mm) vs Tip Shape		
	x^2	df	*p*	x^2	df	*p*	x^2	df	*p*
Cave of Hearths *N = 223*	11.260	6	**0.081**	39.277	6	**0.000**	8.166	6	**0.226**
High Lodge *N = 15*	4.767	4	**0.312**	8.389	4	**0.078**	3.622	4	**0.460**
Warren Hill *N = 548*	23.808	5	**0.000**	7.767	5	**0.170**	5.834	5	**0.323**
Elveden *N = 44*	6.144	5	**0.292**	6.147	5	**0.292**	8.752	5	**0.119**
Hoxne Upper Industry *N = 24*	8.639	5	**0.124**	7.003	5	**0.220**	5.047	5	**0.410**
Et Tabun F *N = 83*	11.162	5	**0.048**	5.127	5	**0.401**	7.804	5	**0.167**
Et Tabun Ea - Ed *N = 530*	39.850	7	**0.000**	7.500	7	**0.379**	18.154	7	**0.011**
Broom Pits *N = 912*	37.786	7	**0.000**	5.922	7	**0.549**	15.408	7	**0.031**
Et Tabun D *N = 6*	3.571	3	**0.312**	4.286	3	**0.232**	4.286	3	**0.232**
Pontnewydd Cave *N = 58*	4.308	6	**0.635**	4.649	6	**0.590**	6.057	6	**0.417**
Cuxton *N = 186*	10.821	7	**0.147**	10.581	7	**0.158**	8.006	7	**0.332**
Lynford *N = 51*	4.143	6	**0.657**	6.162	6	**0.405**	2.910	6	**0.820**

Table 7.5: Showing the results of a Kruskal Wallis H Test on LCT length, width and thickness versus tip shape for the sites under study.

Table 7.5 shows that the majority of LCT proportions (L, W, T) have no statistically significant relationship with tip shape. Where there is a statistically significant relationship between LCT size and tip shape (Cave of Hearths, Warren Hill, Et Tabun F, Et Tabun Ea – Ed and Broom Pits), figure 7.3 above shows that the larger the LCTs seem to have a convergent element to their tip shape, whilst LCTs with non-convergent tip shapes would appear to be generally smaller in size. This may suggest that the larger the original LCT blank, the easier it was to impose a convergent tip shape onto the LCT.

Table 7.5 further suggests that there may be statistically significant relationship between LCT thickness and tip shape for Et Tabun layer Ea – Ed and Broom Pits. This relationship is explored further in figure 7.4 below.

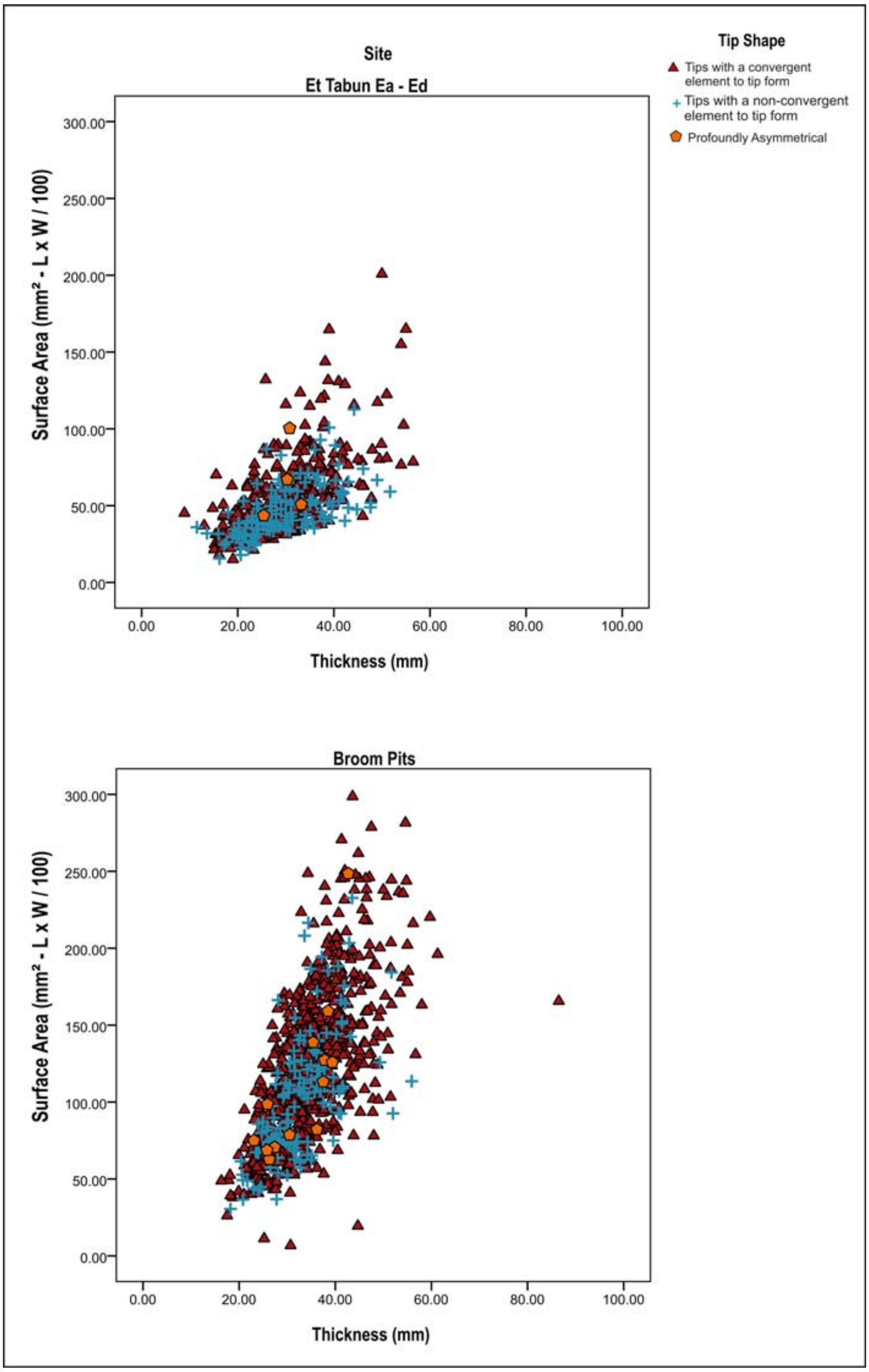


Figure 7.4: Showing the relationship between LCT surface area, thickness and tip shape at Et Tabun Ea – Ed and Broom Pits. Surface area calculated as artefact **L**ength (mm) x **W**idth (mm) / 100.

From figure 7.4 there would appear to be a general relationship between LCT size and the presence of convergence in tip shape in that the larger the LCT, the tip shape is more likely to be convergent. However, it is important to bear in mind that there are a wide range of tip shapes (convergent and non-convergent) present within all assemblages examined for this data set (table 7.1) spread through a range of LCT sizes (figure 7.3). Therefore, given the wide range of tip shapes present across the wide range of LCT sizes there would not appear to be any form of standardisation in regards to tip form imposition present within the data sets examined beyond a broadly pervasive trend that LCTs with a convergent element to tip shape are generally larger in proportion to LCTs with non-convergent tips. This in turn may account for the corresponding broad pattern seen within the symmetry data (figure 7.1) that the larger LCTs would appear to be more symmetrical than their smaller counterparts in each assemblage.

The next criteria for assessment shall be the flaking patterns where the data is presented in table 7.6 below. Once again, Appendix 2 shows a more detailed site by site comparison of LCT flaking patterns, of which table 7.6 represents a summary.

		Site											
		Cave of Hearths (N = 223)	High Lodge (N = 15)	Warren Hill (N = 548)	Elveden (N = 44)	Hoxne Upper Industry (N = 24)	Et Tabun F (N = 83)	Et Tabun Ea - Ed (N = 530)	Broom Pits (N = 912)	Et Tabun D (N = 6)	Pontnewydd Cave (N = 58)	Cuxton (N = 186)	Lynford (N = 51)
Flaking Extent First Face	Complete	3.1%	53.3%	46.4%	47.7%	54.2%	21.7%	20.6%	43.6%	.0%	17.2%	24.2%	51.0%
	Complete Marginal	9.0%	.0%	8.6%	2.3%	4.2%	9.6%	7.2%	7.3%	.0%	5.2%	2.2%	.0%
	Partial Marginal	84.3%	13.3%	23.4%	11.4%	29.2%	31.3%	34.0%	19.7%	66.7%	63.8%	22.6%	9.8%
	Partial	.9%	13.3%	6.8%	9.1%	8.3%	12.0%	15.8%	7.2%	.0%	5.2%	14.5%	7.8%
	Substantial	2.2%	20.0%	15.0%	29.5%	4.2%	25.3%	22.5%	22.0%	33.3%	8.6%	36.6%	31.4%
	None	.4%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Flaking Extent Second Face	Complete	1.3%	46.7%	46.0%	47.7%	8.3%	22.9%	13.4%	41.8%	33.3%	13.8%	12.4%	47.1%
	Complete Marginal	7.6%	6.7%	6.0%	2.3%	8.3%	6.0%	7.2%	9.0%	16.7%	1.7%	2.7%	5.9%
	Partial Marginal	81.6%	26.7%	24.5%	15.9%	25.0%	34.9%	38.1%	15.8%	50.0%	56.9%	33.3%	11.8%
	Partial	.4%	13.3%	7.8%	13.6%	16.7%	14.5%	21.3%	7.2%	.0%	13.8%	17.7%	2.0%
	Substantial	4.0%	6.7%	15.7%	20.5%	41.7%	20.5%	20.0%	26.1%	.0%	13.8%	33.9%	33.3%
	None	4.9%	.0%	.0%	.0%	.0%	1.2%	.0%	.1%	.0%	.0%	.0%	.0%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Total N = 2680

Table 7.6: Showing the relationship between Flaking Extent on the first and second LCT faces for the sites under study.

Table 7.6 above shows a range of initial flaking strategies adopted at each site, therefore I shall go through each site in turn.

The Cave of Hearths suggests that the hominins seemed to have preferred a partial marginal method of thinning and shaping for both faces (first face = 84.3%, second face = 81.6%). This is the least work approach to thinning and shaping and implies that the hominins were not concerned about a standardised method of knapping in LCT manufacture. Furthermore, tables 7.6 and A2.99 suggests that the first and second faces have been worked in similar ways (based on sample size) but I also think differing fashions - if the pattern of flaking combinations is examined they appear to be randomly spread across the data set – which may add support to the lack of standardised form being imposed upon the LCTs at the Cave of Hearths.

From the small sample of LCTs at High Lodge there would appear to be no consistent pattern in regards to LCT shaping and thinning, although the preferred shaping strategy for both faces would appear to have been complete (first face = 53.3%, second face = 46.7%). This may suggest a broad notional standardisation in LCT shaping strategy, however the lack of standardised form imposed through symmetry and tip shape (table 7.1) would indicate other wise. Furthermore, the two sides of the LCTs seem to be shaped in different ways, with the first face having less partial marginal (13.3%) working than the second face (26.7%), yet more LCTs that were worked in a substantial fashion (first face = 20.0%, second face = 6.7%). The second face would also appear to have LCTs that were worked in a complete marginal fashion (6.7%), in contrast to the first face which had none. Therefore, it would seem that the patterns of secondary working support the idea that there are no clear patterns of standardisation in shaping and thinning within the LCTs from High Lodge beyond a broad preference for completely worked LCTs.

The data from Warren Hill would suggest that the LCTs were shaped and thinned in a similar fashion on both faces with a clear preference for LCTs that were completely worked (first face = 46.4%, second face = 46.0%). This may suggest a potential standardisation in LCT shaping, however the lack of form imposed through symmetry and tip shape (table 7.1 above) may suggest that any standardisation in working may not be linked to culturally sanctioned methods of working, but possibly be a result of original blank condition.

From Elveden it can be seen that the hominins seemed to have preferred a complete flaking secondary working strategy overall (first face = 47.7%, second face = 47.7%). Furthermore, the data suggests that the first and second faces were worked in similar fashions, possibly hinting at a potential form of standardisation in preliminary LCT shaping. However, the lack of form imposition through symmetry and tip shape (table 7.1 above) may suggest that this is not an artifice of culturally sanctioned methods of working, but possibly a result of original blank condition.

From the small sample of LCTs in the Hoxne Upper Industry there would appear to be no consistent pattern in regards to LCT shaping and thinning. Interestingly the two sides of the LCTs seem to be knapped in marginally different ways with the first face having significantly more LCTs worked in a complete fashion (54.2%) than the second face (8.3%). Whereas the second face has significantly more LCTs worked in a substantial fashion (41.7%) than the first face (4.2%). The difference between complete and substantial patterns of flaking are that substantial working covers only a majority of the LCT surface, often leaving some cortex on the LCT face, rather than flaking across the whole LCT surface. In relation to assessing the degree of standardisation in shaping and thinning of the LCT, the difference between complete and substantial is visually significant enough to suggest that there is no standardisation in shaping and thinning of the Hoxne Upper Industry LCTs.

The data from Et Tabun layer F shows that the hominins seemed to have favoured the easiest shaping option, of a partial marginal flaking strategy overall (first face = 31.3%, second face = 34.9%). However, complete (first face = 21.7%, second face = 22.9%) and substantial (first face = 25.3%, second face = 20.5%) flaking extents when combined indicate a more intensive flaking strategy may have prevailed. Furthermore, the data suggests that the first and second faces were worked in broadly similar fashions, and if combined with the complete and substantial initial working, it is possible that the hominins of Layer F were imposing deliberate form through a standardised system of LCT shaping or secondary working. However, the more likely explanation is that the extensive flaking strategy formed as a result of a convergent tip preference, perhaps on a functional level, rather than evidence for culturally significant form imposition, further reinforced by the overall lack of full symmetry within the Layer F LCT assemblage (table 7.1). However it should also be acknowledged here that almost one third of the LCTs from Tabun F do not have a convergent tip which may also suggest that hominins were not imposing specific form upon the LCTs present through thinning and shaping in regards to particular LCT morphologies.

From Et Tabun layers Ea - Ed it can be seen that a partial marginal flaking strategy was favoured overall (first face = 34.0%, second face = 38.1%). Furthermore, the data suggests that the first and second faces may have been worked in broadly similar fashions, which in turn, may indicate a standardised system of LCT shaping. However, as with layer F, it is possible that the extensive secondary flaking strategy formed as a result of a convergent tip preference, rather than evidence for culturally significant form imposition, further reinforced by the overall lack of full symmetry within the Layers Ea - Ed LCT assemblage (table 7.1).

The data from Broom Pits shows that a complete thinning and shaping strategy (first face = 43.6%, second face = 41.8%) was preferred at the site. Furthermore, the data suggests that the first and second faces were worked in a broadly similar fashion, possibly hinting at a potential form of standardisation in secondary LCT working, however the lack of standardised form imposed through symmetry and tip shape (table 7.1 above) may suggest that any pattern in initial working may not be linked to culturally sanctioned methods of manufacture, but a result of original blank condition and shape.

From Et Tabun layer D it would seem that a partial marginal flaking strategy (the easiest flaking option) was favoured (first face = 66.7%, second face = 50.0%). However, complete, complete marginal and substantial flaking extents are also represented within the sample. Furthermore, the data suggests that the first and second faces were worked in different fashions, suggesting a lack of standardisation in LCT production. Although the limited sample size and bias nature of the collection makes it difficult to ascertain whether this is a genuine reflection of hominin behaviour.

From the small sample of LCTs from the Pontnewydd Cave assemblage there would appear to be a preference for partial marginal preparation (first face = 63.8%, second face = 56.9%) in regards to LCT shaping and thinning. It should be noted here that this type of shaping and thinning requires the least amount of work and does not contribute hugely to form imposition on the LCTs. This may be a result of raw material constraints on working the LCTs, although more detailed investigations exploring the effect of raw material on LCT production from Pontnewydd Cave (Chapter 6 and Appendix 2) would suggest that this may not be the case. Furthermore, the two sides of the LCTs seem to be often knapped in a semi-comparable fashion, although I do not believe that there is enough similarity to suggest a standardisation in shaping and thinning of the LCTs.

From Cuxton it would appear that there was not a preferred secondary flaking strategy in place, although partial marginal flaking would appear to hold a small majority (first face = 22.6%, second face = 33.3%). Interestingly, the two sides of the LCTs often seem to be knapped in different ways overall, with the first face having more LCTs that were worked in a complete fashion (24.2%) than the second face (12.4%), and less LCTs that were worked in a partial fashion (first face = 14.5%, second face = 17.7%). Therefore, it would seem that the patterns of secondary working support the idea that there are no clear patterns of standardisation in shaping and thinning within the LCTs from Cuxton.

The data for the site of Lynford shows that there appears to have been a favoured complete (first face = 51.0%, second face = 47.1%) and substantial (first face = 31.4%, second face = 33.3%) secondary flaking strategy. Furthermore, the data suggests that the first and second faces were worked in a broadly similar and intensive fashion, suggesting that the hominins of Lynford Quarry may have been working LCTs through a standardised system of secondary flaking and shaping. However, the lack of standardisation in form expressed through full symmetry and tip shape (table 7.1) within the Lynford LCT assemblage may suggest that if cultural form imposition was present, it was not expressed through LCT form.

Chapter 5 (pages 90 - 91) describes a method for assessing the degree of edge working present on LCTs following McNabb *et al* (2004) and McNabb's (2009) methodology. The edge working analysis is not LCT zone specific (tip, medial or butt) but rather gives an overall quantification of edge working for the entire LCT. Using this method a relative index of edge working is created with the minimum total score for an artefact regarding edge working being 12 with the maximum being 60. For ease of analysis, groupings were made within the data set based on the total edge working score for each artefact (Chapter 5 page 91), the results of which may be seen in table 7.7 below.

	12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Cave of Hearths (*N = 223*)	5.8%	32.3%	40.4%	21.5%	**100.0%**
High Lodge (*N = 15*)	.0%	53.3%	46.7%	.0%	**100.0%**
Warren Hill (*N = 548*)	21.0%	64.1%	14.6%	.4%	**100.0%**
Elveden (*N = 44*)	34.1%	59.1%	6.8%	.0%	**100.0%**
Hoxne Upper Industry (*N = 24*)	4.2%	25.0%	41.7%	29.2%	**100.0%**
Et Tabun F (*N = 83*)	39.8%	28.9%	14.5%	16.9%	**100.0%**
Et Tabun Ea - Ed (*N = 530*)	19.8%	33.2%	25.7%	21.3%	**100.0%**
Broom Pits (*N = 912*)	20.9%	59.5%	17.8%	1.8%	**100.0%**
Et Tabun D (*N = 6*)	33.3%	16.7%	16.7%	33.3%	**100.0%**
Pontnewydd Cave (*N = 58*)	69.0%	29.3%	1.7%	.0%	**100.0%**
Cuxton (*N = 186*)	60.2%	32.8%	7.0%	.0%	**100.0%**
Lynford (*N = 51*)	49.0%	43.1%	7.8%	.0%	**100.0%**

Total N = 2680

Table 7.7: Showing the relationship between site and edge working.

From table 7.7 it can be seen that the majority of LCTs have a varied degree of edge working from all sites. However, there may be two broad patterns that are evident within table 7.7: firstly, the sites that fall within the realm of the Acheulean (Cave of Hearths, High Lodge, Warren Hill, Elveden, Hoxne Upper Industry, Et Tabun F, Ea – Ed and Broom Pits) seem to on the whole display an edge working strategy that is more intensive, in that there would appear to be a greater degree of edge working instances-with a medium to high or high index when contrasted to those sites of the Middle Palaeolithic (Et Tabun D, Pontnewydd Cave, Cuxton and Lynford). In spite of this, within these two broad groupings (Lower and Middle Palaeolithic) there would not appear to be any indication of a standardised edge working strategy between the sites as would be expected if edge working was utilised in creating deliberate form (see below) on the LCTs. Rather each sites edge working appears random in distribution between a low to high index and therefore may reflect a response to need, where the edge was reworked as required to perform specific tasks.

Table 7.8 below shows the relationship between site, edge working index and symmetry. The premise being explored here is that a high degree of edge working should correlate positively to a high degree of symmetry, if edge working were crucial to the imposition of symmetry upon LCT form.

		Symmetry by Eye									
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	Pdf[a]	**Total**
Cave of Hearths *N = 223*	12-24 (low index of edge working)	.0%	.0%	.0%	.0%	.0%	4.9%	.9%	.0%	.0%	5.8%
	25-36 (medium to low index of edge working)	.0%	2.2%	2.7%	1.3%	1.3%	20.2%	4.5%	.0%	.0%	32.3%
	37-48 (medium to high index of edge working)	1.3%	1.8%	3.1%	.9%	3.6%	25.1%	3.6%	.9%	.0%	40.4%
	49-60 (high index of edge working)	1.8%	4.9%	2.7%	.9%	.9%	8.5%	.9%	.9%	.0%	21.5%
	Total	**3.1%**	**9.0%**	**8.5%**	**3.1%**	**5.8%**	**58.7%**	**9.9%**	**1.8%**	**.0%**	**100.0%**
High Lodge *N = 15*	12-24 (low index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	25-36 (medium to low index of edge working)	.0%	.0%	.0%	20.0%	.0%	33.3%	.0%	.0%	.0%	53.3%
	37-48 (medium to high index of edge working)	.0%	6.7%	20.0%	13.3%	.0%	6.7%	.0%	.0%	.0%	46.7%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**.0%**	**6.7%**	**20.0%**	**33.3%**	**.0%**	**40.0%**	**.0%**	**.0%**	**.0%**	**100.0%**
Warren Hill *N = 548*	12-24 (low index of edge working)	.4%	1.1%	2.2%	.7%	.7%	15.1%	.7%	.0%	.0%	21.0%
	25-36 (medium to low index of edge working)	4.0%	6.8%	6.4%	5.5%	6.2%	30.8%	2.7%	1.5%	.2%	64.1%
	37-48 (medium to high index of edge working)	2.0%	2.6%	1.5%	1.8%	1.1%	3.6%	.4%	1.3%	.4%	14.6%
	49-60 (high index of edge working)	.4%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.4%
	Total	**6.8%**	**10.4%**	**10.0%**	**8.0%**	**8.0%**	**49.6%**	**3.8%**	**2.7%**	**.5%**	**100.0%**
Elveden *N = 44*	12-24 (low index of edge working)	.0%	.0%	2.3%	.0%	.0%	31.8%	.0%	.0%	.0%	34.1%
	25-36 (medium to low index of edge working)	2.3%	2.3%	13.6%	6.8%	4.5%	27.3%	.0%	2.3%	.0%	59.1%
	37-48 (medium to high index of edge working)	.0%	.0%	.0%	2.3%	2.3%	.0%	.0%	2.3%	.0%	6.8%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**2.3%**	**2.3%**	**15.9%**	**9.1%**	**6.8%**	**59.1%**	**.0%**	**4.5%**	**.0%**	**100.0%**
Hoxne Upper Industry *N = 24*	12-24 (low index of edge working)	.0%	.0%	.0%	.0%	.0%	4.2%	.0%	.0%	.0%	4.2%
	25-36 (medium to low index of edge working)	.0%	.0%	8.3%	.0%	.0%	12.5%	4.2%	.0%	.0%	25.0%
	37-48 (medium to high index of edge working)	.0%	8.3%	4.2%	8.3%	4.2%	16.7%	.0%	.0%	.0%	41.7%
	49-60 (high index of edge working)	.0%	4.2%	.0%	.0%	4.2%	20.8%	.0%	.0%	.0%	29.2%
	Total	**.0%**	**12.5%**	**12.5%**	**8.3%**	**8.3%**	**54.2%**	**4.2%**	**.0%**	**.0%**	**100.0%**
Et Tabun F *N = 83*	12-24 (low index of edge working)	1.2%	3.6%	3.6%	1.2%	.0%	28.9%	1.2%	.0%	.0%	39.8%
	25-36 (medium to low index of edge working)	3.6%	.0%	4.8%	.0%	2.4%	16.9%	1.2%	.0%	.0%	28.9%
	37-48 (medium to high index of edge working)	.0%	2.4%	.0%	.0%	.0%	10.8%	.0%	1.2%	.0%	14.5%
	49-60 (high index of edge working)	1.2%	3.6%	2.4%	1.2%	.0%	7.2%	.0%	1.2%	.0%	16.9%
	Total	**6.0%**	**9.6%**	**10.8%**	**2.4%**	**2.4%**	**63.9%**	**2.4%**	**2.4%**	**.0%**	**100.0%**
Et Tabun Ea -Ed *N = 530*	12-24 (low index of edge working)	.0%	.6%	2.5%	.4%	.4%	15.3%	.6%	.2%	.0%	19.8%
	25-36 (medium to low index of edge working)	.9%	4.5%	7.7%	1.7%	2.1%	14.5%	1.5%	.2%	.0%	33.2%
	37-48 (medium to high index of edge working)	1.7%	3.0%	7.2%	1.1%	.8%	10.8%	.9%	.2%	.0%	25.7%
	49-60 (high index of edge working)	2.3%	2.1%	4.3%	.8%	1.3%	9.2%	.6%	.8%	.0%	21.3%
	Total	**4.9%**	**10.2%**	**21.7%**	**4.0%**	**4.5%**	**49.8%**	**3.6%**	**1.3%**	**.0%**	**100.0%**

a.Parallel distinctive features

Table 7.8: Showing the relationship between site, index of edge working and symmetry.

		Symmetry by Eye									
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	Pdf[a]	**Total**
Broom Pits *N = 912*	12-24 (low index of edge working)	.1%	.7%	1.8%	.5%	.7%	16.8%	.2%	.2%	.0%	20.9%
	25-36 (medium to low index of edge working)	1.3%	3.7%	6.7%	4.3%	3.2%	37.2%	1.8%	1.4%	.0%	59.5%
	37-48 (medium to high index of edge working)	2.3%	1.4%	1.6%	2.9%	1.6%	6.3%	1.0%	.7%	.0%	17.8%
	49-60 (high index of edge working)	.5%	.4%	.1%	.3%	.2%	.0%	.1%	.0%	.0%	1.8%
	Total	**4.3%**	**6.3%**	**10.2%**	**8.0%**	**5.7%**	**60.2%**	**3.1%**	**2.3%**	**.0%**	**100.0%**
Et Tabun D *N = 6*	12-24 (low index of edge working)	.0%	.0%	.0%	.0%	16.7%	16.7%	.0%	.0%	.0%	33.3%
	25-36 (medium to low index of edge working)	.0%	.0%	.0%	.0%	.0%	16.7%	.0%	.0%	.0%	16.7%
	37-48 (medium to high index of edge working)	.0%	.0%	.0%	.0%	16.7%	.0%	.0%	.0%	.0%	16.7%
	49-60 (high index of edge working)	.0%	.0%	16.7%	.0%	.0%	.0%	16.7%	.0%	.0%	33.3%
	Total	**.0%**	**.0%**	**16.7%**	**.0%**	**33.3%**	**33.3%**	**16.7%**	**.0%**	**.0%**	**100.0%**
Pontnewydd Cave *N = 58*	12-24 (low index of edge working)	.0%	1.7%	12.1%	1.7%	.0%	53.4%	.0%	.0%	.0%	69.0%
	25-36 (medium to low index of edge working)	1.7%	1.7%	5.2%	1.7%	.0%	19.0%	.0%	.0%	.0%	29.3%
	37-48 (medium to high index of edge working)	.0%	.0%	1.7%	.0%	.0%	.0%	.0%	.0%	.0%	1.7%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**1.7%**	**3.4%**	**19.0%**	**3.4%**	**.0%**	**72.4%**	**.0%**	**.0%**	**.0%**	**100.0%**
Cuxton *N = 186*	12-24 (low index of edge working)	.5%	.5%	9.1%	.5%	.5%	47.8%	.5%	.5%	.0%	60.2%
	25-36 (medium to low index of edge working)	.5%	3.2%	8.1%	.0%	.5%	18.3%	1.6%	.5%	.0%	32.8%
	37-48 (medium to high index of edge working)	1.6%	1.6%	.0%	.0%	.5%	3.2%	.0%	.0%	.0%	7.0%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**2.7%**	**5.4%**	**17.2%**	**.5%**	**1.6%**	**69.4%**	**2.2%**	**1.1%**	**.0%**	**100.0%**
Lynford *N = 51*	12-24 (low index of edge working)	.0%	.0%	3.9%	3.9%	3.9%	33.3%	2.0%	2.0%	.0%	49.0%
	25-36 (medium to low index of edge working)	7.8%	5.9%	2.0%	5.9%	3.9%	11.8%	3.9%	2.0%	.0%	43.1%
	37-48 (medium to high index of edge working)	.0%	2.0%	.0%	3.9%	.0%	.0%	2.0%	.0%	.0%	7.8%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**7.8%**	**7.8%**	**5.9%**	**13.7%**	**7.8%**	**45.1%**	**7.8%**	**3.9%**	**.0%**	**100.0%**

Total N = 2680

a.Parallel distinctive features

Table 7.8 continued: Showing the relationship between site, index of edge working and symmetry.

Table 7.8 above shows that there does not appear to be a strong relationship between degree of edge working and the presence of symmetry through time. Indeed, where symmetry is present on an LCT, table 7.8 shows that the degree of edge working falls within the medium to low and low indices as often as they are in the medium to high and high indices. Furthermore, the presence of edge working and symmetry appears to be randomly distributed throughout the assemblages represented in table 7.8. This in turn may suggest that edge working could represent a response to functional requirements rather than specific form imposition in the guise of symmetry.

Table 7.9 below shows the relationship between site, edge working index and tip shape. The premise being explored here is to see whether there is a correlation between edge working (over the whole LCT) and specific tip shapes – as a marker of overall LCT morphology. This is done in order to establish whether particular LCT morphology (convergent vs non-convergent) can be positively correlated to degrees of edge working, in that if particular LCT forms are shaped through secondary edge working, then the degree of edge working should be grouped in the medium to high or high index groups for particular tip shapes.

		Tip Shape								
		Markedly Convergent	Convergent with a Square Tip	Convergent with an Oblique Tip	Convergent with a Generalised Tip	Wide or Divergent	Wide or Divergent with an Oblique Bit	Wide with Convex Tip	PA[a]	Total
Cave of Hearths *N = 223*	12-24 (low index of edge working)	.0%	.0%	.0%	.9%	2.7%	1.3%	.9%	.0%	5.8%
	25-36 (medium to low index of edge working)	.9%	2.2%	1.3%	3.1%	17.0%	6.3%	1.3%	.0%	32.3%
	37-48 (medium to high index of edge working)	2.7%	7.2%	2.2%	13.0%	8.1%	4.5%	2.7%	.0%	40.4%
	49-60 (high index of edge working)	6.7%	3.6%	.9%	5.8%	1.8%	1.8%	.9%	.0%	21.5%
	Total	**10.3%**	**13.0%**	**4.5%**	**22.9%**	**29.6%**	**13.9%**	**5.8%**	**.0%**	**100.0%**
High Lodge *N = 15*	12-24 (low index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	25-36 (medium to low index of edge working)	6.7%	.0%	6.7%	33.3%	.0%	6.7%	.0%	.0%	53.3%
	37-48 (medium to high index of edge working)	13.3%	.0%	.0%	26.7%	6.7%	.0%	.0%	.0%	46.7%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**20.0%**	**.0%**	**6.7%**	**60.0%**	**6.7%**	**6.7%**	**.0%**	**.0%**	**100.0%**
Warren Hill *N = 548*	12-24 (low index of edge working)	2.4%	.7%	.7%	11.1%	1.5%	.0%	4.6%	.0%	21.0%
	25-36 (medium to low index of edge working)	8.0%	4.6%	5.8%	26.5%	5.8%	.0%	13.3%	.0%	64.1%
	37-48 (medium to high index of edge working)	2.2%	1.3%	.7%	6.6%	1.6%	.0%	2.2%	.0%	14.6%
	49-60 (high index of edge working)	.0%	.0%	.0%	.4%	.0%	.0%	.0%	.0%	.4%
	Total	**12.6%**	**6.6%**	**7.3%**	**44.5%**	**8.9%**	**.0%**	**20.1%**	**.0%**	**100.0%**
Elveden *N = 44*	12-24 (low index of edge working)	2.3%	2.3%	2.3%	20.5%	.0%	.0%	2.3%	4.5%	34.1%
	25-36 (medium to low index of edge working)	13.6%	2.3%	2.3%	38.6%	.0%	.0%	2.3%	.0%	59.1%
	37-48 (medium to high index of edge working)	2.3%	.0%	.0%	4.5%	.0%	.0%	.0%	.0%	6.8%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**18.2%**	**4.5%**	**4.5%**	**63.6%**	**.0%**	**.0%**	**4.5%**	**4.5%**	**100.0%**
Hoxne Upper Industry *N = 24*	12-24 (low index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	4.2%	.0%	4.2%
	25-36 (medium to low index of edge working)	20.8%	.0%	.0%	.0%	.0%	.0%	4.2%	.0%	25.0%
	37-48 (medium to high index of edge working)	20.8%	12.5%	4.2%	.0%	.0%	.0%	4.2%	.0%	41.7%
	49-60 (high index of edge working)	12.5%	.0%	4.2%	4.2%	8.3%	.0%	.0%	.0%	29.2%
	Total	**54.2%**	**12.5%**	**8.3%**	**4.2%**	**8.3%**	**.0%**	**12.5%**	**.0%**	**100.0%**
Et Tabun F *N = 83*	12-24 (low index of edge working)	12.0%	2.4%	.0%	13.3%	3.6%	.0%	8.4%	.0%	39.8%
	25-36 (medium to low index of edge working)	13.3%	1.2%	2.4%	3.6%	3.6%	.0%	4.8%	.0%	28.9%
	37-48 (medium to high index of edge working)	6.0%	1.2%	2.4%	1.2%	.0%	.0%	3.6%	.0%	14.5%
	49-60 (high index of edge working)	7.2%	3.6%	.0%	.0%	.0%	.0%	6.0%	.0%	16.9%
	Total	**38.6%**	**8.4%**	**4.8%**	**18.1%**	**7.2%**	**.0%**	**22.9%**	**.0%**	**100.0%**
Et Tabun Ea - Ed *N = 530*	12-24 (low index of edge working)	3.6%	.8%	.8%	7.2%	1.7%	.2%	5.5%	.2%	19.8%
	25-36 (medium to low index of edge working)	7.7%	1.7%	1.5%	11.3%	2.5%	.0%	8.1%	.4%	33.2%
	37-48 (medium to high index of edge working)	10.4%	3.2%	1.7%	5.8%	.8%	.0%	3.6%	.2%	25.7%
	49-60 (high index of edge working)	9.1%	4.9%	1.5%	2.3%	.2%	.0%	3.4%	.0%	21.3%
	Total	**30.8%**	**10.6%**	**5.5%**	**26.6%**	**5.1%**	**.2%**	**20.6%**	**.8%**	**100.0%**

a.Profoundly Asymmetrical

Table 7.9: Showing the relationship between site, index of edge working and tip shape.

		Tip Shape								
		Markedly Convergent	Convergent with a Square Tip	Convergent with an Oblique Tip	Convergent with a Generalised Tip	Wide or Divergent	Wide or Divergent with an Oblique Bit	Wide with Convex Tip	PA[a]	Total
Broom Pits *N = 912*	12-24 (low index of edge working)	1.9%	2.0%	2.5%	10.7%	.5%	.0%	2.9%	.4%	20.9%
	25-36 (medium to low index of edge working)	8.7%	3.8%	5.0%	32.5%	2.0%	.9%	5.9%	.8%	59.5%
	37-48 (medium to high index of edge working)	3.8%	1.1%	1.4%	8.9%	.5%	.4%	1.3%	.2%	17.8%
	49-60 (high index of edge working)	.9%	.2%	.0%	.5%	.0%	.0%	.1%	.0%	1.8%
	Total	**15.2%**	**7.1%**	**9.0%**	**52.6%**	**3.1%**	**1.3%**	**10.2%**	**1.4%**	**100.0%**
Et Tabun D *N = 6*	12-24 (low index of edge working)	16.7%	.0%	.0%	.0%	16.7%	.0%	.0%	.0%	33.3%
	25-36 (medium to low index of edge working)	.0%	.0%	16.7%	.0%	.0%	.0%	.0%	.0%	16.7%
	37-48 (medium to high index of edge working)	.0%	.0%	16.7%	.0%	.0%	.0%	.0%	.0%	16.7%
	49-60 (high index of edge working)	16.7%	16.7%	.0%	.0%	.0%	.0%	.0%	.0%	33.3%
	Total	**33.3%**	**16.7%**	**33.3%**	**.0%**	**16.7%**	**.0%**	**.0%**	**.0%**	**100.0%**
Pontnewydd Cave *N = 58*	12-24 (low index of edge working)	6.9%	6.9%	1.7%	46.6%	3.4%	.0%	1.7%	1.7%	69.0%
	25-36 (medium to low index of edge working)	5.2%	1.7%	1.7%	15.5%	3.4%	.0%	1.7%	.0%	29.3%
	37-48 (medium to high index of edge working)	.0%	.0%	.0%	1.7%	.0%	.0%	.0%	.0%	1.7%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**12.1%**	**8.6%**	**3.4%**	**63.8%**	**6.9%**	**.0%**	**3.4%**	**1.7%**	**100.0%**
Cuxton *N = 186*	12-24 (low index of edge working)	9.7%	2.2%	2.2%	38.7%	2.2%	.5%	3.8%	1.1%	60.2%
	25-36 (medium to low index of edge working)	4.8%	2.2%	2.2%	16.1%	.5%	1.1%	4.8%	1.1%	32.8%
	37-48 (medium to high index of edge working)	2.7%	.0%	.5%	3.2%	.0%	.0%	.5%	.0%	7.0%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**17.2%**	**4.3%**	**4.8%**	**58.1%**	**2.7%**	**1.6%**	**9.1%**	**2.2%**	**100.0%**
Lynford *N = 51*	12-24 (low index of edge working)	7.8%	.0%	3.9%	29.4%	3.9%	.0%	2.0%	2.0%	49.0%
	25-36 (medium to low index of edge working)	15.7%	3.9%	2.0%	21.6%	.0%	.0%	.0%	.0%	43.1%
	37-48 (medium to high index of edge working)	3.9%	.0%	.0%	3.9%	.0%	.0%	.0%	.0%	7.8%
	49-60 (high index of edge working)	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	Total	**27.5%**	**3.9%**	**5.9%**	**54.9%**	**3.9%**	**.0%**	**2.0%**	**2.0%**	**100.0%**

Total N = 2680

a.Profoundly Asymmetrical

Table 7.9 continued: Showing the relationship between site, index of edge working and tip shape.

Table 7.9 above shows that there does not appear to be a strong relationship between degree of edge working and tip shape through time on the basis of percentages reflecting frequency of occurrence. Indeed, the indices of edge working for all assemblages and tip shapes are predominantly held within the medium to low and low indices for edge working. This would imply that edge working was not utilised as a means of modifying tip shape to any great extent. This in turn suggests that secondary LCT working or shaping was sufficient to achieve the desired LCT form (in terms of tip shape and symmetry – table 7.1) and may support the notion that LCT edge working was restricted to adapting the LCT on a functional level. Alternatively, the lack of edge working seen in relation to tip shape and symmetry may suggest that secondary working of the LCT was not required on any extensive scale to maintain or create the form of LCT required by the knapper. Either way, the results from tables 7.8 and 7.9 would suggest an overall lack of a standardised approach to LCT manufacture and form imposition through tip shape or symmetry through time.

The site by site raw material assessments against artefact size given in Chapter 6 would further imply that raw material did not impose any constraints of LCT production at any of the sites examined for this thesis. Therefore I would suggest that the patterns reflected within this analysis regarding LCT form imposition and knapping strategies are genuine reflections of the archaeological record and not artifices of raw material constraints.

Conclusions

It is now possible to return to the research questions posed at the beginning of this section and summarise the results described above.

- Based on artefact sizes there would not appear to be any evidence for standardisation in artefact dimensions within any of the assemblages examined.
- The investigations regarding standardisation of form imposition through symmetry and particular tip shape show that absolute LCT symmetry has very little presence (less than 8%) across the entire data set. The majority of the LCTs from all the assemblages under interrogation were in fact found to be completely non-symmetrical in form, which would imply that symmetry

played a limited role in LCT production in the Lower *and* Middle Palaeolithic assemblages studied here.

- The most common tip shape from all assemblages were tips with a convergent element to them. When tips with a symmetrical component to their form were compared to tips that were convergent, it was found that the majority of symmetrical tips had a convergent element, with only 3.5% (average calculated from the data presented in tables 7.2 and 7.3) of symmetrical tips in any assemblage being symmetrical independent of a convergent tip. In other words the majority of symmetrical tips were convergent and not symmetrical in their own right. This in turn implies that the symmetry present in the assemblages may have been as much a result of the extra working and shaping relating to producing a convergent tip rather than a deliberate and intended outcome of the knapper.
- It is unclear at this stage whether convergent tips were seen as culturally significant LCT forms, although, given the overall lack of secondary working, shaping and edge working associated with convergent tips it is possible that convergence was a functionally driven form rather than an accepted cultural norm. Therefore, from all the sites ranging from the Lower to Middle Palaeolithic under examination within this thesis there would appear to be an overall lack of a standardised imposition of LCT form through symmetry and tip shape.
- Investigations into the secondary flaking and shaping strategies of LCTs showed that there were four sites (High Lodge, Hoxne Upper Industry, Et Tabun layer D and Cuxton) that did not display any evidence for a standardised approach to secondary working or shaping for the first and second faces of the LCTs under examination. The remaining eight sites (the Cave of Hearths, Warren Hill, Elveden, Et Tabun layers F and Ea – Ed, Broom Pits, Pontnewydd Cave and Lynford) did display similar working strategies for the first and second LCT faces which may indicate a standardisation in LCT production. However, given the lack of standardised form present within each assemblage (in regards to tip shape and symmetry – table 7.1) it may be suggested that the similarity in initial flaking techniques may not represent a culturally sanctioned mode of standardisation in regards to social signalling. Rather this may be evidence of a conceptual

standardisation (McNabb *et al* 2004) in LCT manufacture, although this is far from satisfactorily established.

- In terms of edge working it has been shown that the index for edge working across all the sites was predominantly in the medium to low and low categories which would seem to imply that secondary edge working when present on LCTs did not play a major component in LCT production and may be limited to functional requirements. Furthermore, edge working did not seem to have any clear links to the imposition of symmetry or particular tip form.
- By arranging the sites in all tables in a broadly chronological fashion it has been possible to assess whether patterns relating to symmetry imposition, tip shape, initial and secondary working change in relation to time. The results would seem to indicate that there is no obvious chronological development present within this data. That is to say, there is no indication of any of the criteria discussed above increasing or decreasing in frequency in a progressive manner through time. Rather the data distributions seem to be virtually random in their distribution patterns which may possibly reflect an indication of local adaptations to specific functional requirements for each site at each individual occupation event.

7.2 Flakes and Flake Tools

The research questions posed of the detached pieces data in Chapter 5 were as follows:

- Assess the delineation, distribution, position and extent of retouch on Non-PCT and PCT flakes to gauge the degree of standardised form imposition through retouch upon flake tools.
- Assess the degree of standardisation (in terms of size) present within flake production both within and between Non-PCT and PCT assemblages. This will indicate whether flakes / flake tools were produced to preferred sizes before discard, or whether flake size was more related to the original flake blank.
- Assess the effect of raw material on artefact production.

The answers to these questions will require an analysis of flake proportions, retouch patterns and raw material effects on artefact production for the sites given above as per the methodology given in Chapter 5. An overall total of 5289 flakes and flakes tools were examined with all tables and figures relating to detached pieces below not including broken pieces as per table 6.14 (page 148). Table 7.10 below shows the relationship between detached pieces (flakes, flake tools and debitage) and flake type as described in Chapter 5.

		Flake Type																
		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	**Total**
High Lodge N = 1228	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	23.1%	65.9%	89.0%
	Flake tool	.0%	.5%	1.1%	1.2%	2.5%	.1%	.2%	.0%	.5%	.0%	.0%	1.0%	.0%	1.4%	.0%	.0%	8.6%
	Debitage	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.2%	2.3%	2.4%
	Total	**.0%**	**.5%**	**1.1%**	**1.2%**	**2.5%**	**.1%**	**.2%**	**.0%**	**.5%**	**.0%**	**.0%**	**1.0%**	**.0%**	**1.4%**	**23.3%**	**68.2%**	**100.0%**
Hoxne Upper Industry N = 1272	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	42.0%	35.5%	77.5%
	Flake tool	.2%	1.3%	4.1%	.6%	3.8%	.0%	.2%	.0%	.3%	.0%	.0%	2.5%	.2%	.1%	.1%	.1%	13.4%
	Debitage	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	1.2%	7.9%	9.0%
	Total	**.2%**	**1.3%**	**4.1%**	**.6%**	**3.8%**	**.0%**	**.2%**	**.0%**	**.3%**	**.0%**	**.0%**	**2.5%**	**.2%**	**.1%**	**43.2%**	**43.5%**	**100.0%**
Et Tabun F N = 153	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	2.0%	2.0%
	Flake tool	1.3%	.7%	39.2%	7.8%	29.4%	.0%	6.5%	.0%	.0%	.0%	.0%	5.2%	.0%	3.3%	4.6%	.0%	98.0%
	Total	**1.3%**	**.7%**	**39.2%**	**7.8%**	**29.4%**	**.0%**	**6.5%**	**.0%**	**.0%**	**.0%**	**.0%**	**5.2%**	**.0%**	**3.3%**	**4.6%**	**2.0%**	**100.0%**
Et Tabun Ea - Ed N = 1562	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	1.0%	.1%	.4%	1.5%
	Flake tool	.4%	.4%	42.5%	13.6%	28.7%	.1%	1.9%	4.0%	.1%	.1%	.1%	4.7%	.0%	1.2%	.5%	.1%	98.5%
	Total	**.4%**	**.4%**	**42.5%**	**13.6%**	**28.7%**	**.1%**	**1.9%**	**4.0%**	**.1%**	**.1%**	**.1%**	**4.7%**	**.0%**	**2.2%**	**.6%**	**.5%**	**100.0%**
Et Tabun D N = 84	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	1.2%	.0%	.0%	1.2%
	Flake tool	1.2%	1.2%	17.9%	3.6%	19.0%	.0%	.0%	39.3%	.0%	.0%	.0%	2.4%	.0%	14.3%	.0%	.0%	98.8%
	Total	**1.2%**	**1.2%**	**17.9%**	**3.6%**	**19.0%**	**.0%**	**.0%**	**39.3%**	**.0%**	**.0%**	**.0%**	**2.4%**	**.0%**	**15.5%**	**.0%**	**.0%**	**100.0%**
Creffield Road N = 91	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	85.7%	3.3%	89.0%
	Flake tool	.0%	.0%	1.1%	1.1%	.0%	.0%	1.1%	3.3%	2.2%	.0%	.0%	2.2%	.0%	.0%	.0%	.0%	11.0%
	Total	**.0%**	**.0%**	**1.1%**	**1.1%**	**.0%**	**.0%**	**1.1%**	**3.3%**	**2.2%**	**.0%**	**.0%**	**2.2%**	**.0%**	**.0%**	**85.7%**	**3.3%**	**100.0%**
Pontnewydd Cave N = 300	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.7%	80.0%	1.0%	81.7%
	Flake tool	.7%	1.3%	5.0%	2.0%	2.7%	.7%	.0%	.7%	1.7%	.0%	.0%	2.3%	.0%	.0%	1.3%	.0%	18.3%
	Total	**.7%**	**1.3%**	**5.0%**	**2.0%**	**2.7%**	**.7%**	**.0%**	**.7%**	**1.7%**	**.0%**	**.0%**	**2.3%**	**.0%**	**.7%**	**81.3%**	**1.0%**	**100.0%**
Cuxton N = 386	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	73.1%	5.2%	78.2%
	Flake tool	.8%	1.0%	1.3%	1.0%	1.6%	.0%	.8%	.3%	.5%	.0%	.0%	1.6%	.0%	.8%	2.1%	.0%	11.7%
	Debitage	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	3.9%	6.2%	10.1%
	Total	**.8%**	**1.0%**	**1.3%**	**1.0%**	**1.6%**	**.0%**	**.8%**	**.3%**	**.5%**	**.0%**	**.0%**	**1.6%**	**.0%**	**.8%**	**79.0%**	**11.4%**	**100.0%**
Lynford N = 213	Flake	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	56.8%	32.4%	89.2%
	Flake tool	.0%	.5%	1.9%	.5%	4.7%	.0%	.5%	.0%	1.4%	.0%	.0%	1.4%	.0%	.0%	.0%	.0%	10.8%
	Total	**.0%**	**.5%**	**1.9%**	**.5%**	**4.7%**	**.0%**	**.5%**	**.0%**	**1.4%**	**.0%**	**.0%**	**1.4%**	**.0%**	**.0%**	**56.8%**	**32.4%**	**100.0%**

Total N = 5289

R1 - Denticulated edge
R2 - Denticulated scraper
R3 - Side scraper
R4 - End / Traverse scraper
R5 - Flake with scraper retouch
R6 - Scraper used as wedge
R7 - Retouched point (awl)
R8 - Retouched point (projectile)
R9 - Retouched notch
R10 - Retouch non diagnostic
R11 - Flaked flake or flaked flake spall (burin)
R12 - Multiple tool
R13 - Unretouched flake used as a wedge
R14 - Utilised flake with no retouch
R15 - Flake with edge damage
R16 - Flake with no retouch

Table 7.10: Showing the relationship between site, flakes, flake tools, debitage and flake type.

As can be seen from table 7.10, there are only nine sites where detached pieces (flakes and flake tools) were present within an assemblage and subsequently examined. The debitage pieces whose presence have been noted are those pieces that were above 20mm and generally encompass flakes that were clearly waste products yet their size precluded them from immediate dismissal. Furthermore, rather unsurprisingly it can be seen that there are generally more flakes than flake tools present within all assemblages. The exceptions to this rule are the Et Tabun layers where artefact collection was heavily subjected to collector's bias favoured toward flake tools. Therefore, the Et Tabun data is to be treated with a certain degree of caution when analysing the retouch and its effect on form imposition in tool manufacture and subsequent conclusions relating to hominin behaviour.

In terms of flake type, unretouched flakes fall within categories R14 – R16. The remaining categories (R1 – R13) pertain to flake tools. Where retouch is present, there would appear to be a varied distribution of flake tools through a number of different categories and no particular preference for specific tool types. The exceptions to this rule are the Et Tabun layers F and Ea - Ed where side scrapers are seemingly the preferred tool type and Et Tabun layer D where retouched points are the dominant tool type, although these patterns are probably a result of collector's bias in the sample, rather than a genuine reflection of hominin behaviour.

Table 7.11 below shows the relationship between site, flake type and Toth type (Toth 1985; Chapter 5 page 83). As can be seen, the presence of detached pieces with Toth types 1 – 4 are seen in all the sites represented in table 7.11 (implying that detached pieces from earlier on in the reduction sequence are present in all assemblages). However, the majority of the detached pieces from all the sites are either Toth type 5 (some cortex on dorsal) or 6 (no cortex on dorsal), and are therefore toward the end of the reduction sequence of a core.

		Toth Type						
		1	2	3	4	5	6	**Total**
High Lodge N = 1228	Flake	.0%	4.2%	2.9%	2.9%	51.5%	27.4%	89.0%
	Flake tool	.0%	.1%	.5%	.0%	5.9%	2.1%	8.6%
	Debitage	.0%	.0%	.0%	.2%	.8%	1.4%	2.4%
	Total	**.0%**	**4.3%**	**3.3%**	**3.2%**	**58.2%**	**30.9%**	**100.0%**
Hoxne Upper Industry N = 1272	Flake	.6%	13.4%	4.1%	2.9%	43.3%	13.2%	77.5%
	Flake tool	.0%	1.6%	.7%	.3%	8.5%	2.4%	13.4%
	Debitage	.0%	.9%	.8%	.2%	6.1%	1.1%	9.0%
	Total	**.6%**	**15.9%**	**5.6%**	**3.4%**	**57.9%**	**16.7%**	**100.0%**
Et Tabun F N = 153	Flake	.0%	.0%	.0%	.0%	1.3%	.7%	2.0%
	Flake tool	.0%	13.7%	2.0%	.0%	54.2%	28.1%	98.0%
	Total	**.0%**	**13.7%**	**2.0%**	**.0%**	**55.6%**	**28.8%**	**100.0%**
Et Tabun Ea - Ed N = 1562	Flake	.0%	.0%	.0%	.0%	1.0%	.5%	1.5%
	Flake tool	.1%	13.8%	2.9%	.1%	60.6%	21.1%	98.5%
	Total	**.1%**	**13.8%**	**2.9%**	**.1%**	**61.6%**	**21.6%**	**100.0%**
Et Tabun D N = 84	Flake	.0%	.0%	.0%	.0%	.0%	1.2%	1.2%
	Flake tool	.0%	2.4%	.0%	.0%	19.0%	77.4%	98.8%
	Total	**.0%**	**2.4%**	**.0%**	**.0%**	**19.0%**	**78.6%**	**100.0%**
Creffield Road N = 91	Flake	.0%	2.2%	5.5%	.0%	39.6%	41.8%	89.0%
	Flake tool	.0%	.0%	.0%	.0%	.0%	11.0%	11.0%
	Total	**.0%**	**2.2%**	**5.5%**	**.0%**	**39.6%**	**52.7%**	**100.0%**
Pontnewydd Cave N = 300	Flake	.0%	2.3%	3.0%	3.0%	27.0%	46.3%	81.7%
	Flake tool	.0%	.3%	1.0%	.3%	6.3%	10.3%	18.3%
	Total	**.0%**	**2.7%**	**4.0%**	**3.3%**	**33.3%**	**56.7%**	**100.0%**
Cuxton N = 386	Flake	.0%	8.5%	1.8%	5.4%	56.7%	5.7%	78.2%
	Flake tool	.0%	.8%	.3%	.0%	9.6%	1.0%	11.7%
	Debitage	.0%	.5%	.3%	1.8%	5.4%	2.1%	10.1%
	Total	**.0%**	**9.8%**	**2.3%**	**7.3%**	**71.8%**	**8.8%**	**100.0%**
Lynford N = 213	Flake	.0%	6.6%	2.8%	6.1%	37.1%	36.6%	89.2%
	Flake tool	.0%	.5%	.9%	.0%	3.8%	5.6%	10.8%
	Total	**.0%**	**7.0%**	**3.8%**	**6.1%**	**40.8%**	**42.3%**	**100.0%**

Total N = 5289

Table 7.11: Showing the relationship between site, flake type and Toth type.

Table 7.12 below shows the relationship between the site, raw material and Toth type in order to ascertain whether certain raw materials were treated differently to others in their knapping sequences.

		Toth Type						
		1	2	3	4	5	6	Total
High Lodge N = 1228	Flint / **Total**	**.0%**	**4.3%**	**3.3%**	**3.2%**	**58.2%**	**30.9%**	**100.0%**
Hoxne Upper Industry N = 1272	Flint / **Total**	**.6%**	**15.9%**	**5.6%**	**3.4%**	**57.9%**	**16.7%**	**100.0%**
Et Tabun F N = 153	Flint	.0%	13.1%	2.0%	.0%	49.7%	24.8%	89.5%
	Chert	.0%	.0%	.0%	.0%	5.9%	2.6%	8.5%
	Flint / Chert	.0%	.7%	.0%	.0%	.0%	1.3%	2.0%
	Total	**.0%**	**13.7%**	**2.0%**	**.0%**	**55.6%**	**28.8%**	**100.0%**
Et Tabun Ea - Ed N = 1562	Flint	.1%	12.5%	2.4%	.1%	54.4%	19.3%	88.7%
	Quartzite	.0%	.0%	.0%	.0%	.1%	.0%	.1%
	Chert	.0%	1.2%	.3%	.1%	6.3%	2.2%	10.1%
	Flint / Chert	.0%	.1%	.1%	.0%	.8%	.1%	1.1%
	Total	**.1%**	**13.8%**	**2.9%**	**.1%**	**61.6%**	**21.6%**	**100.0%**
Et Tabun D N = 84	Flint	.0%	2.4%	.0%	.0%	15.5%	60.7%	78.6%
	Chert	.0%	.0%	.0%	.0%	3.6%	17.9%	21.4%
	Total	**.0%**	**2.4%**	**.0%**	**.0%**	**19.0%**	**78.6%**	**100.0%**
Creffield Road N = 91	Flint / **Total**	**.0%**	**2.2%**	**5.5%**	**.0%**	**39.6%**	**52.7%**	**100.0%**
Pontnewydd Cave N = 300	Flint	.0%	.0%	1.0%	.3%	2.3%	4.0%	7.7%
	Dacite	.0%	.0%	.0%	.0%	.3%	1.0%	1.3%
	Feldspar Phyric Lava	.0%	.3%	.0%	.0%	5.7%	8.0%	14.0%
	Quartz	.0%	.0%	.0%	.0%	.0%	.3%	.3%
	Rhyolitic Tuff	.0%	.0%	.3%	.3%	3.0%	3.3%	7.0%
	Chert	.0%	.0%	.0%	.0%	.7%	.0%	.7%
	Tuff	.0%	.0%	.7%	.3%	.3%	2.3%	3.7%
	Crystal Tuff	.0%	.0%	.0%	.0%	1.0%	3.3%	4.3%
	Crystal Lithic Tuff	.0%	.0%	.3%	.3%	1.7%	3.7%	6.0%
	Microdiorite	.0%	.0%	.0%	.0%	.0%	1.7%	1.7%
	Rhyolitic Lava	.0%	.3%	.3%	.0%	1.3%	2.0%	4.0%
	Ignimbrite	.0%	.3%	.3%	.7%	5.3%	5.7%	12.3%
	Silicic Tuff	.0%	.7%	.0%	.0%	.0%	2.7%	3.3%
	Baked Shale	.0%	.0%	.0%	.0%	.0%	.3%	.3%
	Siltstone	.0%	.0%	.0%	.0%	.0%	2.0%	2.0%
	Fine Silicic Tuff	.0%	.3%	.0%	.0%	5.3%	9.0%	14.7%
	Sandstone	.0%	.0%	.0%	.7%	1.7%	1.7%	4.0%
	Rhyolite	.0%	.3%	.3%	.7%	2.3%	3.7%	7.3%
	Crystal Pumice Tuff	.0%	.0%	.0%	.0%	1.0%	.7%	1.7%
	Flow Banded Rhyolite	.0%	.0%	.0%	.0%	.3%	1.0%	1.3%
	Carboniferous Chert	.0%	.3%	.3%	.0%	.3%	.0%	1.0%
	Basalt	.0%	.0%	.0%	.0%	.3%	.0%	.3%
	Andesite	.0%	.0%	.0%	.0%	.0%	.3%	.3%
	Limestone	.0%	.0%	.3%	.0%	.0%	.0%	.3%
	Mudstone	.0%	.0%	.0%	.0%	.3%	.0%	.3%
	Total	**.0%**	**2.7%**	**4.0%**	**3.3%**	**33.3%**	**56.7%**	**100.0%**
Cuxton N = 386	Flint / **Total**	**.0%**	**9.8%**	**2.3%**	**7.3%**	**71.8%**	**8.8%**	**100.0%**
Lynford N = 213	Flint / **Total**	**.0%**	**7.0%**	**3.8%**	**6.1%**	**40.8%**	**42.3%**	**100.0%**

Total N = 5289

Table 7.12: Showing the relationship between site, raw material and Toth type.

Perhaps unsurprisingly table 7.12 above shows that the majority of detached pieces from the sites under study are from flint nodules with the exceptions being Pontnewydd

Cave and the Et Tabun layers. Table 7.12 further shows that where there is a difference in raw material, a range of flake types were extracted from each raw material, suggesting that there may have been no preference or restriction limiting certain flake types to specific raw materials. The fact that the majority of the detached pieces fall under the Toth categories of 5 and 6 (partial cortical or no cortex respectively – tables 7.11 and 7.12) for all the raw material types, may suggest that the majority of the cores were initially reduced elsewhere and then brought to the sites for finally working. However, I stress the speculative nature of this comment, and do not assert it as a fixed behavioural trait.

In terms of the technological make up of the detached pieces for the sites under study, table 7.13 below show the details.

		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	Total
		Flake Type																
High Lodge N = 1228	Non-PCT / **Total**	**.0%**	**.5%**	**1.1%**	**1.2%**	**2.5%**	**.1%**	**.2%**	**.0%**	**.5%**	**.0%**	**.0%**	**1.0%**	**.0%**	**1.4%**	**23.3%**	**68.2%**	**100.0%**
Hoxne Upper Industry N = 1272	Non-PCT / **Total**	**.2%**	**1.3%**	**4.1%**	**.6%**	**3.8%**	**.0%**	**.2%**	**.0%**	**.3%**	**.0%**	**.0%**	**2.5%**	**.2%**	**.1%**	**43.2%**	**43.5%**	**100.0%**
Et Tabun F N = 153	Non-PCT	1.3%	.7%	38.6%	7.8%	24.8%	.0%	5.2%	.0%	.0%	.0%	.0%	5.2%	.0%	1.3%	3.9%	2.0%	90.8%
	PCT	.0%	.0%	.7%	.0%	3.3%	.0%	1.3%	.0%	.0%	.0%	.0%	.0%	.0%	2.0%	.7%	.0%	7.8%
	PCT?	.0%	.0%	.0%	.0%	1.3%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	1.3%
	Total	**1.3%**	**.7%**	**39.2%**	**7.8%**	**29.4%**	**.0%**	**6.5%**	**.0%**	**.0%**	**.0%**	**.0%**	**5.2%**	**.0%**	**3.3%**	**4.6%**	**2.0%**	**100.0%**
Et Tabun Ea - Ed N = 1562	Non-PCT	.4%	.4%	34.3%	12.4%	22.2%	.1%	1.7%	3.0%	.1%	.1%	.0%	4.0%	.0%	1.0%	.5%	.4%	80.6%
	PCT	.0%	.1%	5.4%	.4%	4.2%	.0%	.1%	.8%	.0%	.0%	.1%	.3%	.0%	.5%	.1%	.0%	11.8%
	PCT?	.0%	.0%	2.9%	.8%	2.4%	.0%	.1%	.2%	.0%	.0%	.0%	.4%	.0%	.7%	.0%	.1%	7.6%
	Total	**.4%**	**.4%**	**42.5%**	**13.6%**	**28.7%**	**.1%**	**1.9%**	**4.0%**	**.1%**	**.1%**	**.1%**	**4.7%**	**.0%**	**2.2%**	**.6%**	**.5%**	**100.0%**
Et Tabun D N = 84	Non-PCT	1.2%	.0%	7.1%	.0%	2.4%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	10.7%
	PCT	.0%	1.2%	9.5%	2.4%	16.7%	.0%	.0%	39.3%	.0%	.0%	.0%	2.4%	.0%	13.1%	.0%	.0%	84.5%
	PCT?	.0%	.0%	1.2%	1.2%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	2.4%	.0%	.0%	4.8%
	Total	**1.2%**	**1.2%**	**17.9%**	**3.6%**	**19.0%**	**.0%**	**.0%**	**39.3%**	**.0%**	**.0%**	**.0%**	**2.4%**	**.0%**	**15.5%**	**.0%**	**.0%**	**100.0%**
Creffield Road N = 91	Non-PCT	.0%	.0%	1.1%	1.1%	.0%	.0%	1.1%	.0%	1.1%	.0%	.0%	.0%	.0%	.0%	61.5%	3.3%	69.2%
	PCT	.0%	.0%	.0%	.0%	.0%	.0%	.0%	3.3%	1.1%	.0%	.0%	2.2%	.0%	.0%	24.2%	.0%	30.8%
	Total	**.0%**	**.0%**	**1.1%**	**1.1%**	**.0%**	**.0%**	**1.1%**	**3.3%**	**2.2%**	**.0%**	**.0%**	**2.2%**	**.0%**	**.0%**	**85.7%**	**3.3%**	**100.0%**
Pontnewydd Cave N = 300	Non-PCT	.7%	.7%	3.7%	2.0%	1.7%	.7%	.0%	.0%	1.3%	.0%	.0%	.7%	.0%	.7%	66.7%	1.0%	79.7%
	PCT	.0%	.7%	1.0%	.0%	1.0%	.0%	.0%	.7%	.3%	.0%	.0%	1.3%	.0%	.0%	11.0%	.0%	16.0%
	PCT?	.0%	.0%	.3%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.3%	.0%	.0%	3.7%	.0%	4.3%
	Total	**.7%**	**1.3%**	**5.0%**	**2.0%**	**2.7%**	**.7%**	**.0%**	**.7%**	**1.7%**	**.0%**	**.0%**	**2.3%**	**.0%**	**.7%**	**81.3%**	**1.0%**	**100.0%**
Cuxton N = 386	Non-PCT / **Total**	**.8%**	**1.0%**	**1.3%**	**1.0%**	**1.6%**	**.0%**	**.8%**	**.3%**	**.5%**	**.0%**	**.0%**	**1.6%**	**.0%**	**.8%**	**79.0%**	**11.4%**	**100.0%**
Lynford N = 213	Non-PCT	.0%	.5%	1.4%	.5%	4.7%	.0%	.5%	.0%	1.4%	.0%	.0%	1.4%	.0%	.0%	55.9%	31.9%	98.1%
	PCT?	.0%	.0%	.5%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.9%	.5%	1.9%
	Total	**.0%**	**.5%**	**1.9%**	**.5%**	**4.7%**	**.0%**	**.5%**	**.0%**	**1.4%**	**.0%**	**.0%**	**1.4%**	**.0%**	**.0%**	**56.8%**	**32.4%**	**100.0%**

Total N = 5289

R1 - Denticulated edge
R2 - Denticulated scraper
R3 - Side scraper
R4 - End / Traverse scraper
R5 - Flake with scraper retouch
R6 - Scraper used as wedge
R7 - Retouched point (awl)
R8 - Retouched point (projectile)
R9 - Retouched notch
R10 - Retouch non diagnostic
R11 - Flaked flake or flaked flake spall (burin)
R12 - Multiple tool
R13 - Unretouched flake used as a wedge
R14 - Utilised flake with no retouch
R15 - Flake with edge damage
R16 - Flake with no retouch

Table 7.13: Showing the relationship between site, flake technology and flake type. Non-PCT – detached pieces completely non prepared core technology in nature; PCT – detached pieces prepared core technology in nature; PCT? Detached pieces that display some aspects of prepared core technology however cannot be described as definitively PCT in nature.

From table 7.13 above it is clear that where retouch is present, and apart from the Et Tabun layers, there does not seem to be a particular tool type related to any particular technology (Non-PCT, PCT or PCT?).The range of flake types through technology types may suggest that the desired end products were functionally driven, where the hominins were producing tools for a specific purpose, through whichever knapping technology suited the production of that artefact. This in turn may suggest that the hominins involved were adaptable enough in their knapping strategies to produce flakes that were required for the job at hand through the easiest manufacture process for them at that time. For Et Tabun layer D, there is a clear preference for retouched points and PCT flakes, however this is to be expected as a retouched point is predominantly the result of PCT manufacturing processes. In addition, the strong correlation between retouched points and layer D in terms of total assemblage make up is probably a result of collector's bias toward Levallois points and the samples examined rather than a genuine reflection of flake tool preference within the layer D assemblage.

Interestingly Et Tabun layers Ea – Ed have some retouched points that are Non-PCT in technology, these artefacts are flakes that are shaped through retouch to resemble a classic PCT retouched point, however they were manufactured through Non-PCT processes. This in turn may suggest that the hominin knappers had a clear intention to produce points irrespective of technological ability. The broad chronological arrangement of the sites in table 7.13 would appear to suggest that based on this data set, PCT appeared in the archaeological record significantly earlier in the Middle East than in Britain, although this is more likely a reflection of assemblage choice for this thesis than a genuine hominin behavioural trend. A further tendency to note from table 7.13 is that once PCT enters the archaeological record they generally seem to form a comparatively small component of the overall assemblage when compared to Non- PCT artefacts. This may further suggest that the hominins involved were adaptable enough in their knapping strategies to produce flakes that were required for the job at hand through the easiest manufacture process for them at that time, and were not locked into specific technological constraints or processes. Or indeed, the pattern of PCT presence within the data set may be a reflection of more prosaic local factors such as raw material availability or constraint. Although the raw material analysis for each site in Appendix 2 may suggests that where a range of raw material is present (such as Pontnewydd Cave), it may not hugely influence the presence of PCT manufacture as PCT manufacture is found on a variety of materials (table A2.70).

Table 7.14 below shows the relationship between site, flake technology and raw material where it can be seen that where PCT is present, it is knapped from as diverse a range of raw material as Non-PCT flakes.

	High Lodge	Hoxne Upper Industry	Et Tabun F				Et Tabun Ea - Ed				Et Tabun D				Creffield Road			Pontnewydd Cave				Cuxton	Lynford		
	N = 1228	N = 1272	N = 153				N = 1562				N = 84				N = 91			N = 300				N = 386	N = 213		
Raw Material	Non-PCT / Total	Non-PCT / Total	Non-PCT	PCT	PCT?	Total	Non-PCT	PCT	PCT?	Total	Non-PCT	PCT	PCT?	Total	Non-PCT	PCT	Total	Non-PCT	PCT	PCT?	Total	Non-PCT / Total	Non-PCT	PCT?	Total
Flint	**100.0%**	**100.0%**	81.0%	7.2%	1.3%	**89.5%**	72.3%	10.0%	6.5%	**88.7%**	4.8%	70.2%	3.6%	**78.6%**	69.2%	30.8%	**100.0%**	6.7%	.7%	.3%	**7.7%**	**100.0%**	98.1%	1.9%	**100.0%**
Quartzite							.1%			**.1%**															
Dacite																		.7%	.7%		**1.3%**				
Feldspar Phyric Lava																		11.7%	2.0%	.3%	**14.0%**				
Quartz																		.3%			**.3%**				
Rhyolitic Tuff																		6.0%	.3%	.7%	**7.0%**				
Chert			7.8%	.7%		**8.5%**	7.5%	1.8%	.8%	**10.1%**	6.0%	14.3%	1.2%	**21.4%**				.7%			**.7%**				
Flint / Chert			2.0%			**2.0%**	.8%	.1%	.3%	**1.1%**															
Tuff																		3.0%	.7%		**3.7%**				
Crystal Tuff																		2.7%	1.3%	.3%	**4.3%**				
Crystal Lithic Tuff																		5.0%	.7%	.3%	**6.0%**				
Microdiorite																		.3%	1.3%		**1.7%**				
Rhyolitic Lava																		3.0%	1.0%		**4.0%**				
Ignimbrite																		11.0%	1.3%		**12.3%**				
Silicic Tuff																		2.3%	1.0%		**3.3%**				
Baked Shale																		.3%			**.3%**				
Siltstone																		2.0%			**2.0%**				
Fine Silicic Tuff																		11.7%	2.0%	1.0%	**14.7%**				
Sandstone																		3.3%	.3%	.3%	**4.0%**				
Rhyolite																		4.7%	2.0%	.7%	**7.3%**				
Crystal Pumice Tuff																		1.3%	.3%		**1.7%**				
Flow Banded Rhyolite																		1.3%			**1.3%**				
Carboniferous Chert																		1.0%			**1.0%**				
Basalt																		.3%			**.3%**				
Andesite																		.3%			**.3%**				
Limestone																			.3%		**.3%**				
Mudstone																				.3%	**.3%**				
Total	**100.0%**	**100.0%**	**90.8%**	**7.8%**	**1.3%**	**100.0%**	**80.6%**	**11.8%**	**7.6%**	**100.0%**	**10.7%**	**84.5%**	**4.8%**	**100.0%**	**69.2%**	**30.8%**	**100.0%**	**79.7%**	**16.0%**	**4.3%**	**100.0%**	**100.0%**	**98.1%**	**1.9%**	**100.0%**

Total N = 5289

Table 7.14: Showing the relationship between site, raw material and flake technology. 0% values have been left blank for ease of interpretation within this large table.

This in turn would suggest that raw material constraints did not adversely affect the pattern of Non-PCT and PCT production and the comparatively small degree of PCT within the flake assemblages is a genuine reflection of flake production rather than raw material constraint.

Figure 7.5 shows the relationship between site, flake size, technology type and flake type.

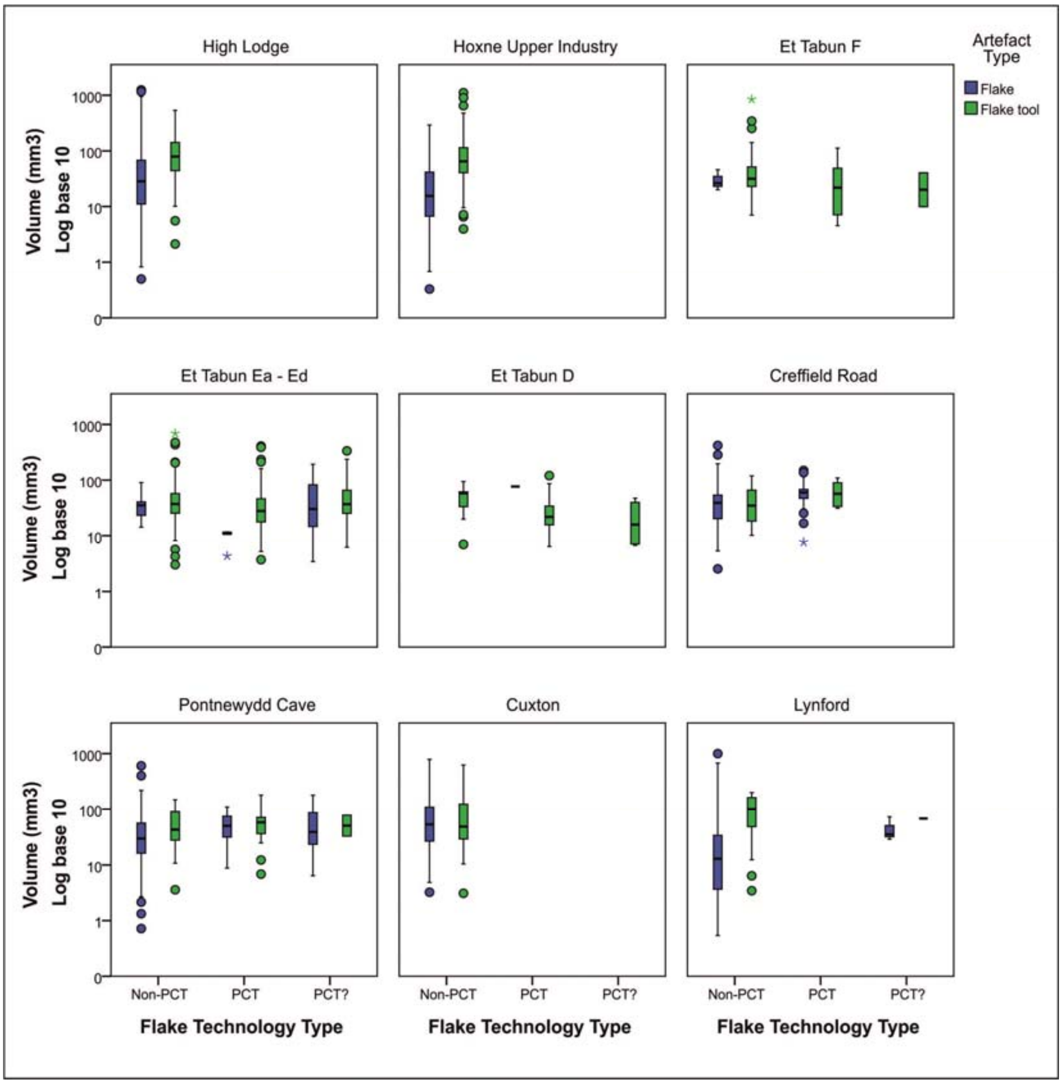


Figure 7.5: Showing the relationship between site, flake size, flake technology and flake type. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000 Log base 10.

From figure 7.5 it can be seen that there does not appear to be a clear correlation between flake size and flake type. This may be seen in that flakes and flake tools appear to have similar ranges in size (except for Et Tabun where collectors bias shows favour toward flake tools). Similarly, there would not appear to be a correlation between flake type and flake technology in that (where applicable), Non-PCT, PCT and PCT? are present through a range of flake and flake tool sizes. Although PCT and PCT? flake tools do seem to be more similar in terms of overall size to each other than to Non- PCT flakes. In other words, figure 7.5 would seem to imply a general lack of standardisation in flake and flake tool production for Non-PCT, PCT and PCT? categories. Where collectors bias is not a critical factor in examining the data in figure 7.5 it can seen that on the whole flake tools would appear to be smaller in size than normal unretouched flakes, perhaps illustrating the reductive impact of retouch along the flake edge.

Table 7.15 below illustrates the relationship between retouch presence on the flake edge, site and flake technology type.

		Retouch present on left edge			Retouch present on distal edge			Retouch present on right edge			Retouch present on proximal edge		
		Yes	No	**Total**	Yes	No	**Total**	Yes	No	**Total**	Yes	No	**Total**
High Lodge N = 88	Non-PCT / **Total**	**50.0%**	**50.0%**	**100.0%**	**58.0%**	**42.0%**	**100.0%**	**45.5%**	**54.5%**	**100.0%**	**4.5%**	**95.5%**	**100.0%**
Hoxne Upper Industry N = 166	Non-PCT / **Total**	**79.5%**	**20.5%**	**100.0%**	**75.3%**	**24.7%**	**100.0%**	**79.5%**	**20.5%**	**100.0%**	**13.3%**	**86.7%**	**100.0%**
Et Tabun F N = 138	Non-PCT	56.5%	36.2%	**92.8%**	55.8%	37.0%	**92.8%**	60.9%	31.9%	**92.8%**	6.5%	86.2%	**92.8%**
	PCT	5.1%	.7%	**5.8%**	4.3%	1.4%	**5.8%**	5.8%	.0%	**5.8%**	1.4%	4.3%	**5.8%**
	PCT?	1.4%	.0%	**1.4%**	1.4%	.0%	**1.4%**	1.4%	.0%	**1.4%**	.0%	1.4%	**1.4%**
	Total	**63.0%**	**37.0%**	**100.0%**	**61.6%**	**38.4%**	**100.0%**	**68.1%**	**31.9%**	**100.0%**	**8.0%**	**92.0%**	**100.0%**
Et Tabun Ea - Ed N = 1511	Non-PCT	49.4%	31.9%	**81.3%**	46.2%	35.1%	**81.3%**	53.7%	27.6%	**81.3%**	5.7%	75.6%	**81.3%**
	PCT	9.3%	2.4%	**11.7%**	6.0%	5.7%	**11.7%**	8.4%	3.3%	**11.7%**	1.4%	10.3%	**11.7%**
	PCT?	4.8%	2.3%	**7.0%**	4.2%	2.8%	**7.0%**	5.1%	1.9%	**7.0%**	.6%	6.4%	**7.0%**
	Total	**63.4%**	**36.6%**	**100.0%**	**56.4%**	**43.6%**	**100.0%**	**67.2%**	**32.8%**	**100.0%**	**7.7%**	**92.3%**	**100.0%**
Et Tabun D N = 71	Non-PCT	11.3%	1.4%	**12.7%**	9.9%	2.8%	**12.7%**	8.5%	4.2%	**12.7%**	2.8%	9.9%	**12.7%**
	PCT	78.9%	5.6%	**84.5%**	33.8%	50.7%	**84.5%**	69.0%	15.5%	**84.5%**	5.6%	78.9%	**84.5%**
	PCT?	.0%	2.8%	**2.8%**	1.4%	1.4%	**2.8%**	1.4%	1.4%	**2.8%**	.0%	2.8%	**2.8%**
	Total	**90.1%**	**9.9%**	**100.0%**	**45.1%**	**54.9%**	**100.0%**	**78.9%**	**21.1%**	**100.0%**	**8.5%**	**91.5%**	**100.0%**
Creffield Road N = 10	Non-PCT	30.0%	10.0%	**40.0%**	30.0%	10.0%	**40.0%**	.0%	40.0%	**40.0%**	.0%	40.0%	**40.0%**
	PCT	50.0%	10.0%	**60.0%**	20.0%	40.0%	**60.0%**	50.0%	10.0%	**60.0%**	10.0%	50.0%	**60.0%**
	Total	**80.0%**	**20.0%**	**100.0%**	**50.0%**	**50.0%**	**100.0%**	**50.0%**	**50.0%**	**100.0%**	**10.0%**	**90.0%**	**100.0%**
Pontnewydd Cave N = 51	Non-PCT	27.5%	39.2%	**66.7%**	25.5%	41.2%	**66.7%**	31.4%	35.3%	**66.7%**	.0%	66.7%	**66.7%**
	PCT	19.6%	9.8%	**29.4%**	17.6%	11.8%	**29.4%**	23.5%	5.9%	**29.4%**	.0%	29.4%	**29.4%**
	PCT?	2.0%	2.0%	**3.9%**	3.9%	.0%	**3.9%**	2.0%	2.0%	**3.9%**	.0%	3.9%	**3.9%**
	Total	**49.0%**	**51.0%**	**100.0%**	**47.1%**	**52.9%**	**100.0%**	**56.9%**	**43.1%**	**100.0%**	**.0%**	**100.0%**	**100.0%**
Cuxton N = 34	Non-PCT / **Total**	**41.2%**	**58.8%**	**100.0%**	**55.9%**	**44.1%**	**100.0%**	**55.9%**	**44.1%**	**100.0%**	**2.9%**	**97.1%**	**100.0%**
Lynford N = 23	Non-PCT	65.2%	30.4%	**95.7%**	52.2%	43.5%	**95.7%**	73.9%	21.7%	**95.7%**	4.3%	91.3%	**95.7%**
	PCT?	.0%	4.3%	**4.3%**	.0%	4.3%	**4.3%**	4.3%	.0%	**4.3%**	.0%	4.3%	**4.3%**
	Total	**65.2%**	**34.8%**	**100.0%**	**52.2%**	**47.8%**	**100.0%**	**78.3%**	**21.7%**	**100.0%**	**4.3%**	**95.7%**	**100.0%**

Total N = 2092

Table 7.15: Showing the relationship between site, technology type and retouch edge presence.

Table 7.15 shows the number of flake tools per site that have retouch. Where retouch is present across all assemblages it would appear to be focused on more than one edge with no obvious bias or preference for a particular side regardless of the technology of production. Although the exception to this would appear to be the proximal edges that have an expected tendency not to be retouched to any great degree in comparison to the left, distal and right flake edges. The apparent lack of pattern to the data concerning retouch presence and technology of flake production could imply that retouch was imposed upon an artefact simply to perform a particular task at the time of imposition regardless of flake production technique. Although retouch delineation, distribution, position and extent are examined in greater detail below.

Retouch Delineation

Table 7.16 below shows the relationship between site and retouch delineation (as defined in Chapter 5) per flake edge.

		Site								
		High Lodge N = 88	Hoxne Upper Industry N = 166	Et Tabun F N = 138	Et Tabun Ea - Ed N = 1511	Et Tabun D N = 71	Creffield Road N = 10	Pontnewydd Cave N = 51	Cuxton N = 34	Lynford N = 23
Left	Rectilinear	1.1%	.0%	7.2%	5.2%	.0%	.0%	.0%	.0%	.0%
	Convex	4.5%	17.5%	20.3%	15.8%	28.2%	.0%	2.0%	.0%	4.3%
	Concave	1.1%	2.4%	2.9%	1.9%	5.6%	.0%	.0%	.0%	.0%
	Notched	8.0%	6.0%	2.9%	1.1%	4.2%	10.0%	5.9%	2.9%	4.3%
	Denticulated	6.8%	12.0%	2.9%	2.2%	2.8%	10.0%	21.6%	8.8%	13.0%
	Saw	.0%	.0%	.0%	.2%	.0%	.0%	.0%	.0%	.0%
	Cran	.0%	.6%	.7%	.1%	.0%	.0%	.0%	.0%	.0%
	Shoulder	4.5%	3.6%	2.9%	1.7%	1.4%	10.0%	.0%	2.9%	.0%
	Nosed	1.1%	.6%	1.4%	.2%	.0%	.0%	.0%	.0%	.0%
	Tongue	.0%	1.8%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	Irregular	21.6%	33.7%	17.4%	29.3%	39.4%	50.0%	19.6%	26.5%	39.1%
	Regular	1.1%	1.2%	4.3%	5.8%	8.5%	.0%	.0%	.0%	4.3%
	None	50.0%	20.5%	37.0%	36.6%	9.9%	20.0%	51.0%	58.8%	34.8%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Distal	Rectilinear	3.4%	2.4%	2.2%	3.6%	.0%	.0%	.0%	2.9%	.0%
	Convex	12.5%	13.3%	13.8%	12.0%	5.6%	.0%	3.9%	.0%	8.7%
	Concave	.0%	4.2%	1.4%	1.0%	.0%	.0%	2.0%	2.9%	.0%
	Notched	3.4%	4.8%	2.2%	.3%	.0%	.0%	3.9%	5.9%	8.7%
	Denticulated	3.4%	16.3%	1.4%	1.5%	.0%	.0%	3.9%	.0%	4.3%
	Shoulder	4.5%	2.4%	5.8%	5.6%	.0%	20.0%	2.0%	5.9%	4.3%
	Nosed	9.1%	7.8%	15.2%	14.6%	23.9%	10.0%	7.8%	8.8%	.0%
	Tongue	.0%	3.0%	.0%	.5%	.0%	.0%	.0%	.0%	4.3%
	Irregular	19.3%	19.9%	17.4%	14.4%	15.5%	20.0%	21.6%	26.5%	21.7%
	Regular	2.3%	.6%	2.2%	3.0%	.0%	.0%	2.0%	2.9%	.0%
	None	42.0%	25.3%	38.4%	43.6%	54.9%	50.0%	52.9%	44.1%	47.8%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Right	Rectilinear	2.3%	2.4%	12.3%	5.2%	2.8%	.0%	2.0%	.0%	.0%
	Convex	6.8%	18.7%	13.0%	20.8%	21.1%	.0%	3.9%	2.9%	17.4%
	Concave	3.4%	1.2%	3.6%	1.9%	.0%	.0%	.0%	2.9%	.0%
	Notched	4.5%	6.6%	2.2%	.7%	1.4%	20.0%	7.8%	.0%	8.7%
	Denticulated	13.6%	15.1%	5.8%	2.5%	2.8%	.0%	9.8%	20.6%	13.0%
	Saw	.0%	1.2%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	Cran	.0%	1.2%	.0%	.1%	.0%	.0%	2.0%	.0%	.0%
	Shoulder	.0%	3.0%	.0%	2.3%	1.4%	.0%	.0%	11.8%	4.3%
	Nosed	.0%	3.6%	.0%	.1%	.0%	.0%	2.0%	.0%	4.3%
	Tongue	.0%	1.2%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	Irregular	12.5%	24.1%	24.6%	26.1%	39.4%	30.0%	23.5%	14.7%	30.4%
	Regular	2.3%	1.2%	6.5%	7.3%	9.9%	.0%	5.9%	2.9%	.0%
	None	54.5%	20.5%	31.9%	32.8%	21.1%	50.0%	43.1%	44.1%	21.7%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Proximal	Rectilinear	.0%	.0%	.7%	.0%	.0%	.0%	.0%	.0%	.0%
	Convex	1.1%	1.8%	.7%	1.6%	2.8%	.0%	.0%	.0%	.0%
	Concave	.0%	.0%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	Notched	.0%	.0%	.7%	.2%	.0%	.0%	.0%	.0%	.0%
	Denticulated	.0%	.6%	.0%	.2%	.0%	.0%	.0%	.0%	.0%
	Shoulder	.0%	1.2%	.0%	.3%	.0%	.0%	.0%	.0%	.0%
	Nosed	2.3%	1.8%	1.4%	1.9%	.0%	.0%	.0%	.0%	.0%
	Tang (straight)	.0%	.0%	.0%	.0%	1.4%	.0%	.0%	.0%	.0%
	Irregular	1.1%	7.8%	4.3%	3.3%	4.2%	10.0%	.0%	2.9%	4.3%
	Regular	.0%	.0%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	None	95.5%	86.7%	92.0%	92.3%	91.5%	90.0%	100.0%	97.1%	95.7%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Total N = 2092

Table 7.16: Showing the relationship between site, and retouch delineation per flake edge.

From table 7.16 above it is clear that there are a range of retouch delineations for the left, distal and right edges from all the sites where retouch tools are present. The range of retouch delineations on the proximal edges were more limited and mostly irregular in character. For the left, distal and right edges the most common form of retouch delineation across all sites would also appear to be irregular retouch. Irregular retouch is an unstructured form of retouch and probably related to the knapper following the shape of the original flake edge rather than imposing any particular preconceived form. Interestingly, denticulated and convex retouch delineations are the next most popular retouch types across all sites except Creffield Road (table 7.16). Both denticulated and convex retouch delineations impose a very specific and clear form to the flake edge - either a jagged denticulated edge or a convex curve, however, the collected samples from Et Tabun aside, these retouch delineations do not form a large component of the overall flake tool assemblages.

As mentioned previously, the artefacts from Et Tabun are the result of heavy collection bias, and therefore the percentages of the retouch tools seen within these assemblages must not be taken as definitive indications of hominin behaviour, as the true make up of the originally knapped assemblage is unknown. The generally mixed nature of retouch delineations seen across all the sites in table 7.16 may indicate that retouch imposed on flake edges was a response to requirement, rather than imposing a particular socially mediated standardised form on the flake tools.

Retouch distribution

Table 7.17 below show the relationship between site, retouch distribution (as defined in Chapter 5) and flake edge.

		Site								
		High Lodge N = 88	Hoxne Upper Industry N = 166	Et Tabun F N = 138	Et Tabun Ea - Ed N = 1511	Et Tabun D N = 71	Creffield Road N = 10	Pontnewydd Cave N = 51	Cuxton N = 34	Lynford N = 23
Left	Discontinuous	.0%	1.2%	1.4%	.9%	7.0%	20.0%	3.9%	.0%	.0%
	Total	28.4%	65.7%	41.3%	49.2%	33.8%	.0%	33.3%	17.6%	21.7%
	Partial	21.6%	12.7%	20.3%	13.2%	49.3%	60.0%	11.8%	23.5%	43.5%
	None	50.0%	20.5%	37.0%	36.6%	9.9%	20.0%	51.0%	58.8%	34.8%
	Total %	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Distal	Discontinuous	.0%	1.8%	.7%	.1%	.0%	.0%	.0%	.0%	.0%
	Total	39.8%	56.6%	48.6%	48.1%	42.3%	30.0%	39.2%	41.2%	26.1%
	Partial	18.2%	16.9%	12.3%	8.1%	2.8%	20.0%	7.8%	14.7%	26.1%
	None	42.0%	24.7%	38.4%	43.6%	54.9%	50.0%	52.9%	44.1%	47.8%
	Total %	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Right	Discontinuous	.0%	2.4%	.0%	.7%	5.6%	10.0%	.0%	.0%	.0%
	Total	28.4%	63.3%	55.1%	55.1%	31.0%	10.0%	27.5%	32.4%	52.2%
	Partial	17.0%	13.9%	13.0%	11.4%	42.3%	30.0%	29.4%	23.5%	26.1%
	None	54.5%	20.5%	31.9%	32.8%	21.1%	50.0%	43.1%	44.1%	21.7%
	Total %	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Proximal	Discontinuous	.0%	1.2%	.0%	.1%	1.4%	.0%	.0%	.0%	.0%
	Total	3.4%	6.6%	7.2%	5.6%	2.8%	10.0%	.0%	.0%	.0%
	Partial	1.1%	5.4%	.7%	2.1%	4.2%	.0%	.0%	2.9%	4.3%
	None	95.5%	86.7%	92.0%	92.3%	91.5%	90.0%	100.0%	97.1%	95.7%
	Total %	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Total N = 2092

Table 7.17: Showing the relationship between site, and retouch distribution per flake edge.

From table 7.17 it can be seen that where retouch is present on a flake it is predominantly ‘total’ or ‘partial’ in character across all sites except Creffield Road where discontinuous retouch seems to play an increased role (although this may be the result of a much smaller artefact sample). The sites where retouch distribution as a majority over all the flake edges are described as ‘total’ are High Lodge, Hoxne Upper Industry, Et Tabun F, Et Tabun layers F, Ea-Ed and D, and Cuxton. Total retouch implies that the entire edge of the flake has been retouched and may indicate (on its own) that form was being applied to the flake. However, given the range of retouch delineations in table 7.17 above, deliberate form imposition may be unlikely. Interestingly the Lynford flake tools show a preference for partial retouch on the left edge, and a total preference for the right edge. Such a pattern may indicate that the right edge was the preferred edge for use, with some use of the left edges, although such an assumption on hominin behaviour is pure speculation.

Where retouch is present, the proximal edges display a mixed preference for retouch delineation across the sites. Certainly, one clear pattern from tables 7.16 and 7.17 is that for all the sites where retouch flakes were part of the studied assemblage, there does not appear to have been a uniform method of distributing retouch along the flake edges, and the range of retouch delineations found on each flake edge across all sites may further suggest an apparently random imposition of retouch on the flake tools. Alternatively, such a range in retouch delineation and distribution types may reflect some sort of prehensile requirement, user preference or blank by blank variation in edge morphology. Whatever the reason, I think that the non-standardised pattern of retouch imposition continues to support the hypothesis mentioned above that retouch appears to be imposed on flake tools as a response to use or functional requirement, rather than producing an aesthetic tool form. If retouch were imposed in relation to particular tool forms it would be expected that retouch delineations and distributions would display a much more uniform and standardised pattern than those seen in tables 7.16 and 7.17.

Retouch Position

Table 7.18 below shows the relationship between site, retouch position (as defined in Chapter 5) and flake edge.

		Site								
		High Lodge N = 88	Hoxne Upper Industry N = 166	Et Tabun F N = 138	Et Tabun Ea - Ed N = 1511	Et Tabun D N = 71	Creffield Road N = 10	Pontnewydd Cave N = 51	Cuxton N = 34	Lynford N = 23
Left	Direct	39.8%	46.4%	53.6%	57.1%	62.0%	30.0%	43.1%	26.5%	39.1%
	Inverse	10.2%	4.8%	5.1%	3.6%	12.7%	40.0%	5.9%	14.7%	26.1%
	Alternating	.0%	27.1%	2.9%	2.3%	14.1%	10.0%	.0%	.0%	.0%
	Bifacial	.0%	1.2%	1.4%	.3%	1.4%	.0%	.0%	.0%	.0%
	Crossed	.0%	.0%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	None	50.0%	20.5%	37.0%	36.6%	9.9%	20.0%	51.0%	58.8%	34.8%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Distal	Direct	51.1%	41.6%	54.3%	53.7%	31.0%	20.0%	43.1%	44.1%	34.8%
	Inverse	5.7%	6.6%	6.5%	1.5%	8.5%	30.0%	3.9%	11.8%	17.4%
	Alternating	1.1%	26.5%	.7%	1.1%	5.6%	.0%	.0%	.0%	.0%
	Crossed	.0%	.6%	.0%	.0%	.0%	.0%	.0%	.0%	.0%
	None	42.0%	24.7%	38.4%	43.6%	54.9%	50.0%	52.9%	44.1%	47.8%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Right	Direct	33.0%	40.4%	63.8%	63.3%	49.3%	20.0%	49.0%	41.2%	60.9%
	Inverse	11.4%	5.4%	3.6%	2.0%	18.3%	20.0%	7.8%	11.8%	13.0%
	Alternating	.0%	33.1%	.7%	1.7%	11.3%	10.0%	.0%	2.9%	4.3%
	Bifacial	1.1%	.6%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	Crossed	.0%	.0%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	None	54.5%	20.5%	31.9%	32.8%	21.1%	50.0%	43.1%	44.1%	21.7%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Proximal	Direct	3.4%	9.6%	7.2%	6.8%	7.0%	.0%	.0%	2.9%	4.3%
	Inverse	1.1%	1.2%	.0%	.4%	1.4%	10.0%	.0%	.0%	.0%
	Alternating	.0%	2.4%	.7%	.5%	.0%	.0%	.0%	.0%	.0%
	Bifacial	.0%	.0%	.0%	.1%	.0%	.0%	.0%	.0%	.0%
	None	95.5%	86.7%	92.0%	92.3%	91.5%	90.0%	100.0%	97.1%	95.7%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Total N = 2902

Table 7.18: Showing the relationship site, and retouch position per flake edge.

Table 7.18 shows that where retouch was present on a flake edge, direct retouch was clearly the overall preferred choice across all sites and edges except Creffield Road where inverse retouch holds a marginally more dominant position in the assemblage. Direct and inverse retouch positions are the simplest ways to impose retouch upon a flake edge as it requires working from one direction only. Interestingly, Hoxne Upper Industry displays a propensity for alternating retouch on all the flake edges. The presence of alternating retouch implies a fairly complicated form of retouch where along an edge the knapper is putting retouch on the dorsal and ventral sides of the flake in an alternating fashion. This would suggest a very deliberate style of retouch imposed on flake tools, however, the mixed retouch delineations and distributions in tables 7.16 and 7.17 would argue against any culturally meaningful associations with retouch imposition. Given that direct and inverse retouch positions are the easiest and least work positions to impose retouch upon a flake, table 7.18 would seem to support the hypothesis set out above that retouch appears to be imposed on flake tools as a response to use, rather than particular tool form.

Retouch Extent

Table 7.19 below shows the relationship between site, retouch extent (as defined in Chapter 5) and flake edge.

		Site								
		High Lodge N = 88	Hoxne Upper Industry N = 166	Et Tabun F N = 138	Et Tabun Ea - Ed N = 1511	Et Tabun D N = 71	Creffield Road N = 10	Pontnewydd Cave N = 51	Cuxton N = 34	Lynford N = 23
Left	Short	42.0%	49.4%	47.1%	52.5%	67.6%	80.0%	49.0%	26.5%	26.1%
	Long	4.5%	22.3%	10.9%	6.6%	8.5%	.0%	.0%	8.8%	21.7%
	Invasive	3.4%	7.8%	5.1%	4.2%	14.1%	.0%	.0%	5.9%	17.4%
	None	50.0%	20.5%	37.0%	36.6%	9.9%	20.0%	51.0%	58.8%	34.8%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Distal	Short	47.7%	49.4%	55.1%	49.7%	33.8%	50.0%	47.1%	50.0%	21.7%
	Long	5.7%	21.1%	3.6%	4.0%	2.8%	.0%	.0%	2.9%	21.7%
	Invasive	4.5%	4.8%	2.9%	2.6%	8.5%	.0%	.0%	2.9%	8.7%
	None	42.0%	24.7%	38.4%	43.6%	54.9%	50.0%	52.9%	44.1%	47.8%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Right	Short	34.1%	54.8%	52.2%	55.5%	56.3%	40.0%	56.9%	35.3%	39.1%
	Long	4.5%	19.9%	10.1%	7.1%	11.3%	10.0%	.0%	8.8%	39.1%
	Invasive	6.8%	4.8%	5.8%	4.5%	11.3%	.0%	.0%	11.8%	.0%
	None	54.5%	20.5%	31.9%	32.8%	21.1%	50.0%	43.1%	44.1%	21.7%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Proximal	Short	4.5%	11.4%	6.5%	6.9%	7.0%	10.0%	.0%	2.9%	.0%
	Long	.0%	1.2%	.0%	.4%	.0%	.0%	.0%	.0%	4.3%
	Invasive	.0%	.6%	1.4%	.3%	1.4%	.0%	.0%	.0%	.0%
	None	95.5%	86.7%	92.0%	92.3%	91.5%	90.0%	100.0%	97.1%	95.7%
	Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Total N = 2092

Table 7.19: Showing the relationship between site, and retouch extent per flake edge.

Table 7.19 shows that where retouch is present on a flake, a short extent was the preferred option across all sites and edges. Short retouch is not invasive across the surface of the flake and therefore is limited to edge manipulation only. The next most common retouch position appears to be long across all sites and all edges except the proximal edge for Et Tabun layer D. This leaves invasive retouch as the least common form of retouch experienced across all the sites and edges. Long and invasive retouch extend much farther across the surfaces of the flake in comparison to short retouch and their presence may indicate a much more invested attention to detail in shaping the edge. However, their comparative minority status within the flake tool assemblages would indicate that this extended attention to edge detail and shaping may not have played a significant role in flake tool production.

Furthermore, the mixed ranges of retouch extents seen within all sites except Lynford would further support the hypothesis that retouch may have been imposed as a functional response rather than cultural typology. Lynford however, seems to display a more standardised approach to retouch extent possibly suggesting that in retouch extent at least, the Lynford hominins were producing retouched flakes to more of a socially sanctioned template. However, given the small sample size of flake tool and the lack of standardisation evidence in the retouch delineation, distribution and position for Lynford this is difficult to assert with any degree of confidence. Overall the pattern of retouch extent would seem to support the idea that retouch appears to be imposed on flake tools as a response to use, rather than particular tool form.

Conclusions

It is now possible to return to the research questions posed at the beginning of this section and summarise the results described above.

- From the results seen in this broad flake analysis (and supported in Chapter 6 and Appendix 2 through the more detailed site by site investigation) it would appear that raw material did not affect Non-PCT and PCT flake production. This is based on the presence of similar ranges in flake types across a range of raw materials where variation in raw materials was present (Chapter 6 raw material graphs). Furthermore, similar sizes of PCT flakes were present within assemblages with raw material differences and those that had a homogenous raw material presence.

- Given that the range in flake sizes for Non- PCT and PCT flakes in each assemblage had similar internal ranges it would appear that standardisation in flake size was not clearly evident within any assemblage. Furthermore, given the range of Non-PCT and PCT flake sizes were similar across relevant assemblages, it would imply that raw material did not adversely affect flake production regardless of flake technology.
- From the retouch analysis, it is evident that standardisation in retouch application is largely absent in retouch delineation, distribution, position and extent from all sites and all edges. Rather the apparently random imposition of retouch delineations, distributions, positions and extents could suggest that retouch was may have been imposed as a response to functional requirement (although this is far from certain) rather than to impose a culturally meaningful typology upon the flake tools as would be expected if retouch were applied to the flakes in a standardised fashion. The presence of PCT flakes within the Et Tabun layers, Creffield Road and Pontnewydd Cave do however represent fundamental shifts in attitude toward flake production on a technological front. A key observation in spite of this technological shift is that they appear to have been treated the same as Non-PCT flakes in terms of retouch presence on each flake edge (personal observation, table 7.15 above). The behavioural implications of this shall be discussed in greater detail in the next chapter.

7.3 Cores

Given that the majority of cores can be presumed to not be the intended or derived artefact product (core tools aside), the amount of analysis and features recorded for cores in relation to the overall aims of this thesis are greatly reduced. Therefore, the research questions posed of the core data in Chapter 5 were as follows:

- Establish whether a preferred core type was being produced within each assemblage by classifying all cores according to table 5.1 (page 92). This in turn would allow an insight into whether cores were reduced in a particular manner (in the case of **A** core types – table 5.1) or whether the knappers were reducing cores to a preferred template in regards to final core morphology (core categories **B** and **C** – table 5.1) based on an assessment of core typology.

- Assess the effect of raw material on core size and whether this changes in relation to time and geography, and Non-PCT to PCT, in order to examine the possibilities of bias towards particular raw materials.
- Assess the degree of standardisation (in terms of size) present within the cores from all groups (Non-PCT to PCT) in order to assess changes through time.

The answers to these questions will require an analysis of core typology in conjunction with artefact proportion, and raw material on core types for the sites given above as per the methodology given in Chapter 5. All tables and figures relating to cores below do not include broken pieces as per table 6.14 (page 148) where a total of 449 cores (426) and core tools (23) were analysed from a maximum of eight sites where full assemblages were examined.

Table 7.20 below shows the relationship between site, Non-PCT generic cores, Non-PCT fixed margin cores and PCT cores.

		High Lodge		Hoxne Upper Industry						Et Tabun F					
		N = 121		N = 27						N = 38					
		Core / Total		Core		Core tool		**Total**		Core		Core tool		**Total**	
Non-PCT Core - Generic Type	A1 - Alternate	**8**	***7.0%***	2	*7.4%*	2	*7.4%*	**4**	***14.8%***	1	*5.0%*	0	*.0%*	**1**	***5.0%***
	A2 - Alternate and Parallel	**52**	***45.2%***	5	*18.5%*	3	*11.1%*	**8**	***29.6%***	1	*5.0%*	0	*.0%*	**1**	***5.0%***
	A3 - Parallel single platform	**9**	***7.8%***	0	*.0%*	0	*.0%*	**0**	***.0%***	7	*35.0%*	1	*5.0%*	**8**	***40.0%***
	A4 - Parallel multiple platform	**1**	***.9%***	0	*.0%*	1	*3.7%*	**1**	***3.7%***	1	*5.0%*	0	*.0%*	**1**	***5.0%***
	A5 - Single	**12**	***10.4%***	0	*.0%*	0	*.0%*	**0**	***.0%***	1	*5.0%*	0	*.0%*	**1**	***5.0%***
	A6 - Mixture of A1 - A5	**24**	***20.9%***	5	*18.5%*	2	*7.4%*	**7**	***25.9%***	4	*20.0%*	0	*.0%*	**4**	***20.0%***
	A7 - Other non-PCT	**9**	***7.8%***	3	*11.1%*	4	*14.8%*	**7**	***25.9%***	4	*20.0%*	0	*.0%*	**4**	***20.0%***
	Total	**115**	***100.0%***	**15**	***55.6%***	**12**	*44.4%*	**27**	***100.0%***	**19**	***95.0%***	**1**	***5.0%***	**20**	***100.0%***
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	**1**	***16.7%***	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	B2 - Discoid	**4**	***66.7%***	0	*.0%*	0	*.0%*	**0**	***.0%***	6	*42.9%*	0	*.0%*	**6**	***42.9%***
	B3 - Other	**1**	***16.7%***	0	*.0%*	0	*.0%*	**0**	***.0%***	8	*57.1%*	0	*.0%*	**8**	***57.1%***
	Total	**6**	***100.0%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**14**	***100.0%***	**0**	***.0%***	**14**	***100.0%***
PCT Core Type	C1- Radial	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***	1	*25.0%*	0	*.0%*	**1**	***25.0%***
	C2 - Convergent	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	C3 - Parallel / laminar	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***	3	*75.0%*	0	*.0%*	**3**	***75.0%***
	C3a - Simple prepared cores	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	C4 - Other	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	Total	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**4**	***100.0%***	**0**	***.0%***	**4**	***100.0%***

Table 7.20: Showing the relationship between site, Non-PCT generic cores, Non-PCT fixed margin cores and PCT cores.

		Et Tabun Ea - Ed						Et Tabun D		Creffield Road		Pontnewydd Cave		Cuxton		Lynford	
		N = 128						N = 15		N = 8		N = 76		N = 28		N = 8	
		Core		Core tool		Total		Core / Total		Core / Total		Core / Total		Core / Total		Core / Total	
Non-PCT Core - Generic Type	A1 - Alternate	2	5.7%	2	5.7%	**4**	***11.4%***	**0**	***.0%***	**0**	***.0%***	**1**	***3.3%***	**4**	***16.0%***	**0**	***.0%***
	A2 - Alternate and Parallel	2	5.7%	0	.0%	**2**	***5.7%***	**1**	***50.0%***	**0**	***.0%***	**3**	***10.0%***	**7**	***28.0%***	**1**	***33.3%***
	A3 - Parallel single platform	7	20.0%	0	.0%	**7**	***20.0%***	**0**	***.0%***	**0**	***.0%***	**4**	***13.3%***	**1**	***4.0%***	**0**	***.0%***
	A4 - Parallel multiple platform	2	5.7%	0	.0%	**2**	***5.7%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**1**	***4.0%***	**0**	***.0%***
	A5 - Single	1	2.9%	0	.0%	**1**	***2.9%***	**0**	***.0%***	**0**	***.0%***	**16**	***53.3%***	**3**	***12.0%***	**0**	***.0%***
	A6 - Mixture of A1 - A5	7	20.0%	2	5.7%	**9**	***25.7%***	**0**	***.0%***	**0**	***.0%***	**4**	***13.3%***	**8**	***32.0%***	**2**	***66.7%***
	A7 - Other non-PCT	9	25.7%	1	2.9%	**10**	***28.6%***	**1**	***50.0%***	**0**	***.0%***	**2**	***6.7%***	**1**	***4.0%***	**0**	***.0%***
	Total	**30**	***85.7%***	**5**	***14.3%***	**35**	***100.0%***	**2**	***100.0%***	**0**	***.0%***	**30**	***100.0%***	**25**	***100.0%***	**3**	***100.0%***
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	1	1.4%	0	.0%	**1**	***1.4%***	**1**	***33.3%***	**0**	***.0%***	**1**	***3.4%***	**0**	***.0%***	**0**	***.0%***
	B2 - Discoid	16	23.2%	0	.0%	**16**	***22.9%***	**0**	***.0%***	**0**	***.0%***	**14**	***48.3%***	**0**	***.0%***	**2**	***40.0%***
	B3 - Other	51	72.9%	2	2.9%	**53**	***75.7%***	**2**	***66.7%***	**1**	***100.0%***	**14**	***48.3%***	**2**	***100.0%***	**3**	***60.0%***
	Total	**68**	***97.1%***	**2**	***2.9%***	**70**	***100.0%***	**3**	***100.0%***	**1**	***100.0%***	**29**	***100.0%***	**2**	***100.0%***	**5**	***100.0%***
PCT Core Type	C1- Radial	5	21.7%	1	4.3%	**6**	***26.1%***	**2**	***20.0%***	**4**	***57.1%***	**16**	***94.1%***	**0**	***.0%***	**0**	***.0%***
	C2 - Convergent	0	.0%	0	.0%	**0**	***.0%***	**2**	***20.0%***	**3**	***42.9%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***
	C3 - Parallel / laminar	9	39.1%	1	4.3%	**10**	***43.5%***	**4**	***40.0%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***
	C3a - Simple prepared cores	7	30.4%	0	.0%	**7**	***30.4%***	**1**	***10.0%***	**0**	***.0%***	**0**	***.0%***	**1**	***100.0%***	**0**	***.0%***
	C4 - Other	0	.0%	0	.0%	**0**	***.0%***	**1**	***10.0%***	**0**	***.0%***	**1**	***5.9%***	**0**	***.0%***	**0**	***.0%***
	Total	**21**	***91.3%***	**2**	***8.7%***	**23**	***100.0%***	**10**	***100.0%***	**7**	***100.0%***	**17**	***100.0%***	**1**	***100.0%***	**0**	***.0%***

Total N = 449

Table 7.20 continued: Showing the relationship between site, Non-PCT generic cores, Non-PCT fixed margin cores and PCT cores.

Table 7.20 above shows that for each site, there are a variety of core types being produced, through a variety of methods. This would therefore suggest an overall trend across the data set that there is no preference for particular core type (morphology, or method of reduction) from any site examined (table 7.20), although there are some individual site differences to this general trend within PCT cores (see below).

For the sites where PCT was not present, (High Lodge, Hoxne Upper Industry and Lynford) High Lodge and Lynford show cores that are Non-PCT but have a fixed margin, whilst Hoxne Upper Industry just had Non-PCT generic cores. The spread of core types within these three sites seem to be fairly varied (within cores and core tools) with a possible slight preference for an alternate and parallel manufacturing technique at High Lodge and Hoxne Upper Industry. Lynford does not seem to show a particular preference for any one core type (fixed margin or generic) over any other.

Where PCT was present within site cores, (Et Tabun layers, Creffield Road, Pontnewydd Cave and Cuxton) with the exceptions of Et Tabun layer D and Creffield Road, the PCT cores would seem to mimic the pattern seen within the flake data in that they form a comparatively small component of the overall core assemblage. Furthermore, within the Non-PCT cores at these sites, there would appear to be no clear preferences for core type. Within the PCT data however, there would appear to be some unambiguous preferences for particular core types: parallel / laminar cores being the dominant preferences within the PCT cores from all the Et Tabun layers, convergent and Radial from Creffield Road and Radial from Pontnewydd Cave. It is worth noting the preferred PCT types from each site reflect the preferred PCT flake types from each site, suggesting that manufacturing for particular tool types was carried out at each PCT site.

In terms of examining the cores from all assemblages for any form of standardisation in artefact size, figure 7.6 below shows the relationship between site, core length and width, and core type.

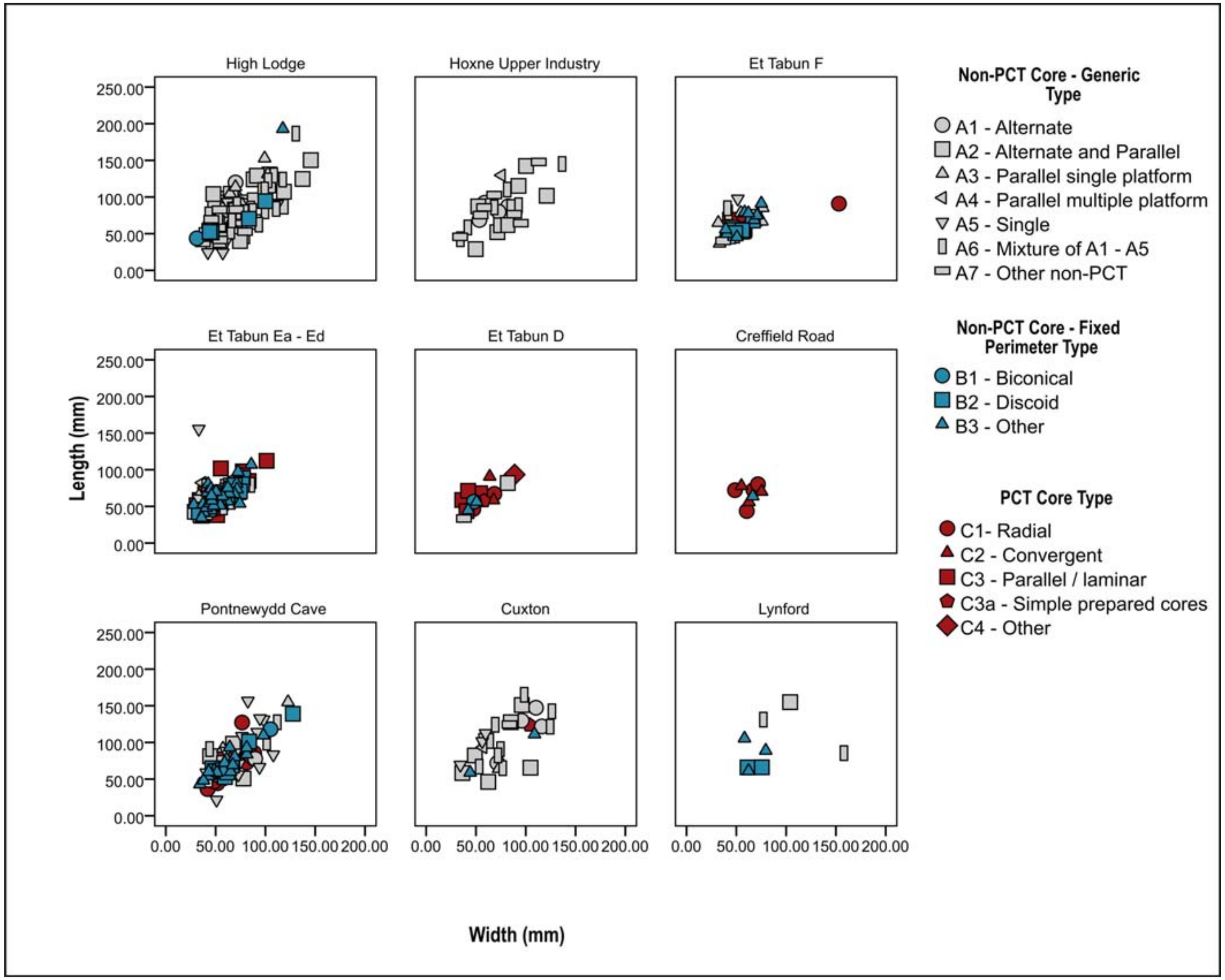


Figure 7.6: Showing the relationship between site and core size.

From figure 7.6 it can be seen that the Non-PCT and PCT cores for High Lodge, Hoxne Upper Industry, Pontnewydd Cave, Cuxton and Lynford are reduced to a variety of core sizes regardless of technology type. For the Et Tabun layers and Creffield Road figure 7.6 implies that the cores are reduced to similar 'standardised' sizes (within their own assemblages) however, this may be a false impression of the data, and more a result of relatively small sample sizes (Creffield Road), or biased sample collection (Et Tabun). In addition, Appendix 2 shows the individual plots for core sizes for each site on a larger scale, which would suggest that the core sizes were not grouped as closely as seen in figure 7.6.

In terms of raw material, figures 7.7- 7.9 below show the relationship between site, core volume and raw material.

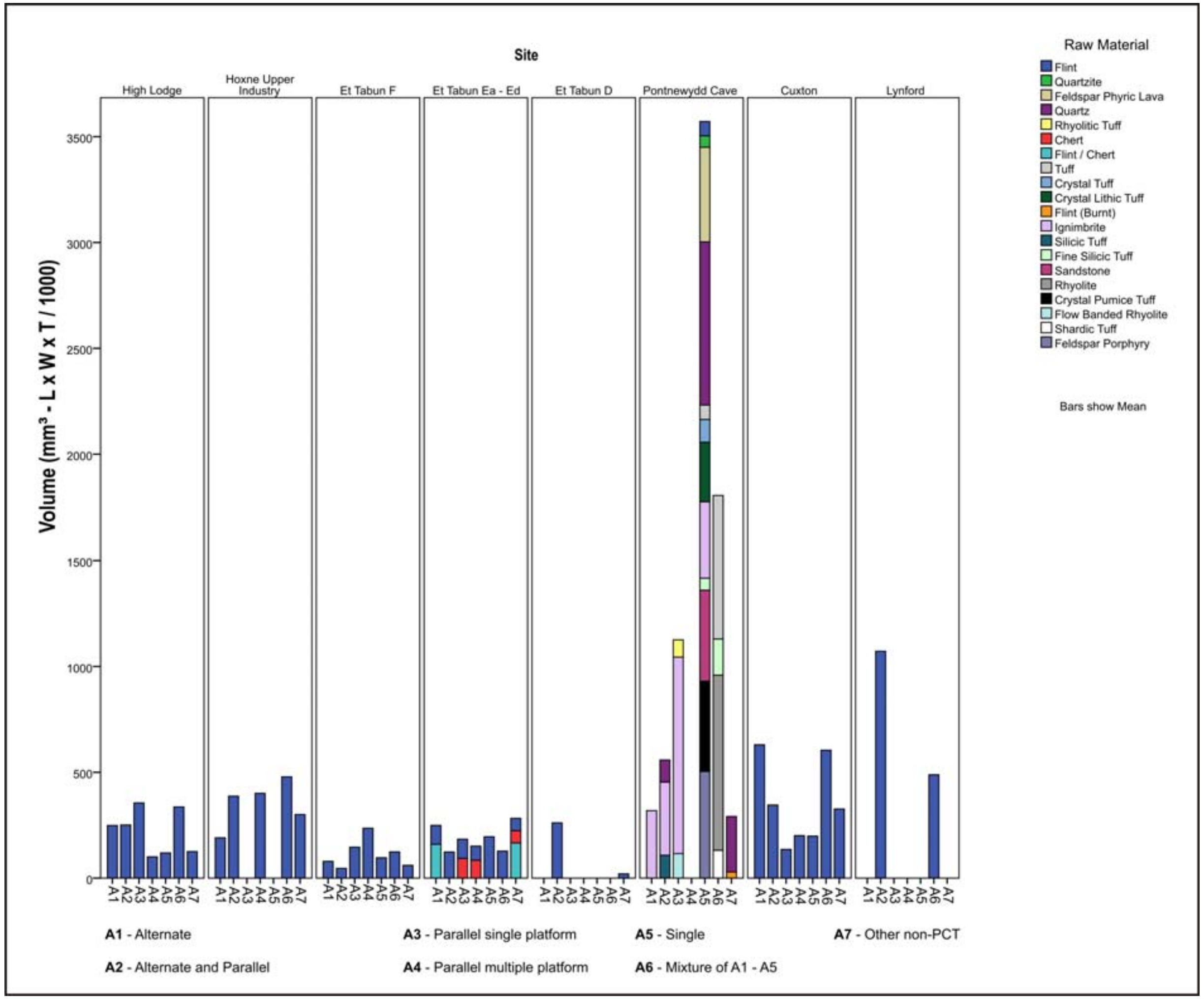


Figure 7.7: Showing the relationship between site, core volume, raw material and Non-PCT generic cores. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000.

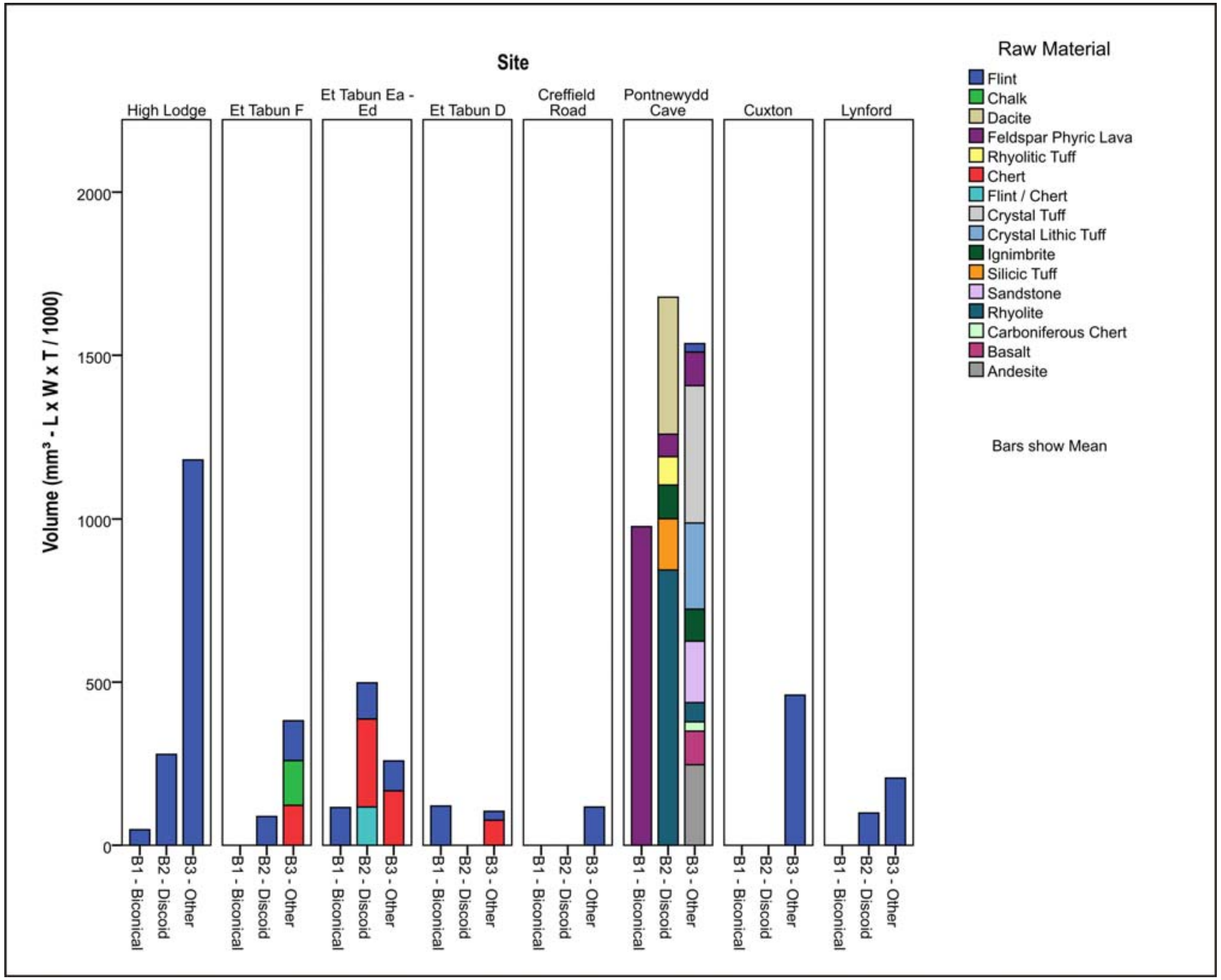


Figure 7.8: Showing the relationship between site, core volume, raw material and Non-PCT fixed margin cores. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000.

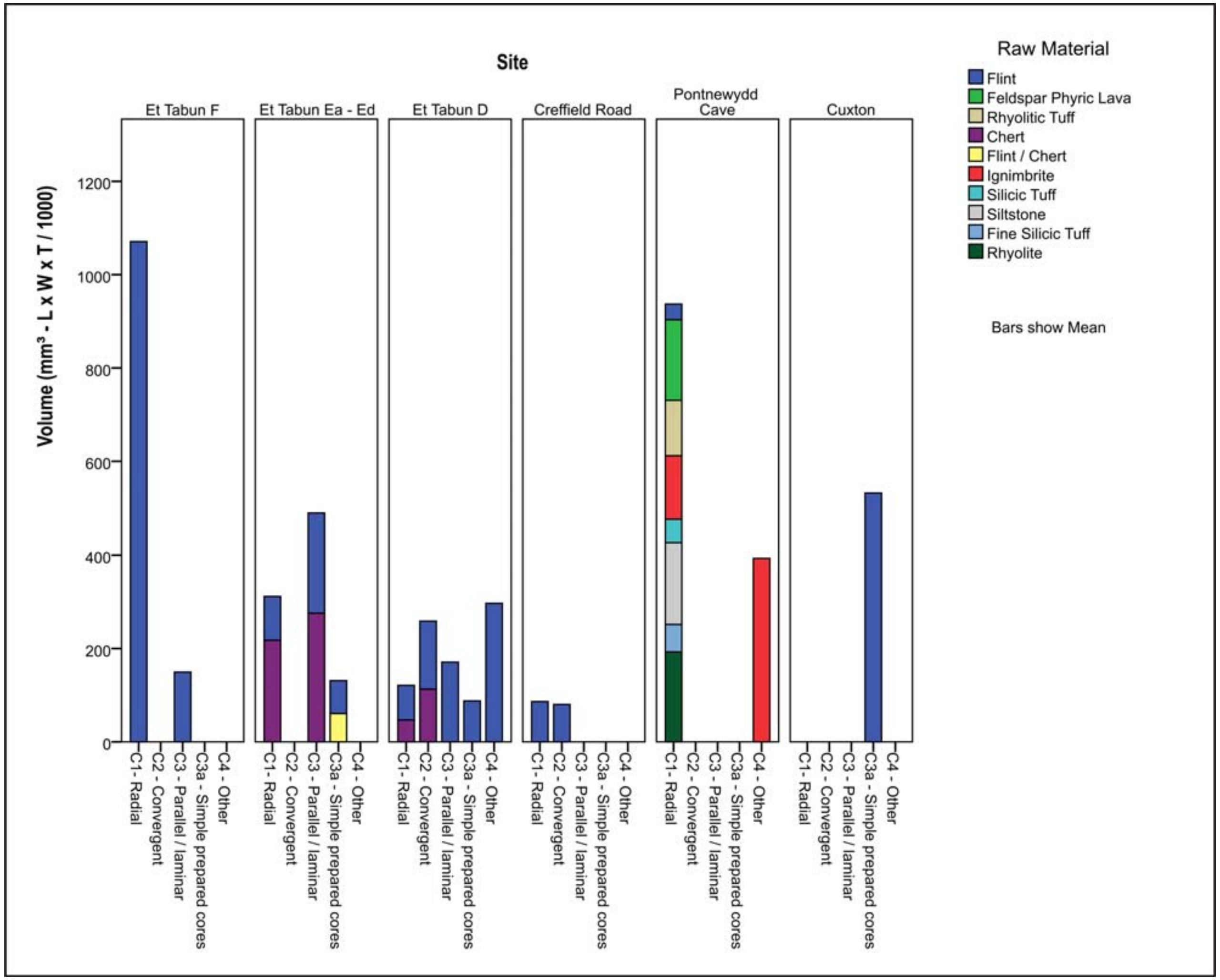


Figure 7.9: Showing the relationship between site, core volume, raw material and PCT cores. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000.

Based on the raw material overview in Chapter 6 for each site and figures 7.7 – 7.9 showing artefact type and raw material above it is, I hope, clear that the hominins of each assemblage were able to reduce the cores in a variety of techniques producing a range of core types across a range of raw materials. In other words, the hominin knappers appear to be able to make anything the may have wanted to, on any raw material, using the most appropriate technique of reduction for that particular instance of knapping, with no clear preference for a particular reductive technique or end core morphology. Perhaps the only pattern worth reiterating is that the flint cores from Pontnewydd were greatly reduced in comparison to other raw materials. This in turn may suggest that flint was in short supply at the site and subsequently the flint cores were worked to a greater degree than the other raw materials present.

Conclusions

It is now possible to return to the research questions posed at the beginning of this section and summarise the results described above.

- The results presented above would seem to indicate that there would not appear to be any degree of standardisation in discarded core form given that there were no preferred or prevalent core typologies present within any assemblage irrespective of reductive (technological) technique from this data set.
- From the results presented above and in Appendix 2, there would not appear to be an adverse impact on core reduction from any technology complex or raw material. Where more than one raw material was present at the site, hominins seemed to be able to reduce the cores to a varying degree of size irrespective of raw material type. The only real relationship between core size and raw material is the presence of greatly reduced flint cores at Pontnewydd Cave, where flint cores were clearly worked and reduced to a much greater extent than the surrounding raw materials.
- From the results presented above and in Appendix 2, there would not appear to be any degree of standardisation in core size regardless of raw material or techno type at any stage represented within this data base.

7.4 Summary

The purpose of this chapter was to present a summary of the results of the lithic analysis conducted for this thesis (presented in full in Appendix 2). From the results presented above I have shown that LCT symmetry and form imposition through a standardised system of knapping would appear to be largely absent in the archaeological record. Similarly, deliberate form imposition through retouch and secondary working does not seem to be present to any great extent within flakes or flake tools. Cores would also appear to lack a standardised system of working and reduction in size. Given the lack of standardisation in artefact form and production across all artefact types, I would suggest that there does not seem to be any clear evidence within the artefacts to suggest that socio-cultural practices held a dominant influence on artefact production at any of the sites examined for this thesis.

The next chapter shall discuss the implications of the lithic analysis for the Identity Model and the predictions given in table 4.3 for how it relates to the archaeological record.

Chapter 8 – Discussion of Lithic Analysis

Through the Methodology discussed in Chapter 5, and the lithic analysis results presented in Chapters 6 and 7 it has been possible to test some of the predictions laid out in table 4.3 (Chapter 4 pages 74 - 75) for how the Identity Model relates to the archaeological record.

To reiterate an earlier point, the empirical methodology / data collection / analysis were aimed at examining and testing whether or not the Identity Model related to the archaeological record in table 4.3 for material culture categories 2 and 3, and by inference, 1, 4 and 5. The reader should refer back to table 4.3 which describes the predictions for how the Identity Model correlates to the archaeological record for material culture categories 2 and 3.

The main principle that was examined and tested within the lithic analysis summarised in Chapter 7 was:

- When did material culture become incorporated within systems of social communication? The implications being that such a use of material culture would indicate that a sense of an intex and a perpetuated intex had been realised within a collective identity and a third-order of intentionality as a minimum had been achieved.

In order to test the premise stated above against the archaeological record, it has been assumed that the greater the degree of standardised form imposition within an assemblage of artefacts (for example: LCT symmetry), the greater the extent social signalling was embodied within the artefact; the artefact then becomes a vehicle for social communication. A tentative example of such standardised assemblages may potentially be seen in the twisted ovates described by White (1998). White (1998) cautiously postulates that the twisted ovate assemblages of the British Isles dated to late Oxygen Isotope Stage 11 or early Oxygen Isotope Stage 10 may be evidence for a standardised tradition of manufacture given that they would appear to be associated with social import apparently free of raw material constraint. Within Palaeolithic academic discourse it has often been assumed that as the Acheulean (material culture category 2) progresses, symmetry on LCTs exponentially increases through time into the Middle

Palaeolithic (Saragusti *et al* 1998; Hodgson 2009), and that therefore, symmetrical LCTs provide the clearest example for lithic artefacts imbued with social meaning. Certainly if standardised forms of LCT morphology or manufacture are important on a social level (as is suggested in discussions relating to LCT symmetry - Saragusti *et al* 1998; Hodgson 2009), then it would be expected that clear patterns would appear in the data grouping artefacts of similar morphology and manufacturing technique together.

According to the Identity Model, this would indicate that the hominins concerned had attained a third-order of intentionality through the realisation of their intex and use of their perpetuated intex within a social environment governed by a collective identity (table 4.3). The Social Brian Hypothesis predicts that hominins with a third-order of intentionality are potentially present with *H. ergaster* and *H. erectus*, but almost certainly so with *H. heidelbergensis* and *H. rhodesiensis* (figure 2.2 – page 15 and figure 2.4 – page 21). Both *H. heidelbergensis* and *H. rhodesiensis* are commonly associated with the Acheulean and material culture category 2. If the results shown in Chapter 7 (and Appendix 2) had reflected a high degree of standardised form imposition on lithic artefacts on an assemblage wide scale with a positive correlation through time (as is widely assumed – Saragusti *et al* 1998; Kohn and Mithen 1999; Hodgson 2009) then it would have meant that the predictions within the Social Brain Hypothesis relating to orders of intentionality and hominin cognitive capability (figures 2.2 and 2.4) were directly corroborated through the archaeological record. However, as the results of the lithic analysis did not suggest a large degree of standardisation was present within any artefact type from any assemblage examined within this thesis, I would propose that currently held beliefs relating to hominin cognitive and behavioural abilities may need to be re-examined. The purpose of this discussion chapter is to relate the results presented in Chapter 7 in relation to the Identity Model and the associated degree of cognitive complexity linked to the presence or absence of standardisation within the analysed assemblages.

I shall now describe a summary of the results presented in Chapter 7 and state what the results mean in regards to the Identity Model predictions in table 4.3 in terms of hominin behaviour and cognitive ability. I shall do this by examining each category of lithic tool type LCTs, flakes / flake tools and cores in turn. After the results summary and preliminary relation to the Identity Model given below shall follow a broader discussion on how the Identity Model may relate to the archaeological record in regards to the results presented within this thesis.

8.1 Large Cutting Tools (LCTs)

To address the question of when material culture became incorporated within systems of social communication and expressed through a perpetuated intex within a collective identity, the main lines of enquiry relating to the LCTs were related to impositions of standardisation in form and / or manufacture (and therefore culturally sanctioned modes of artefact production) within LCT manufacture:

- To what extent is there an imposition of standardisation in size within assemblages?
- To what extent is there a standardised imposition of form and shape through the presence of symmetry and tip shape?
- To what extent are standardised methods of artefact manufacture imposed on the LCT under study through the degree of initial and secondary flaking?
- Do the above criteria change in relation to time?

In order to address the first question, about whether standardisation in LCT manufacture may have been expressed through LCT size as opposed to or in addition to form imposition, Chapter 7 shows a number of diagrams illustrating LCT length versus width, however, figure 8.1 below allows for a clear comparison here.

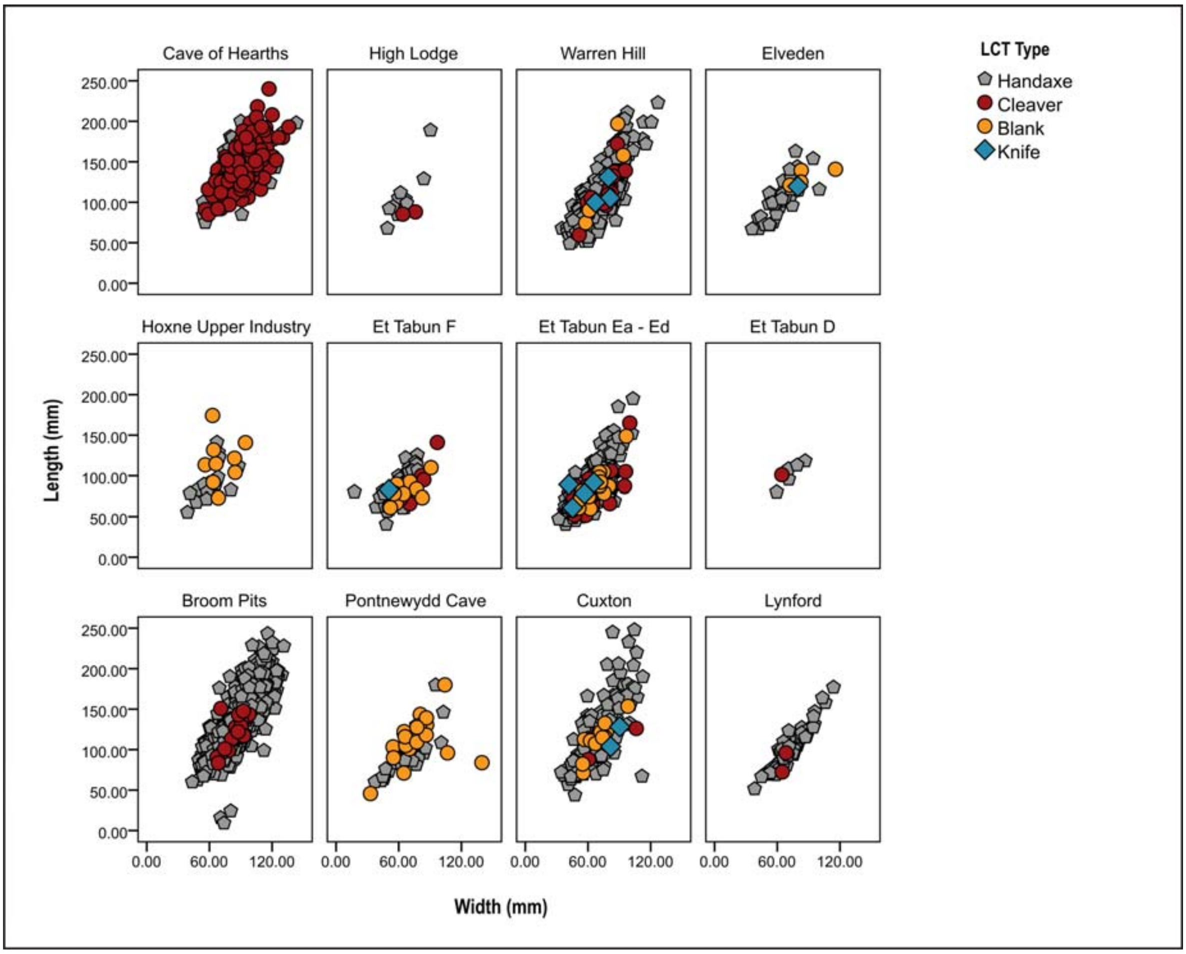


Figure 8.1: Showing the relationship between LCT type, length and width for each site.

From figure 8.1 it is apparent that there are a range of LCT sizes present across all LCT types from each site under study. This is irrespective of temporal or geographic range with no groupings present within any data set suggesting a preferred or standardised convention pertained to LCT size. The relevance of this in terms of the Identity Model predictions laid in table 4.3 are that degrees of artefact standardisation do not appear to be clearly expressed through LCT size, therefore LCT size may be unlikely to be significant within systems of social communication. This therefore would suggest that intex perpetuation was not expressed through artefact size by the hominins represented by the sites under study for this thesis. However, examination of deliberate form imposition and extent of initial and secondary working must be examined before any definitive statements may be made regarding hominin cognitive capabilities.

In answering the second question relating to the LCT analysis in regards to the extent of standardisation in LCT form through the presence of symmetry and particular tip shape, Chapter 7 offers a number of tables and figures that are relevant to this question.

However, I shall summarise the results below, with table 8.1 illustrating the presence of symmetry categories within LCT assemblages studied for this thesis.

	Symmetry by Eye										
	yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	Pdf[a]	**Total**	
Cave of Hearths (N = 223)	3.1%	9.0%	8.5%	3.1%	5.8%	58.7%	9.9%	1.8%	.0%	**100.0%**	**Lower Palaeolithic**
High Lodge (N = 15)	.0%	6.7%	20.0%	33.3%	.0%	40.0%	.0%	.0%	.0%	**100.0%**	
Warren Hill (N = 548)	6.8%	10.4%	10.0%	8.0%	8.0%	49.6%	3.8%	2.7%	.5%	**100.0%**	
Elveden (N = 44)	2.3%	2.3%	15.9%	9.1%	6.8%	59.1%	.0%	4.5%	.0%	**100.0%**	
Hoxne Upper Industry (N = 24)	.0%	12.5%	12.5%	8.3%	8.3%	54.2%	4.2%	.0%	.0%	**100.0%**	
Et Tabun F (N = 83)	6.0%	9.6%	10.8%	2.4%	2.4%	63.9%	2.4%	2.4%	.0%	**100.0%**	
Et Tabun Ea - Ed (N = 530)	4.9%	10.2%	21.7%	4.0%	4.5%	49.8%	3.6%	1.3%	.0%	**100.0%**	
Broom Pits (N = 912)	4.3%	6.3%	10.2%	8.0%	5.7%	60.2%	3.1%	2.3%	.0%	**100.0%**	
Et Tabun D (N = 6)	.0%	.0%	16.7%	.0%	33.3%	33.3%	16.7%	.0%	.0%	**100.0%**	**Middle Palaeolithic**
Pontnewydd Cave (N = 58)	1.7%	3.4%	19.0%	3.4%	.0%	72.4%	.0%	.0%	.0%	**100.0%**	
Cuxton (N = 186)	2.7%	5.4%	17.2%	.5%	1.6%	69.4%	2.2%	1.1%	.0%	**100.0%**	
Lynford (N = 51)	7.8%	7.8%	5.9%	13.7%	7.8%	45.1%	7.8%	3.9%	.0%	**100.0%**	
Total (N = 2680)	**4.7%**	**8.1%**	**13.1%**	**6.3%**	**5.6%**	**56.3%**	**3.8%**	**2.1%**	**.1%**	**100.0%**	

a.Parallel distinctive features

Table 8.1: Showing the relationship between symmetry category, site and Palaeolithic period.

Table 8.1 shows that symmetry within LCT form does not appear to be a significant component of LCT assemblages regardless of temporal or geographical range, with fully non-symmetrical LCTs (no,no,no) being the largest symmetry category from each assemblage. Pure symmetry (yes,yes,yes category) remains a consistently minor component (less than 8%) of any assemblage at any time. In regards to near symmetry within LCT form (categories that have at least one 'yes'), table 8.1 shows that these also form a relatively low overall component within the individual LCT assemblages, although the general levels of symmetry presence are greater than those seen within the pure symmetry category. If the presence of symmetry on LCTs from the Lower (material culture category 1 and 2 - table 4.3) and Middle Palaeolithic (material culture category 3 – table 4.3) are compared against each other (table 8.1), it becomes clear that the presence of pure symmetry certainly does not increase through time (on the basis that percentage of an assemblage reflects frequency of occurrence) as has often been assumed (Ambrose 2001; Hodgson 2009 and references therein). Indeed, both within and between assemblages, there would appear to be no consistent pattern to symmetry imposition, apart from the fact that symmetry is not present on LCT form to any great extent from any assemblage across the entire data set. This therefore in turn may suggest that a socially mediated signal or intex perpetuation was not expressed through the imposition of symmetry on LCT form from the assemblages studied within this thesis.

In general, LCT form is primarily determined through LCT tip shape and therefore the effect of tip shape on the presence of symmetry needs to be clarified. As has been established in Chapter 7 (tables 7.1, 7.2 and 7.3) there would appear to be a direct correlation between the presence of tip symmetry and a convergent element to tip form. Figure 8.2 below shows a direct comparison between the presence of symmetry on LCT tip form and the presence of convergence on LCT tip form, building upon and amalgamating the data shown in Chapter 7, figures 7.1 (page 160) and 7.3 (page 165).

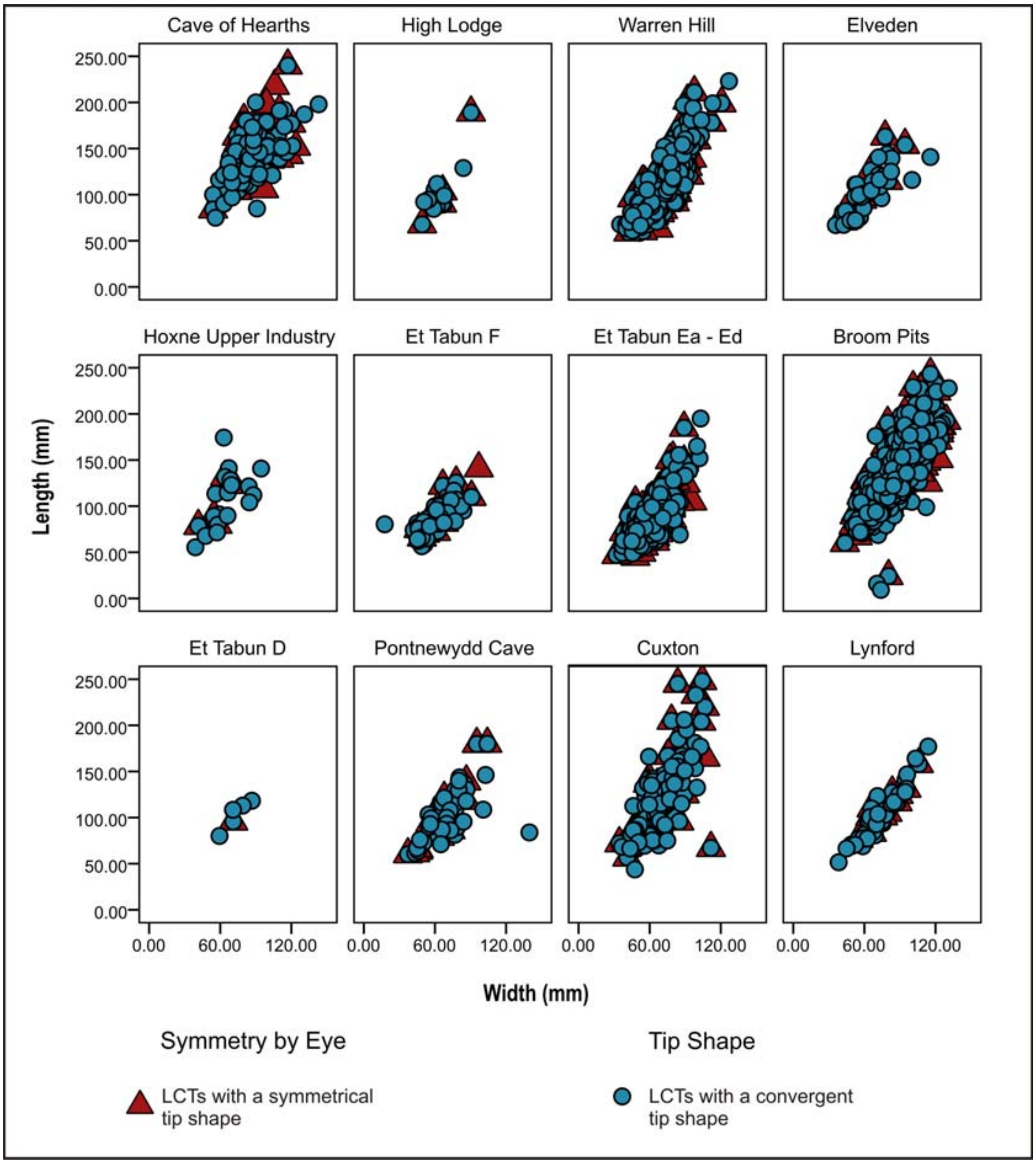


Figure 8.2: Showing the relationship between LCT symmetry and LCT convergent tip shape.

Figure 8.2 (data drawn from tables 7.2 and 7.3) shows that in the majority of cases, where symmetry is present within tip shape (red triangle) that same tip also has a convergent element to its form (blue circle).Given the overwhelming correlation between symmetry and convergent tip shape seen in figure 8.2, it would be reasonable to assume that where symmetry was present on LCT form it may not be the deliberately intended outcome in the majority of instances, but rather a result of the shaping of a convergent tip. On average, only 3.5% of LCTs per assemblage with a symmetrical component to their form are non-convergent in tip shape (calculated from data presented in tables 7.2 and 7.3).

In order to ascertain whether standardisation in LCT form was expressed in alternate ways, such as LCT tip shape and working (secondary / shaping and edge working) procedures need to be examined. Table 8.2 below shows the relationship between tip shape and LCT assemblage studied for this thesis.

	Tip Shape									
	Markedly Convergent	Convergent with a Square Tip	Convergent with an Oblique Tip	Convergent with a Generalised Tip	Wide or Divergent	Wide or Divergent with an Oblique Bit	Wide with Convex Tip	PA[a]	**Total**	
Cave of Hearths (N = 223)	10.3%	13.0%	4.5%	22.9%	29.6%	13.9%	5.8%	.0%	**100.0%**	**Lower Palaeolithic**
High Lodge (N = 15)	20.0%	.0%	6.7%	60.0%	6.7%	6.7%	.0%	.0%	**100.0%**	
Warren Hill (N = 548)	12.6%	6.6%	7.3%	44.5%	8.9%	.0%	20.1%	.0%	**100.0%**	
Elveden (N = 44)	18.2%	4.5%	4.5%	63.6%	.0%	.0%	4.5%	4.5%	**100.0%**	
Hoxne Upper Industry (N = 24)	54.2%	12.5%	8.3%	4.2%	8.3%	.0%	12.5%	.0%	**100.0%**	
Et Tabun F (N = 83)	38.6%	8.4%	4.8%	18.1%	7.2%	.0%	22.9%	.0%	**100.0%**	
Et Tabun Ea - Ed (N = 530)	30.8%	10.6%	5.5%	26.6%	5.1%	.2%	20.6%	.8%	**100.0%**	
Broom Pits (N = 912)	15.2%	7.1%	9.0%	52.6%	3.1%	1.3%	10.2%	1.4%	**100.0%**	
Et Tabun D (N = 6)	33.3%	16.7%	33.3%	.0%	16.7%	.0%	.0%	.0%	**100.0%**	**Middle Palaeolithic**
Pontnewydd Cave (N = 58)	12.1%	8.6%	3.4%	63.8%	6.9%	.0%	3.4%	1.7%	**100.0%**	
Cuxton (N = 186)	17.2%	4.3%	4.8%	58.1%	2.7%	1.6%	9.1%	2.2%	**100.0%**	
Lynford (N = 51)	27.5%	3.9%	5.9%	54.9%	3.9%	.0%	2.0%	2.0%	**100.0%**	
Total (N = 2680)	**18.8%**	**8.0%**	**6.9%**	**42.6%**	**7.1%**	**1.8%**	**13.8%**	**.9%**	**100.0%**	

a. Profoundly Asymmetrical

Table 8.2: Showing the relationship between LCT tip shape, site and Palaeolithic period.

Table 8.2 shows that from all the LCT assemblages studied for this thesis, the most common form of LCT tip shape contained a convergent element as opposed to a wide, divergent or convex tip shape. However, to re-iterate an earlier observation, within the tips with a convergent aspect, there would appear to be a diverse range of convergent tip types, with the most common being convergent with a generalised tip and markedly convergent (table 8.2). Convergent with a generalised tip tends to refer to those tip shapes that had a convergent element, but did not have a specific tip shape as described through markedly convergent, convergent with a square tip or convergent with an oblique tip. The implication for this in regards to standardised tip manufacture is that convergent with a generalised tip would imply that there were no standardisations within LCT tip shape apart from a generic convergence in overall form. Furthermore, if the site from the Lower Palaeolithic are compared to those from the Middle Palaeolithic, it may be seen that as with symmetry presence, there is no positive correlation between a preference for particular tip shapes in respect to time (on the basis that percentage of an assemblage reflects frequency of occurrence). Therefore, given the spread of tip types present within all the LCT assemblages examined in table 8.2, I would suggest that there is little evidence for a standardised tip form being imposed.

There does exist however an interesting pattern within the tip shape data shown in figure 7.3, and that is that LCTs with a convergent tip would seem to be on the whole larger in size than LCTs with a divergent, wide or convex tip. However, when this relationship was further interrogated through the application of a Kruskal Wallis H test (table 7.5 – page 167), it was determined that there was no statistically significant relationship between LCT size and tip shape.

The pattern that convergent LCTs may be generally larger in size than wide, divergent or convergent LCTs has been described before by McPherron (1999). McPherron suggests that such a pattern in relation to LCT morphology and size may reflect the processes of reduction, where non-convergent LCTs are smaller because they have been reduced to a greater extent than convergent LCTs or, as convergent LCTs are reduced they become wide, divergent or convex in form (McPherron 1999). However, on a broad behavioural level, I do not see a reduction / re-sharpening sequence entirely explaining the pattern that convergent tips are generally larger than non-convergent tips. The reason for this is that within figure 7.3, it can be seen that within each individual assemblage (irrespective of geography or raw material) there are a large proportion of

LCTs with convergent tips that are similar in size to, or smaller than LCTs with non-convergent tips. This in turn would suggest that there is no significant relationship between convergent tip shape and overall LCT size. I would suggest that the pattern of LCT tip shape and size may be linked to some functional requirement / purpose toward specific butchery or other raw material processing tasks. However, offering an explanation for the exact nature of these functional requirements is outside the remit of this thesis, although an interesting future research project would be to conduct a detailed use wear analysis on LCTs with a range of tip shapes in order to test whether tip shape were linked to specific function.

Within the context of this thesis, the prevalence of a diverse range of convergent and non-convergent tip types through a range of LCT sizes (figure 7.3, table 8.2), would suggest that within the assemblages studied, there is no clear evidence for a standardised or preferred imposition of tip shape. Therefore, I would suggest that tip shape and by inference overall LCT form may not have been used as culturally meaningful statements within social signalling. The range of tip shapes imposed upon the LCTs under study (table 8.2) show that specific forms were clearly being imposed upon the LCTs from so called mental templates. However, the lack of absolute standardisation within the end product would seem to suggest that the idea of an LCT was held as a mental image within the individuals memory (McNabb *et al* 2004), yet the final form or tool remained a flexible and fluid concept. Therefore, based on the lack of an overall standardised LCT from any assemblage studied for this thesis, it would appear that intex perpetuation may not have been expressed through overall LCT form, and therefore a third-order of intentionality may not necessarily be linked to the manufacture of LCTs. However, to explore this link further how LCTs were reduced and shaped through secondary shaping and edge working techniques must be discussed.

The data for the secondary flaking or LCT shaping strategies practiced on the first and second faces of the LCTs under examination within this thesis were displayed in table 7.6. Although table 8.3 below shows whether the flaking strategies for both LCT faces were broadly similar (or not), as a marker for standardisation in shaping technique. The premise being that if both faces of an LCT were worked in a similar fashion through secondary flaking or shaping, then there may be a degree of standardisation within the knapping processes conducted in making the LCT. Furthermore, if this pattern is seen on an assemblage level rather than an individual artefact level (table 7.6), then the pattern of standardisation within artefact manufacture may carry some cultural / social significance.

Site	Evidence for similar secondary working / shaping on first and second LCT faces?
Cave of Hearths	Yes
High Lodge	No
Warren Hill	Yes
Elveden	Yes
Hoxne Upper Industry	No
Et Tabun Layer F	Yes
Et Tabun Layers Ea - Ed	Yes
Broom Pits	Yes
Et Tabun Layer D	No
Pontnewydd Cave	Yes
Cuxton	No
Lynford	Yes

Table 8.3: Showing the relationship between the first and second LCT faces in regards to LCT secondary working or shaping. Based on table 7.6 page 170.

From table 8.3 (and table 7.6) it can be seen that the majority of the sites examined for this thesis display patterns of secondary working or LCT shaping that may indicate a broad element of standardisation in the knapping process through the similarity in the working of both LCT faces. However, given the lack of standardisation evident in LCT size, symmetry imposition and tip shape it is unlikely that any standardisation present within LCT manufacture is culturally significant on a social signalling scale. Furthermore, the arrangement of the sites in table 8.3 in a broad chronological manner would indicate that there is no positive correlation between a broadly standardised LCT shaping strategy and time. Therefore, the standardisation in LCT manufacture probably reflects a learned method of LCT production of: “this is how to make a LCT,” with the final form of the artefact held as a loose concept within the knappers mind influenced through original blank shape and functional requirement. In other words the standardisation in primary manufacture processes reflects McNabb *et al's* (2004) 'conceptual standardisation' where the hominin knappers had a capacity for "creating and manipulating chains of sequentially related routine actions" (McNabb *et al* 2004: 667) in the creation of an LCT without the LCT carrying a culturally significant social signal or intex meaning. Therefore, I do not believe that LCTs were used as examples of perpetuated intex in regards to the presence of secondary working or shaping of the artefacts, despite the potential for standardisation in the knapping processes.

The data pertaining to LCT edge working has already been presented in Chapter 7 (tables 7.7 – 7.9). The premise under examination with regards to LCT edge working was as follows. The greater the degree of edge working present on an LCT, the greater the potential for deliberate imposition of form with socio-cultural meaning or perpetuated intex. Therefore, if edge working were positively related to deliberate symmetrical form imposition through time, and not a response to other requirements, then where symmetry was present, the degree of edge working should be in the medium to high or high index in order to achieve symmetry through edge manipulation. That is to say, if edge working was used as a method of refining LCT symmetrical form, it would be expected that edge working would appear, on average, in greater concentrations where symmetry was present on an LCT. Figure 8.3 below shows the relationship between LCT volume, edge working index and symmetry. LCT volume is used as a general proxy for LCT size in order to establish whether there was a relationship between LCT size, the amount of edge working present and symmetry presence. However, the volume plots also provide a useful heuristic in order to visually represent the relationship between artefact symmetry and edge working index.

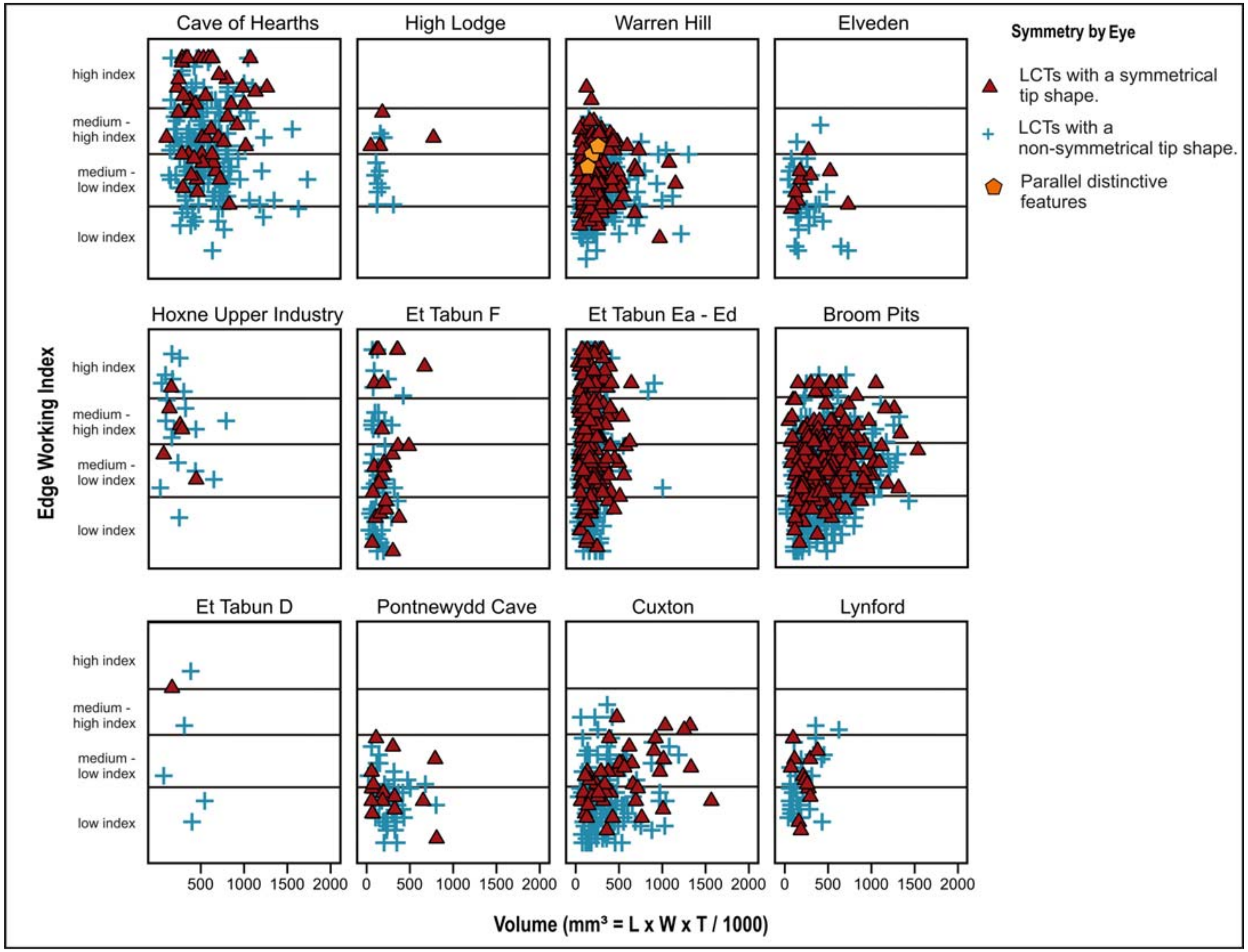


Figure 8.3: Showing the relationship between edge working index, LCT volume and symmetry. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000.

As can be seen from figure 8.3 (and table 7.7) there does not appear to be a strong correlation between degree of edge working, LCT size or the presence of symmetry at any site under study regardless of temporal or geographic range, because the symmetrical tip shapes are distributed across the different edge working categories. Indeed, where symmetry is present on an LCT in figure 8.3 it shows that the degree of edge working falls within the medium to low and low indices as often as they are in the medium to high and high indices. Furthermore, figure 8.3 shows that non-symmetrical LCTs are present across the entire edge working index range as often as symmetrical LCTs, further supporting the idea that edge working was not used to influence LCT form. This in turn may suggest that the large indexical range of edge working present on a variety of LCT sizes could have been linked to functional requirement in terms of creating a working edge, rather than an aide in form imposition.

In order to examine this further, figure 8.4 below shows the relationship between edge working index, LCT volume and tip shape. The premise explored here is that if edge working were related to deliberate form imposition through tip shape across time, and not a response to functional requirements, then the degree of edge working should be in the medium to high or high index on tip shapes that were produced to a culturally sanctioned mental template. Once again, in figure 8.4, LCT volume is used as a general proxy for LCT size in order to establish whether there was a relationship between LCT size, the amount of edge working present and tip shape. However, the volume plots also provide a useful heuristic in order to visually represent the relationship between LCT tip shape and edge working index.

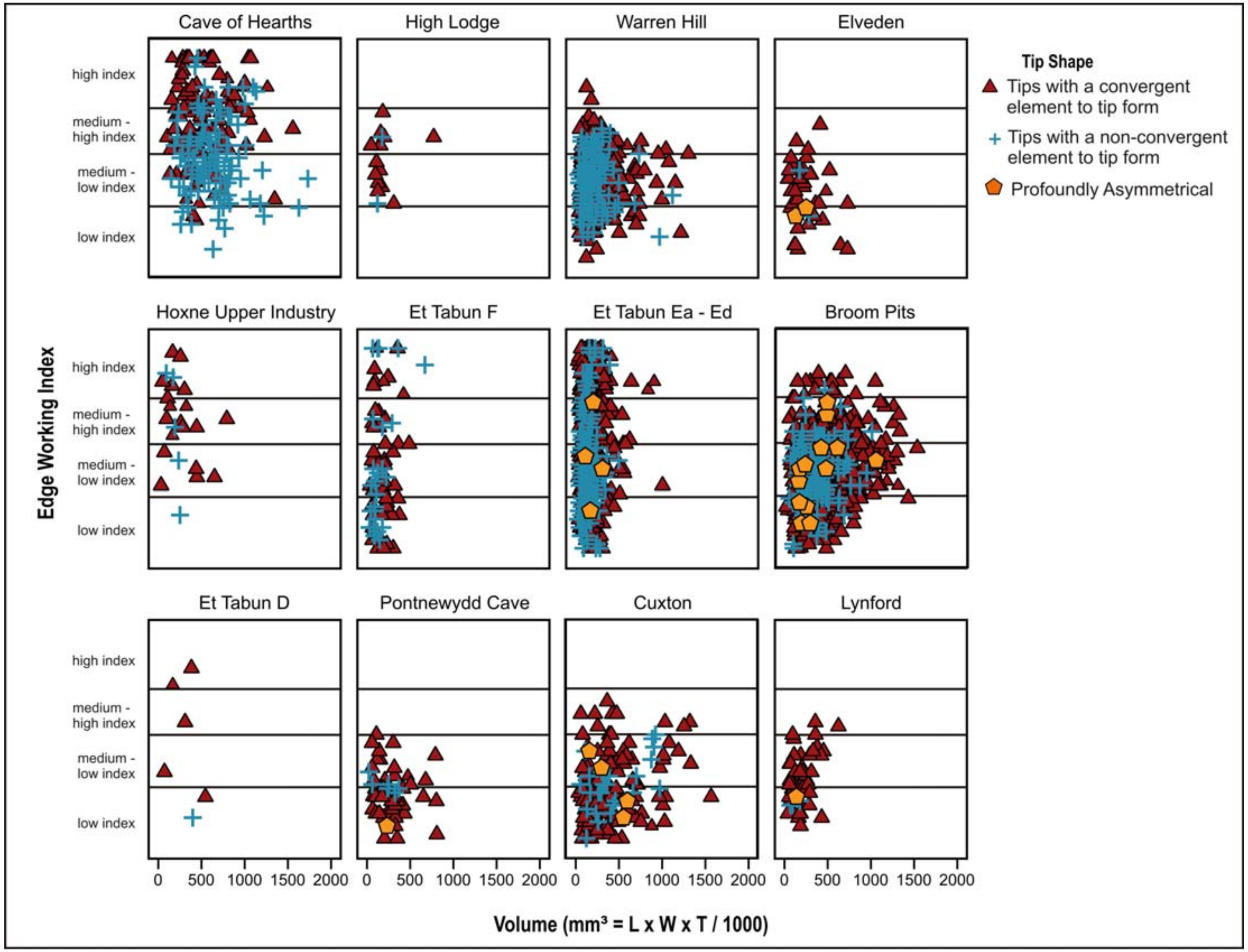


Figure 8.4: Showing the relationship between edge working index, LCT volume and tip shape. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000.

Figure 8.4 above shows that there does not appear to be a strong correlation between degree of edge working, LCT volume and tip shape through time. However tips with a convergent element may tend to have more edge working than non-convergent tips in some assemblages, although this is by no means an exclusive trend. Indeed, for the majority of sites under study, the indices of edge working in regards to tip shape are predominantly held within the medium to low and low categories for convergent and non-convergent tip categories. This in turn would imply that edge working was not utilised as a means of modifying tip shape to any great degree. Conversely this may suggest that secondary LCT working or shaping was sufficient to achieve the desired LCT form (in terms of tip shape and symmetry – tables 8.1 and 8.2, figures 8.3 and 8.4) adding further support to the notion that LCT edge working may have been restricted to adapting the LCT on a functional level.

Alternatively, the lack of edge working seen in relation to tip shape and symmetry may suggest that secondary working of the LCT was not required on any extensive scale to maintain or create the form of LCT required by the knapper. Either way, the results from figures 8.3 and 8.4 would suggest an overall lack of a standardised approach to secondary edge working in LCT manufacture and form imposition through tip shape or symmetry through time and therefore it is unlikely that edge working contributed to imposing form upon LCTs across time and geography in relation to a perpetuated intex / culturally meaningful social signal.

Conclusion

It is now possible to return to the research questions posed at the beginning of this section and summarise the results described above.

- Based on artefact sizes there would not appear to be any evidence for standardisation within artefact dimensions from any of the assemblages examined for this thesis. Therefore it is taken that intex perpetuation or culturally significant social signals were not expressed through LCT size.
- The investigations regarding standardisation of form imposition through symmetry and particular tip shape show that absolute LCT symmetry has very little presence (less than 8%) in all assemblages across time and space.

The majority of the LCTs from all the assemblages under interrogation were in fact found to be completely non-symmetrical in form, reiterating that absolute symmetry seems to have played a limited role in LCT production within the Lower *and* Middle Palaeolithic.

- Furthermore, the most common tip shape from all assemblages had a convergent element to them. When tips with a symmetrical component to their form were compared to tips that were convergent, it was found that there was a direct correlation between convergence in tip shape and presence of symmetry. This may imply that the symmetry present within the assemblages may have been as much a result of the extra working and shaping relating to producing a convergent tip rather than a deliberate and intended outcome of the knapper. It is unclear at this stage whether convergent tips were seen as culturally significant LCT forms, although, given the wide range of convergent tip types and the overall lack of secondary working or shaping and edge working associated with convergent tips, it seems likely that tip convergence may have been a functionally driven form rather than an accepted cultural norm. Therefore, from all the sites ranging from the Lower to Middle Palaeolithic under examination within this thesis there would appear to be an overall lack of a standardised imposition of LCT form through symmetry and tip shape which would further suggest that a perpetuated intex was not expressed through LCT form.
- Investigations into the secondary working or LCT shaping strategies showed that there were four sites (High Lodge, Hoxne Upper Industry, Et Tabun layer D and Cuxton) that did not display any evidence for a standardised approach to secondary working or shaping for the first and second faces of the LCTs under examination. The remaining eight sites (the Cave of Hearths, Warren Hill, Elveden, Et Tabun layers F and Ea – Ed, Broom Pits, Pontnewydd Cave and Lynford) did display similar working strategies for the first and second LCT faces. This may indicate a standardisation in LCT production possibly reflecting a learnt behaviour on how to produce a LCT rather than a culturally mediated knapping strategy or an example of perpetuated intex.
- In terms of edge working it has been shown that the edge working index across all the sites was predominantly in the medium to low and low categories which would seem to imply that edge working, when present on

LCTs did not play a major component in LCT form imposition and may subsequently be limited to functional requirements. Furthermore, the lack of association between edge working and the clear links to the imposition of symmetry or particular tip form may add further support to the notion that a perpetuated intex was not being incorporated within LCT production at the sites under examination.

- By arranging the sites in all tables and figures in a broadly chronological fashion it has been possible to assess whether patterns relating to symmetry imposition, tip shape, secondary working or shaping and edge working change in relation to time. The results would seem to indicate that there is no obvious chronological progression present within this data. That is to say, there is no indication of any of the criteria discussed above increasing or decreasing in frequency in a progressive manner through time. Rather, the data distributions seem to be virtually random in their patterns which may be an indication of local adaptations to specific functional requirements for each site at each individual occupation event.

In terms of behavioural implications for Acheulean (material culture category 2 – table 4.3) and Middle Palaeolithic (material culture category 3 – table 4.3) hominins and the Identity Model, the genuine lack of standardised form within LCTs has a number of inferences:

- Whilst symmetry may have been deliberately imposed on a small minority of artefacts, contrary to popular belief (Ambrose 2001; Hodgson 2009) symmetry does not seem to play a major role in LCT manufacture regardless of temporal or geographic range within the data set studied here.
- Given the lack of a standardised imposition of symmetrical form, tip shape, LCT shaping and edge working within the LCTs studied, it is unlikely that overall LCT forms were significant within systems of social communication or used as a form of perpetuated intex.
- This would in turn suggest that if intex perpetuation was carried out by the Acheulean and Middle Palaeolithic hominins as evidenced within this thesis, it was not expressed through LCT symmetry or specific LCT form. This may further suggest that if the desire for intex perpetuation

were present within the hominins represented within the data analysed for this thesis, it may have been expressed in some other manner.

I shall now examine the evidence from the detached pieces.

8.2 Flakes and Flake Tools

In order to address the question of when material culture became incorporated within systems of social communication, the main questions relating to flakes and flake tools were, like LCTs, related to the imposition of standardisation form within flake manufacture:

- Assess the delineation, distribution, position and extent of retouch on Non-PCT and PCT flakes to gauge the degree of standardised form imposition.
- Assess the degree of standardisation (in terms of size) present within flake production both within and between Non-PCT and PCT assemblages.
- Assess the effect of raw material on artefact production.

Chapter 7 (and Appendix 2) have already presented a number of tables, graphs and text that help to answer the questions posed. Here I will address how they relate to the Identity Model. In order to address the first question in relation to establishing whether assemblages displayed evidence for deliberate and regularly imposed form imposition on flakes and flake tools, table 7.10 shows that on typological grounds across all assemblages, there was very little standardisation seen in particular flake / flake tool types that were produced. The possible exception to this rule would be the Et Tabun layers F and Ea – Ed for side scrapers and layer D for retouched points. However, as has been mentioned before, the Et Tabun assemblages were heavily subjected to collectors bias, so it is likely that the preference for side scrapers and retouched points evidenced within the Et Tabun assemblages were a result of Garrod's preference for flake tools with a definite typology, rather than a true behavioural reflection of the original knappers.

Furthermore, to echo observations from Chapter 7 (table 7.13), it is clear that where retouch is present, apart from the Et Tabun layers, there does not seem to be a particular tool type related to any particular technology (Non-PCT, PCT or PCT?). For Et Tabun layer D, there is a clear preference for retouched points and PCT flakes, however this is to be expected as a retouched point is predominantly the result of PCT manufacturing processes, although the strong correlation for layer D in terms of total assemblage make up is probably due to collector's bias. Interestingly, as noted in Chapter 7 Et Tabun layers Ea – Ed have some retouched points that are Non-PCT in technology, these artefacts are flakes that are shaped through retouch to resemble a classic PCT retouched point, however they are manufactured on Non-PCT end products. A further point to note from table 7.13 is that once PCT enters the archaeological record they generally seem to form a comparatively small component of the overall assemblage when compared to Non- PCT artefacts. This may suggest that the hominins involved were adaptable enough in their knapping strategies to produce flakes that were required for the job at hand through the easiest manufacture process for them at that time. Therefore, overall it would appear that typologically, there would not appear to be one flake tool type that defines any assemblage or technology type, but rather a range of flake tools and a high component of unretouched flakes. This would seem to imply that the hominin knappers engaged with a highly adaptable flaking strategy responding to functional need and requirements as they arose by producing the most suitable flake tool through the most suitable technological method to get the job done, rather than producing flake tools to a predefined or standardised cultural norm as an expression of perpetuated intex within a collective identity.

In regards to retouch imposition upon flake tools, tables 7.15 – 7.19 show that where retouch was present on a flake edge there were no definitive patterns of imposed retouch. In other words, there were a range of retouch delineations, extents, distributions and positions across all detached pieces with retouch present across all sites with flake tools. The only semi-consistent pattern evidenced was that when retouch was imposed upon a flake, it was often done so in a single direction (direct or inverse) which may suggest that retouch was imposed in a fashion that did not require much planning time as bifacial or alternate retouch may do. This in turn may imply that when retouch was imposed upon a tool it was done so in an expedient fashion that required little forethought toward stylistic considerations which may have been evident through a standardised strategy of retouch imposition. In other words, flake tools by their very nature were made to fulfil a need of the knapper, however, at least within the context of this thesis, it would appear that that is all the knapper was considering through the creation of the flake tools studied. There is certainly no indication of a standardised or preferred flake tool from any assemblage with a favoured type of retouch. Therefore I would suggest that within the assemblages studied for this thesis retouch on flake tools were imposed as a functional response to fulfil a particular task at a particular time, and not incorporated into systems of social signals or perpetuations of intex.

In regards to flake and flake tool proportion, figure 7.5 shows that there would not appear to be any clear correlation between artefact type (flake or flake tool) and artefact size. The spread between flake and flake tool size ranges would appear to be fairly even across all assemblages with no preference for a particular size of flake or flake tool being produced as would be expected if artefact size were incorporated within culturally mediated social communications. However, figure 8.5 below may show some interesting patterns that could elucidate the relationship between flake size, type and technology.

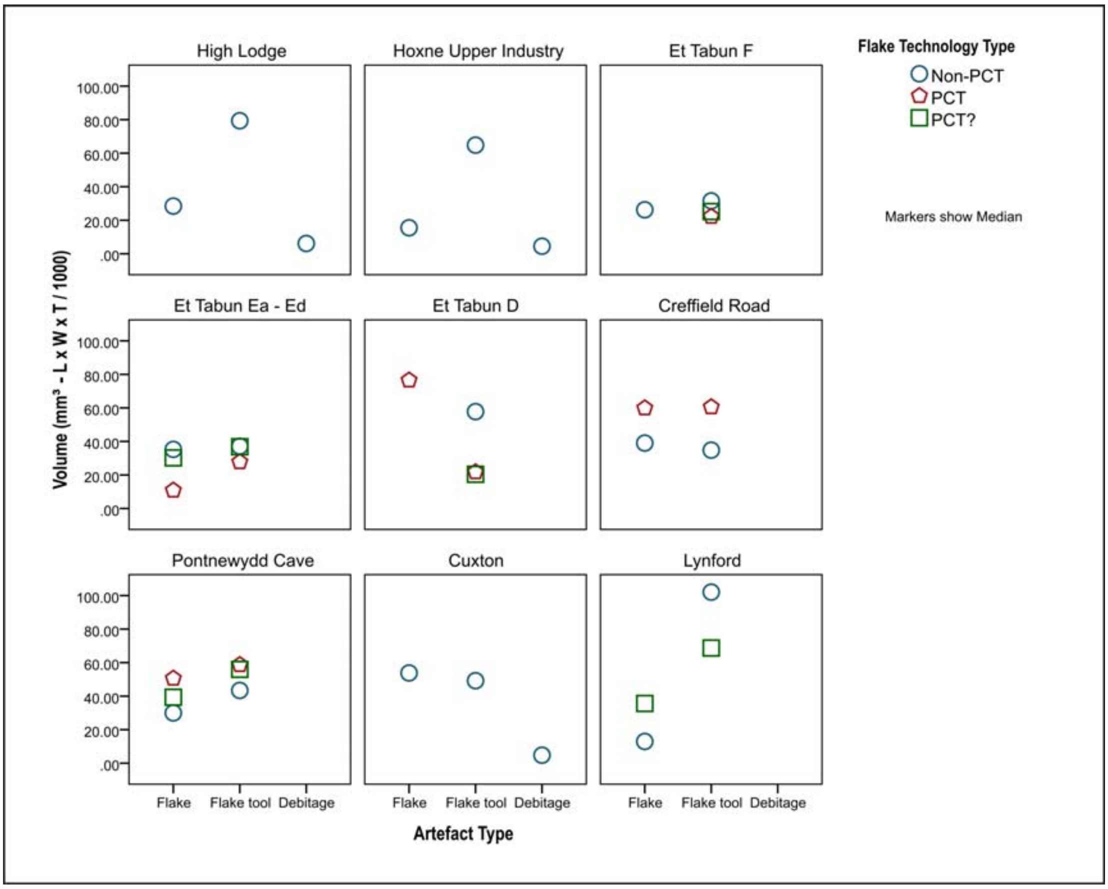


Figure 8.5: Showing the relationship between volume, flake / artefact type and technology type. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000. Markers show median of volume between flake technology and artefact type.

Figure 8.5 would seem to suggest that in the majority of assemblages, the flake tools would appear to be larger in size than non-retouched flakes (with the exception of Et Tabun layer D and Cuxton). Furthermore, from figure 8.5, it would appear that once PCT or flakes with PCT characteristics (PCT?) enter the record, they are generally producing flakes that are of similar size, regardless of artefact type (flake or flake tool) with the exception of Et Tabun D. However, the differences encountered within Et Tabun Layer D may be explained by the skewed collector's bias toward only collecting flake tools and that the sample consists of 1 PCT flake against 71 flake tools. Therefore the patterns reflected within Et Tabun layer D cannot be taken as a behavioural norm but a result of collector's and sample bias. The similarity in PCT artefact size is to be expected given that the aim of PCT is to produce flakes of similar sizes and shape, however, given the lack of standardisation in the imposition of retouch and the range of flake sizes seen within figure 7.5, I would suggest that socially meaningful signals are not being replicated through flake or flake tool size or retouch imposition.

Conclusion

It is now possible to return to the research questions posed at the beginning of this section and summarise the results described above.

- Given that the flake proportions for Non- PCT and PCT flakes in each assemblage had a range of size present for the Non-PCT and PCT flakes it would appear that standardisation in flake size was not clearly evident beyond a technical level and therefore it is taken that intex perpetuation was not being expressed through flake size.
- From the retouch analysis, it is clear that standardisation in retouch application was largely absent in retouch delineation, distribution, position and extent from all sites and all edges.
- Rather, the apparently random imposition of retouch delineations, distributions, positions and extents would imply that retouch was imposed as a response to fulfil a functional need rather than to impose a culturally meaningful typology or perpetuation of intex through the flake tools.
- The presence of PCT flakes within the Et Tabun layers, Creffield Road and Pontnewydd Cave do represent fundamental shifts in attitude toward flake production on a technological front, however they would appear to be treated

the same as Non-PCT flakes in terms of retouch presence on each flake edge (personal observation, table 7.15 above), and therefore it would appear that intex perpetuation was not expressed through retouch imposition on flake tools.

In terms of behavioural implications for Acheulean (material culture category 2 – table 4.3) and Middle Palaeolithic (material culture category 3 – table 4.3) hominins and the Identity Model, the genuine lack of standardised form within flakes and flake tools has a number of inferences:

- Based upon the lithic analysis for the detached pieces, it would appear that flakes and flake tools were not incorporated into culturally constructed systems of social communication, but rather produced as functional responses to perform specific tasks as need arose.
- This in turn may initially suggest that the use of flake tools within systems of identity perpetuation and broadcast may have been limited within the assemblages examined for this thesis.
- This would further suggest that if intex perpetuation was carried out by the Acheulean and Middle Palaeolithic hominins as evidenced within the detached pieces of this thesis, it was not expressed through flake or flake tool standardisation in size or specific / preferred form. This may further suggest that if the desire for intex perpetuation were present within the hominins represented within the data analysed for this thesis, it may have been expressed in some other manner not entirely represented within the lithic data examined for this thesis.

8.3 Cores

In order to address the question of when material culture became incorporated within systems of social communication, the main questions relating to cores focused on the imposition of standardisation by:

- Assess the effect of raw material on core size and whether this changes in relation to time and geography, and Non-PCT to PCT in order to examine the possibilities of bias towards particular raw materials.

- Assess the degree of standardisation (in terms of size) present within the cores from all groups (Non-PCT to PCT) in order to assess changes through time.

The effect on raw material on the range of Non-PCT and PCT cores has been extensively covered in Chapter 6 and Chapter 7 (figures 7.7 – 7.9) where it was determined that raw material would not appear to have adversely affected core reduction. In order to assess standardisation in core proportion across technology types, figure 7.6 above and 8.6 below provide a useful heuristic.

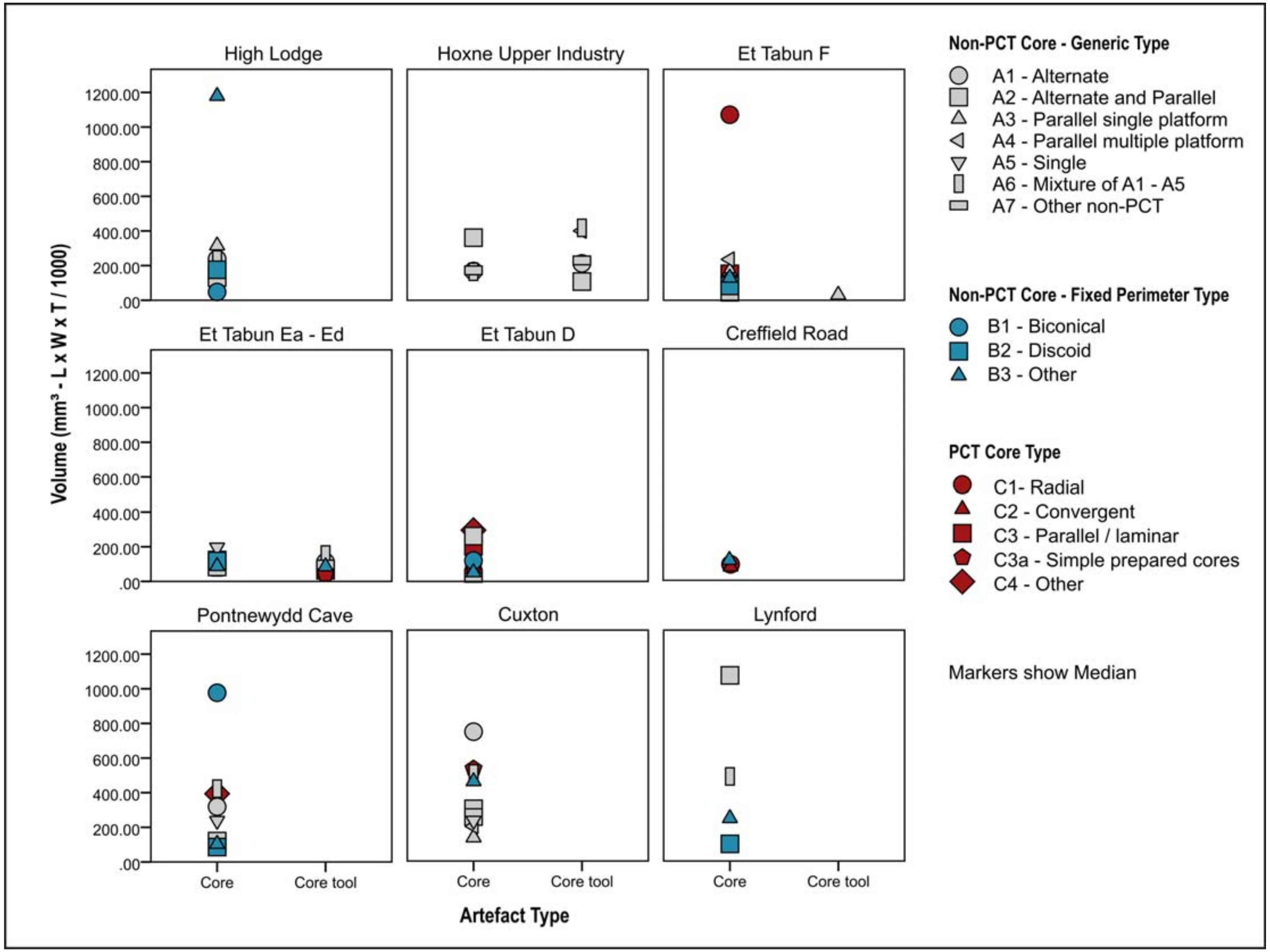


Figure 8.6: Showing the relationship between core volume, artefact type and core technology. Volume calculated as artefact **L**ength (mm) x **W**idth (mm) x **T**hickness (mm) / 1000.

From figures 7.6 and 8.6 it would appear that the core sizes are not standardised across technology types, however, PCT cores do show a similarity in size (with the exception of Et Tabun F). Readers should look at each site in their own right (figures 7.6 and 8.6) and notice the large degrees of variability in core typology and size to notice that there would not appear to be any indication of a standardised core typology or size evident from any site. However it is acknowledged here that such a complex interplay of initial raw material size and knapping character, coupled with the functional need of the knapper when reducing the cores and a host of other uncontrollable or unpredictable variables makes an inter site comparison of this nature on this particular tool type difficult to extract any meaningful behavioural information.

Conclusions

It is now possible to return to the research questions posed at the beginning of this section and summarise the results described above.

- From the results presented above, in Chapters 6, 7 and Appendix 2, there would not appear to be an adverse impact on core reduction from any technological approach to flaking or raw material. Where more than one raw material was present at the site, hominins seemed to be able to reduce the cores to varying sizes irrespective of raw material type. The only real relationship between core size and raw material is the presence of greatly reduced flint cores at Pontnewydd Cave, where flint and chert cores were clearly worked and reduced to a much greater extent than the surrounding raw materials. This probably reflects the superior knapping qualities seen within flint over the remaining raw materials found at Pontnewydd Cave. Certainly, raw material exploitation does not seem to have been incorporated within any form of perpetuated intex in core reduction.
- From the results presented above, Chapters 6, 7 and in Appendix 2, there would not appear to be any degree of standardisation in core size regardless of raw material or technology type at any stage represented within this data base. Therefore, cores do not appear to have been incorporated within any system of culturally meaningful social communications or any form of intex perpetuation.

I shall now review the Identity Model in light of the data discussed above and presented within Appendix 2, Chapters 6 and 7.

8.4 Implications for the Identity Model

The data presented in Chapter 7 and summarised above has suggested that contrary to widely held belief (Ronen 1982; Mellars 1989; 1991; Saragusti *et al* 1998; Kohn and Mithen 1999; Wenban-Smith 2004; Foley and Gamble 2009) standardisation in lithic artefact production (LCTs and flake tools) as a marker for artefact manufacture through a culturally mediated filter, does not seem to have a positive correlation in respect to time, and in fact would appear to be largely absent across the entire data set studied for this thesis. The results of the lithic analysis presented within this thesis may therefore potentially have some significant impact on how the archaeological record is related to presumed hominin behaviour within our current understanding exemplified in table 4.3 and by Ambrose (2001). This in turn has some substantial implications for how the Identity Model is related to the archaeological record in terms of the time scale of cognitive development and behavioural complexity as currently understood through the Social Brain Hypothesis (table 2.1, figure 2.4). I shall now discuss the implications of the results summarised above in relation to the Identity Model and associated hominin cognitive / behavioural implications in two groups, LCTs, detached pieces and cores.

Large Cutting Tools

As has been previously stated, conventional belief dictates that the imposition of symmetrical form upon LCTs of the Acheulean and the Middle Palaeolithic was both an important component of LCT production and significantly increased in occurrence through time as greater degrees of social meaning and cultural communications were associated with LCT production (Saragusti *et al* 1998; Kohn and Mithen 1999; Ambrose 2001; Wenban-Smith 2004; Foley and Gamble 2009; Hodgson 2009). This in turn, according to the Identity Model, would have suggested that the Acheulean and Middle Palaeolithic hominins were actively engaged with and practicing a minimum of a third to fourth-order of intentionality through intex perpetuation within a collective identity.

However, from the data presented within this thesis, it would appear that symmetry plays a relatively minor role in LCT production (less than 8% of any assemblage). Moreover, it does *not* increase in presence through time, and where present appears to be randomly distributed in occurrence.

Furthermore, the data presented within this thesis in relation to specific form imposition as evidenced through particular tip forms would suggest that there was no real preference on a cultural level for particularly shaped LCTs, as all assemblages tend to have a wide range of tip shapes present. This range in tip shape may even be evidenced through the most common tip shape category classified – a generalised convergent tip – where the tip is only broadly convergent in shape, with no consistent or preferred final form evident.

The secondary flaking or LCT shaping and edge working analysis suggests that although deliberate form was undoubtedly being imposed upon LCT construction, it was not standardised to any great extent through final form (symmetry, tip shape) or knapping strategy (secondary or edge working). Therefore it would seem that the LCTs seen within this thesis data set echo Ashton and McNabb's (1994) 'mental construct' ideas where the shape of the LCT was a fluid idea in the mind of the knapper depending on individual ability, raw material constraints, function, time, place and circumstance. There may be potential indications for some degree of normalised pattern in LCT shaping or secondary working seen in table 8.3, however, this may relate to McNabb *et al's* (2004) 'conceptual standardisation' based on 'individualised memic constructs' expressed within LCT form through a capacity for "creating and manipulating chains of sequentially related routine actions" (McNabb *et al* 2004: 667) rather than a culturally mediated reduction strategy.

If it is accepted that a lack of standardised LCT form represents an absence of intex perpetuation, or the use of LCTs in social signals and subsequently a potential for a lack of third-order intentionality, the question arises as to what the data from this thesis suggests the cognitive potential of the Acheulean and Middle Palaeolithic hominins may have been. Returning to the concept of a theory of mind, I proposed in Chapter 2 that a theory of mind marks the beginning step in the development of abstract thought and symbolic construction through the conscious conception of a mind that is separate to one's own. Similarly, I would suggest that Ashton and

McNabb's (1994) 'mental construct' and McNabb *et al's* (2004) notion of 'conceptual standardisation' in LCT form would also indicate an ability to conceive of an abstract tool form in the minds eye and impose that form onto a LCT blank. Essentially, I propose that the imposition of a mental construct or conceptual standardisation in LCT manufacture is providing some speculative evidence for the presence of abstract thought. This in turn could infer that the maker of an LCT had to have a theory of mind or second-order intentionality as a minimum in order to be able to form a mental construct or a notion of conceptual standardisation (as examples of abstract thought).

One question that persists is if material culture category 2 hominins had a second-order of intentionality, and an ability for abstract thought through the presence of LCT form being held as a mental construct, why did they apparently not (based on the data presented within this thesis) take that extra cognitive leap and utilise LCTs within social signalling? One answer may be that the application of the notion of standardisation, as modern researchers understand it, to artefacts made by non-modern human species is an inappropriate and misleading premise by which to examine the Palaeolithic record (Chase 1991). However, an alternate notion may be that the lack of full standardisation in LCT manufacture may also indicate that the hominin knapper imitating their contemporaries *never quite realised what it was that their contemporaries were envisaging themselves* in relation to LCT form. This in turn may suggest that the material culture category 2 hominins were fixed within a second-order of intentionality / theory of mind, locked into the so called Acheulean gaze (Foley and Gamble 2009) of attending to LCT form imposition, without realising the full potential of such a gaze to consciously off-load social interactions and culturally meaningful signals onto the material culture with which they interacted.

If it is accepted that LCTs were not utilised as socially meaningful artefacts within hominin social groups, then, from the above, I would suggest that socially meaningful communications were probably held within the realm of the body, where the individual's body was both the canvas of broadcast and the vehicle for comprehension. Cognitively speaking, a theory of mind or second-order of intentionality representing an abstract ability and a notion of internal and external identity would be sufficient for the body to be a canvas of social signalling. The

Identity Model suggests that it is only with a minimum of third-order of intentionality that material culture props could be incorporated within social signals. I make this suggestion based on the data examined within this thesis, it is not however intended as a definitive statement as organic material culture may have been incorporated within culturally significant communications with in the Acheulean (material culture category 2) and beyond. However, the evidence for such artefacts is limited (Chase and Dibble 1987) and I believe that the Identity Model is flexible enough to incorporate the role of organic and lithic material culture within culturally meaningful interactions of the material culture category 2 / Acheulean hominins should future studies show that to be the case.

In regards to Middle Palaeolithic or material culture category 3 hominins (typically Neanderthals based on the data sets presented within this thesis), the data presented within this thesis would suggest that LCTs were not included within the social signalling repertoire of the Middle Palaeolithic. However, the issue may not be so clear cut due to the presence of PCT within their tool kit, and the potential ramifications for cognitive ability, a point that shall be discussed in greater detail in Chapter 9 below.

Flakes, flake tools and cores

The purpose of the flake and flake tool analysis within this thesis was to test the long held view that (along with LCT manufacture) flake tool manufacture becomes increasingly more standardised through the Acheulean and the Middle Palaeolithic (Ronen 1982; Mellars 1989; 1991; Monnier 2006). As has been shown in the results summary above (Chapter 7, Appendix 2), there would appear to be little evidence present within the data sets examined for this thesis that would suggest any degree of standardisation within flake or flake tool production in regards to artefact size or imposition of form through retouch working. In regards to flakes and cores, this is perhaps not a surprising state of affairs given that they are more likely to be an unintended by-product of flake tool manufacture, rather than an intended artefact in their own right. The importance of flakes and cores lies in their ability to inform scholars of the mechanism of artefact production / reduction through the *chaîne opératoire*. Therefore it would be reasonable to assume that flakes (and cores) as artefacts are unlikely to be involved within intex construction or perpetuation.

Subsequently, I shall primarily focus upon the flake tools for this section of the discussion.

The lack of standardisation within flake tools in regards to retouch imposition (delineation, distribution, position and extent) within all flake tool assemblages irrespective of temporal or geographic range studied for this thesis corresponds to recent work conducted on retouched flake tool standardisation in the Middle Palaeolithic (Monnier 2006). Monnier (2006) uses a broadly comparable methodology to the one described in Chapter 5 (relating to the study of retouch imposition) in her assessment of retouched tools from the French Middle Palaeolithic and returns a similar result for a lack of evidence for the presence of standardisation in flake tool proportions or retouch imposition. Therefore, two separate studies produced similar results in respect to flake tool standardisation, which subsequently strengthens the interpretive implications of the results presented within this thesis.

Simply put, the lack of standardisation within flake tool production and retouch imposition would indicate that contrary to widely held presumption, culturally sanctioned social signalling through lithic artefact production would appear to be largely absent within Acheulean and Middle Palaeolithic flake tool (and LCT) assemblages. From the case studies examined within this thesis, the lack of standardisation in lithic artefact production would imply that intex and its subsequent perpetuation were not being conducted through lithic artefacts in the way that has been argued for so long (for example, Ronen 1982; Mellars 1989; 1991).

Rather, retouch imposition and artefact form would seem to be largely unrelated, with retouch being applied to the flake edge as a response to fulfilling a particular functional requirement at the / or near the time of knapping. Monnier seems to have reached a similar conclusion within her own study where, based on ethnographic studies, she suggested that “overall tool morphology (was) unimportant in the majority of tasks to which stone tools are put” (Monnier 2006: 77) a sentiment which closely echoes the functional role of retouch imposition offered within this thesis. Monnier does go on to suggest that where specific tool morphologies are important are when tools are relating to certain tasks such as perforating or hafting

(Monnier 2006). The cognitive implications for creating a composite tool is something that I shall return to below in Chapter 9, however, the lack of standardisation found within the retouch imposition on any of the flake tools examined within this thesis would seem to suggest that lithic artefacts do not play significant roles in culturally sanctioned modes of communication within the Lower to Middle Palaeolithic, and I would propose, that the random imposition of retouch on flake tools (irrespective of technology type) is indicative of a functionally driven requirement over aesthetic value. In other words, intex and perpetuated intex if present within the minds and bodies of Acheulean and Middle Palaeolithic hominins, does not seem to be present within the lithic tools they produced and used, based on the data examined within this thesis.

The potential significance of PCT technology as representing a fundamental cognitive and behavioural shift in relation to flake tool production is discussed in Chapter 9, the purpose of this section is to merely relate the Identity Model to the data analysed within this thesis.

8.5 Summary

The purpose of this chapter was to present a summary of the results of the lithic analysis presented within Chapter 7, and relate those results to the categories of identity described within the Identity Model (Chapter 3). From the discussion presented above I have suggested that based on the lithic analysis and the overall absence of standardisation in any sphere regarding LCT and flake tool production may suggest that the hominins producing the material culture studied within this thesis were not producing material culture through a culturally mediated filter, and as such do not display evidence for the perpetuation of an intex within the framework of a collective identity. This in turn would infer that the knappers of the lithic tools studied were limited to a second-order of intentionality or theory of mind, with only a notion of an internal and external identity to aide them in the navigation of their social environments. There is however, another aspect to material culture category 3 tool production that must be examined before we can truly ascertain whether the category 3 or Middle Palaeolithic hominins (typically Neanderthals in regards to the data set examined for this thesis) can be assigned an intentionality level similar to that given to the category 2 or Acheulean hominins above. This aspect of material culture is the effect of PCT in relation to cognitive ability and behavioural complexity, irrespective of the presence of standardisation in retouch imposition on the artefacts.

The significance of PCT in relation to the Identity Model and the Social Brain hypothesis are discussed in detail in the next Chapter.

Chapter 9 – The Identity Model, the Social Brain Hypothesis and the Palaeolithic record

Chapters 7 and 8 have shown that contrary to widely held belief, standardisation – as a marker of culturally mediated artefact manufacture - in lithic tool production does not seem to correlate positively in relation to time, or indeed artefact form or manufacture (in the case of LCTs and Non-PCT flakes). This in turn may therefore suggest that standardisation - as a cultural marker evidenced through regularity in final artefact form or manufacture - was not a significant factor in lithic tool production to the hominins represented in the data set examined. This in turn may suggest that lithic artefacts may not have been incorporated within systems of social communication as has often been presumed (Ronen 1982; Mellars 1989; 1991; Kohn and Mithen 1999; Ambrose 2001; Wenban-Smith 2004; Foley and Gamble 2009; table 4.3).

If this premise is accepted, then the role of lithic artefacts as markers of hominin behaviour and cognitive ability – which has often been measured against the degree of standardisation present in artefact form or assemblage typology – must be reassessed in light of the results presented in Chapters 7 and 8. From the discussion in Chapter 8 I suggested that material culture category 2 assemblages, based on the lack of standardised form imposition on LCTs (through symmetry, tip shape, shaping and edge working) and flake tools (through retouch), may indicate that the hominins involved were limited to a second-order of intentionality and a notion of an internal and external identity. This was based on the apparent absence of evidence pertaining to a notion of perpetuated intex (artefacts used in social signalling). The same pattern pertaining to a lack of standardisation presence in LCT and flake tool production is reflected within material culture category 3 assemblages, however there is one important aspect to material culture category 3 artefacts that has yet to be discussed, and that is the presence of PCT.

PCT is a technological knapping strategy found in lithic assemblages associated with material culture categories 3, 4 and 5 where the core is prepared on two surfaces to produce one or more flakes of desired size, thickness and shape (Barham and Mitchell

2010: 194). PCT within material culture category 3 artefacts represent a significant and fundamental shift in cognitive ability and hominin behaviour which are separate to the imposition of culturally significant form upon lithic artefacts. The cognitive and behavioural shifts in turn have some important implications for the Identity Model and the Social Brain Hypothesis in terms of their application to the archaeological record.

9.1 PCT and implications for the Identity Model and the Social Brain Hypothesis

The purpose of this section is to assess the cognitive potential of material culture category 3 / PCT artefacts and their significance for the Identity Model in recognising the cognitive threshold required to utilise material culture within systems of social signalling. I suggest that PCT artefacts are indicative of a third-order of intentionality linked to the degree of complexity seen within the *chaîne opératoire* and the increased potential for intex perpetuation within a collective identity on archaeologically invisible remains linked to composite tool technology.

Around 300,000 years ago there was a fundamental technological shift in tool making from hand held tools (the Acheulean or material culture category 2 – table 4.3) toward composite tools – these are tools that were hafted and made of multiple components (evidenced through PCT or material culture category 3 – table 4.3) (Barham and Mitchell 2008; Barham 2010). In defining ‘composite’ here I follow Barham’s (2010: 374) lead where the stress is on integrating different materials with distinct properties to create a single tool rather than the conceptually separate examples of chimpanzees using two or more tools in sequence (Sugiyama 1998; Parker and McKinney 1999: 55 cited in Barham 2010).

In reference to material culture category 3 artefacts, I am not suggesting that every flake produced as a result of PCT was utilised within a composite tool, although there are clearly specific PCT tool morphologies that were designed for inclusion within a composite suite such as retouched points (**R8** table 5.1, 7.10). What is significant is that the technique of PCT allowed, for the first time, the repeated *controlled* technological production of flakes that were regularised in size and shape (as a result of technological influences and not necessarily cultural influences) resulting in a detached piece that would be more conducive toward inclusion within a composite approach.

Essentially, the main difference between material culture category 3 and 2 artefacts is that category 2 artefacts are dependent upon a linear reductive process to produce final tool morphology, whereas category 3 artefacts have the potential to be involved within a hierarchical additive process transforming a number of distinct components into a previously inconceivable tool form, the composite (Barham 2010). This in turn suggests a shift in cognitive ability where material culture category 3 artefacts:

> “signal the implementation of planning, social learning, and a high level of imagination and intentionality…to conceive (of) tools made from multiple components” (Barham and Mitchell 2008: 219).

Furthermore, in order to conceive of a composite tool, the creator must have an understanding for a minimum of three to four separate and distinct raw materials, and how they work together (Barham and Mitchell 2008). This in turn suggests a conscious understanding of three to four separate *chaîne opératoires* that must be performed for each separate composite element before they could be combined into a single tool. For example: preparing a haft from a range of available raw materials (such as wood, bone, antler or horn) to fit a range of specific purposes depending on their reaction to stress (Barham and Mitchell 2008: 219; Barham 2010). Additionally, a binding agent may be required to aide the hafting process, where a range of raw materials (either plant or animals based) must be correctly prepared in relation to intended use (Barham 2010). The inserts for the composite tool must also be manufactured from a further range of raw materials (such as stone, bone, antler or horn) with each raw material requiring a particular manufacturing or reductive process (Barham 2010). If an adhesive is incorporated within the binding process then further specialist knowledge on an even greater range of raw materials (plant or animal based) will be required in order to prepare the materials correctly (such as heating and including additional raw materials such as charcoal, ochre or ash) (Barham 2010). Finally, once all the separate components for the composite tool creation have been processed through their separate *chaîne opératoires* the hominin must then combine all the product results together in the correct order. Essentially, to create a composite tool, a range of specialist knowledge bases for each composite component (with all their individual cognitive challenges) (Barham 2010) must then be combined together through an overarching single *chaîne opératoire* in the mind of the composite creator.

The process of conceiving and manufacturing a composite tool, by combining a number of *chaîne opératoire* processes to result in a single tool "mark(s) something new technologically *and* cognitively" (Barham 2010: 377 my emphasis). As Barham states, composite technology is both

> "transformative and imaginative…an innovation derived from existing knowledge of organic and inorganic materials…brought together for the first time as integrated tools" (Barham 2010: 377 - 379).

It is this bringing together of three to four distinct *chaîne opératoires* and separate raw materials of varying physical properties to form a single tool through a process of hierarchical creation (Barham 2010) that distinguishes and elevates the cognitive development of PCT technology over that of the material culture category 2 artefacts. In order to hold more than one *chaîne opératoires* within the mind, a more developed sense and understanding of abstraction than that encountered with a theory of mind must be held by material culture category 3 hominin.

In terms of linking the cognitive requirements of composite tool manufacture to the Social Brain Hypothesis and the Identity Model (table 4.3) I suggest a third-order intentionality threshold at minimum is required. This third-order intentionality threshold may be related to the number of distinct *chaîne opératoires* that can be successfully held and then combined within an individuals mind. However, I think that it is more likely related to the increasingly complex social interactions and co-ordinations that need to be managed in order to combine three to four distinct *chaîne opératoires* successfully into a single artefact of material culture. As Barham (2010) advocates, composite tool making would require a complex system of social communication and co-ordination, possibly along the lines of syntactic language suggested by Gibson (2007) in order to support the structure of thought inherent within composite technology

(Barham 2010). However, whether fully syntactical language is totally necessary to categorise new tool forms and co-ordinate raw material processing is open to question, I believe that a combination of complex systems of visual display accompanied by vocal utterance would suffice to achieve the intended goal of composite tool manufacture (as suggested in table 4.3).

Certainly what is clear is that composite tool manufacture would require and result in a distribution of social expertise (Barham 2010) through the transmission of raw material manipulations and through the multiple *chaîne opératoires* between multiple individuals within the group. In order to keep track of such complex social organisation and co-ordination a minimum of third-order intentionality (and possibly even fourth-order) must be in play. Each individual engaged upon the task of completing one *chaîne opératoire* must have a full understanding *and* working knowledge of not only the other *chaîne opératoires* involved in the sequence of manufacturing a composite tool, but also the mental states of the individuals engaged within the distinct *chaîne opératoires* of the composite sequence. This mental understanding would be crucial in order to combine the separate organic and inorganic components in the correct order, at the correct time to successfully create the composite.

However, even if it is assumed that only one individual (isolated from having to engage with the mental states of their contemporaries) is involved in creating a composite, I still believe that a third-order of intentionality at minimum is required as explained below. In order to create a composite tool, an individual must firstly envisage the tool in their mind as a mental construct, the individual must then mentally visualise and enact each process involved within each distinct *chaîne opératoire* and then combine them all together as a single tool in the correct order at the correct time. In order to form a mental construct of a tool, I would suggest that a second-order of intentionality is required as demonstrated through the Acheulean or material culture category 2 LCT. However, the ability to mentally follow the hierarchical processes involved in manipulating three to four distinct raw material bases through three to four physically different *chaîne opératoires* and then combine them to create the original mental construct of the desired tool would (I suggest) require a third-order of intentionality at least. If this process is then included with a social / group context then a fourth-order of intentionality may be required to co-ordinate the creation of such tools in line with the behaviours of other group members.

Nevertheless, whether engaged with as a collective or individual task, the combination of multiple raw materials (organic and inorganic) into a single artefact would provide a focal point for knowledge transfer and the development of cognitive understanding through shared experience (Iacoboni and Mazziotta 2007; Grove and Coward 2008; Barham 2010) and I would add, a sense of collective purpose and realised commonality of understanding, all of which could be mediated through complex systems of visual display and vocal utterance that would require a third to fourth-order of intentionality simply to work.

If it is accepted that a minimum of third-order intentionality is required to construct a composite tool, most commonly associated with PCT flakes within the Palaeolithic record (Barham 2010), then the presence of PCT flakes or cores within an assemblage would indicate that the hominins involved had reached third-order intentionality. As has been stated before in Chapter 3 within the Identity Model a minimum of third-order intentionality is required to utilise material culture within social signalling through a perpetuated intex. However, just because a cognitive potential has been realised in one area, does not necessarily mean that it was realised in another. In other words, just because you may need a third-order of intentionality as a minimum to construct a composite tool, does not necessarily mean that that composite tool carries a culturally significant social signal implicit within a sense of intex and perpetuated intex.

Certainly some would suggest that a social consequence of hafting would be that the haft becomes a vehicle for social communication, of a personal and group identity (perpetuated intex within a collective identity framework) (Barham and Mitchell 2008; Barham 2010), and while the potential for such an act of display is clearly present within the third to fourth-order hominin of the composite tool, the realisation of that potential has yet to be conclusively proved. Certainly, despite the relatively standardised size or shape of PCT points for hafting purposes, the lack of standardisation within the retouch imposed upon the PCT points (table 7.13, 7.16 – 7.19, Appendix 2) would perhaps argue against such a supposition and if Monnier

(2006) is to be believed, such an inclusion of material culture within social signals would only occur with the standardisation seen within Upper Palaeolithic blade technologies and the advent of the modern human (although this is outside the scope of this thesis). However, it must not be forgotten that the retouched lithic tool is only one of multiple components present within the composite tool. The organic nature of the hafts, bindings and adhesives from the Middle Palaeolithic often leave little trace within the archaeological record, and where evidence does survive (Barham 2002; Mazza *et al* 2006; Barham and Mitchell 2008; Barham 2010) it tends not to carry any recognisable evidence as a vehicle of culturally meaningful social signals. Although this is not to say that they were not used within culturally significant social signals, it just means that we may not be able to identify these signals within the archaeological record due to their perishable or alien nature.

Therefore, if material culture category 3 artefacts suggest the possibility that a third-order of intentionality has been reached by the hominin creators, it must now be established whether it is possible to determine whether the same hominins were capable of utilising their material culture into systems of social signalling or visual display through the perpetuation of their intex within a collective identity. In order to do this, the evidence for visual display within the Palaeolithic must first be briefly examined.

9.2 Assessing the evidence for inclusion of material culture / behaviour into visual display and identity propagation

When discussing the term visual display in the context of Palaeolithic hominins the train of thought tends to move toward body ornamentation and the subsequent evidence for such an act. Similarly, when discussing the question of body ornamentation within a Palaeolithic context, given the limited evidence for such an act across such a large time depth, focus falls upon two main vehicles, beads and pigment use. As of the time of writing, the incontrovertible use of beads as a system of personal adornment (a prime example of perpetuated abstract) within a securely dated context have almost exclusively been associated with modern humans (Kuhn *et al* 2001; Henshilwood *et al* 2004; d’Errico *et al* 2005; Vanhaeren *et al* 2006; Kuhn and Stiner 2007; Botha 2008). Where beads have been claimed to be associated with non-*H. sapiens* there is considerable uncertainty as to the contextual integrity of the artefacts in question (d'Errico *et al* 1998; Zilhao and d'Errico 1999; d'Errico *et al* 2003; Kuhn and Stiner 2007) and therefore their association with any species other than *H. sapiens*. Subsequently, based on current evidence, when discussing the evidence for body ornamentation in relation to non-modern human species, we can only examine the use of pigments to any degree of certainty in terms of association and the discussion shall proceed accordingly.

Evidence for anthropogenically modified pigment use in the Palaeolithic is scarce and tends to range in dates from 300,000 – 170,000 years ago spanning a variety of geographical regions such as France, the Netherlands, the Czech Republic, India, South Africa, Zambia and Kenya (Clark *et al* 1947; Clark 1974; Thevenin 1976; Marshack 1981; Roebrucks 1984; Wreschner 1985; Beaumont and Morris 1990; Bednarik 1992; Barham 2000; Clark and Brown 2001; McBrearty 2001 cited in Barham 2002: 188, table 2). As an aside that may prove significant in future research, it is interesting to note the archaeological correspondence in dates between the use of pigments and the emergence of material culture category 3 technologies (although this may be more a reflection of our current understanding of the Palaeolithic record or artefact collection, rather than a genuine pattern of behaviour).

Unlike beads, pigments may have had uses beyond the decoration of the body such as medicinal, a preservative in hide processing or as an element in making adhesives for composite tools (Velo 1984; Minzoni-Deroche *et al* 1995; Callahan 1999; Barham 2002; Kuhn and Stiner 2007; Barham 2010) with the use of pigments within body ornamentation potentially arising out of a primarily functional role. However, use of iron minerals as pigments incorporated into degrees of signalling behaviour have historically been of primary rather than secondary purpose (Knight, Power and Watts 1995; Barham 2002). Therefore, when anthropogenically modified (such as rubbing or striations) pigments are found within the archaeological record, their use within systems of culturally meaningful visual displays that incorporate the body must not be immediately dismissed. This is especially so when considering that the Identity Model predicts that hominins that attain a third-order of intentionality (as those producing composite tools) certainly have the cognitive potential to include pigments within visual display as an expression of their intex within a collective identity.

Anthropologically speaking, the use of body decorations (regardless of medium - pigment, ornamentation or clothing) are almost exclusively associated with social communications (Kuhn and Stiner 2007). However, the key element to our discussion in regards to pigment use within the Middle Palaeolithic is the durability of the social signal being displayed by the body. According to Kuhn and Stiner (2007), the use of pigments (such as would be incorporated with perpetuated intex) in comparison to a more durable social signal such as beads (such as would be incorporated with perpetuated abstract) as a vehicle for social communication are limited in their effectiveness, in terms of the transferability, quantity of expression, durability, standardisation in display, investment differential and cost of the broadcast signal. Following this reasoning, the cognitive ability required to construct a social signal based on pigment use and the body may potentially be less than the more durable and effective incorporation of symbolic material culture (such as beads with a perpetuated abstract). I would agree with this notion, in comparison to a symbolically imbued artefact of social expression such as a bead, pigment use may be more limited, but then so potentially are the cognitive abilities of the hominins that exclusively engage in social broadcasting through pigment use on the body as is predicted within tables 4.3. This difference I would suggest is epitomised in the difference in cognitive ability required for perpetuated intex (third to fourth-order intentionality) and perpetuated abstract (fifth-order intentionality) as explained in Chapter 3.

Kuhn and Stiner (2007) suggest that pigment-only decorative systems would have been largely related to the visual display of the individual and not media for displaying standardised social messages. In other words, pigment use may represent an expression of individual uniqueness rather than institutionalised relationships between individuals or groups. Such a hypothesis also agrees closely with the notions of intex and perpetuated intex (operating at a third-order intentionality) ensconced within the Identity Model. However I would add an additional cognitive component. In order for an individual to broadcast their uniqueness though the perpetuated intex, they must be confident that the rest of the group will read the social signal broadcast as one of difference to the socially construed norm, therefore, there must be some form of standardised social norm or commonality of understanding in place framed within a collective identity (operating at a fourth-order intentionality), as proposed within the Identity Model, in order for a signal of difference to be recognised. If such a premise is accepted then it stands to reason that the visual displays of the body that incorporate pigments would be able to incorporate a degree of institutionalised relationship between individuals. The limitation being that the degree of institutionalisation within social communications involving pigment-only visual display may only be understood within the group and not necessarily on an inter-group basis.

What is certain however is that the potential use of pigments within visual displays of the body within a third to fourth-order of intentionality shows that:

> "social information – and identities – were longer lasting and more structured, such that there was an advantage to expressing them in semi-permanent media" (Kuhn and Stiner 2007: 51).

This would suggest that the hominins involved must have reached a cognitive level where they were able to conceive of individual and larger group identities in order to be able to express them in the semi-permanent capacity suggested by pigment use. Such a notion fits well with the Identity Model and the construction of a concept of intex and its subsequent perpetuation within a collective identity.

Within the data presented for this thesis, the concept of intex and its perpetuation does not seem to be visible within the lithic artefacts studied, irrespective of typology or technology. Indeed, the lithic artefacts would only suggest that once PCT and subsequently evidence for composite tool making enters the record, the creators must operate under a third-order of intentionality as a minimum. There is the potential for hafted composite tools to play a role within culturally meaningful signals (Barham 2010), however, the evidence for Middle Palaeolithic composites has yet to suggest that this is the case, despite the fact that the hominins involved may have the cognitive potential to do so.

Therefore, it is interesting that evidence for anthropogenically modified pigment use would seem to enter the archaeological record at much the same time as PCT composite technologies, and it is the potential use of pigments within visual displays centred around the body that may be the avenue of expression for an individual's intex and perpetuated intex within a collective identity, rather than through lithic artefacts and the apparent myth of standardisation. In other words, rather than looking for standardisation in lithic tool manufacture for evidence for material culture incorporation in social signals, it is possibly the use of organic materials such as pigments that supply the corroborating evidence for the application of the Identity Model and the archaeological record.

The potential use of pigments and the construction of composite tools within the Middle Palaeolithic illustrates a marked increase in cognitive ability over the social interactions of the Acheulean. From the data presented within this thesis, it seems unlikely that the hominins of the Acheulean laboured under anything other than a second-order of intentionality or theory of mind. Certainly as shown in Chapters 7, 8 and Appendix 2 within the lithic artefactual evidence there was not evidence for composite tool manufacture or standardisation in LCT form (in symmetry, tip shape or working) that would suggest a notion of an intex or perpetuated intex within a collective identity had been realised. Furthermore, at the time of writing, no anthropogenically modified pigments have been found in association with material culture category 2 artefacts, or dated to the Acheulean.

Therefore, in order to answer the question: When did material culture became incorporated within systems of social communication? I would suggest that the answer must lie with the advent of material culture category 3 (tables 4.3) technologies around 300,000 years ago. With the innovation of PCT and composite technologies, a third-order of intentionality must have been realised on a cognitive level. Only with a third-order of intentionality may material culture or behavioural acts potentially become imbued with the culturally significant systems of social communications required to perpetuate the intex within a collective identity expressed within the Identity Model. The possible evidence for such an incorporation of social meaning within visual display may be the use of pigmentation which seems to broadly correspond to the appearance of composite tools within the archaeological record (Barham 2002).

9.3 The Identity Model and implications for the Social Brain Hypothesis

In regards to the Identity Model, Chapters 5 – 8 have been aimed at testing the links made in table 4.3 in how the Identity Model may relate to the archaeological record. In particular I have examined data sets presented within this thesis for the presence of standardisation as evidence of lithic artefacts being used in systems of culturally meaningful social signals, and by implication, notions of intex and perpetuated intex within a collective identity. I believe that the principles of the Identity Model presented in Chapter 3 still maintains a validity in regards to the internal logic present within the model and has proved a new, innovative and useful heuristic by which to examine the archaeological record. Certainly, using the principles of intex and perpetuated intex in regards to interrogating the archaeology presented within this thesis has proved to be a useful discursive device in accessing potential motivations behind otherwise murky and unsubstantiated claims on hominin behaviour and cognitive ability (such as the presence of symmetry within LCTs).

What the data presented within this thesis has shown is that it is in the relating of the Identity Model to the archaeological record (as shown in table 4.3) - based on a synopsis of widely held academic belief in relation to hominin behaviour and tool use (Ronen 1982; Mellars 1989; 1991; Saragusti *et al* 1998; Kohn and Mithen 1999; Ambrose 2001; Wenban-Smith 2004; Foley and Gamble 2009; table 4.3) – where some significant amendments are required. The changes and amendments in how the Identity Model relates to the archaeological record from table 4.3 may be seen in table 9.1 and discussed in greater detail below.

Category of material culture (modified after Clark 1969: 31)	Description	Behavioural implications	Role of the body in social communication	Category of identity
1	• Deliberate lithic tool production to create specific edges for use. • No standard form imposition, tool shape governed by raw material size, shape and mechanical properties. • Consists of pebble tool industries dominated by small flake removals (<10cm) and chopping tools (Oldowan). • Bone or wood tools that have limited evidence for anthropogenic modification.	• Hominins have a realised sense of self which compliments the egocentric goal directed behaviour reflected in the strategies of tool production. • Evidence for some forward planning in raw material procurement. • Social communications governed by egocentric, dyadic, gestural and attention directed auditory signals with a greater repertoire than extant primates. • The beginnings of simple imitative learning may be evidenced here.	• Similar to that of extant primates. • The body is limited to egocentric, context specific and dyadic non-theory of mind social communications. • The body is used in sexual selection through visual display with an increased propensity for female choice in mate selection within a predominantly polygynous mating strategy. • Visual display plays an important role in social communication on an intra and inter-group level.	• Internal
2	• Lithic tools predominantly based on large flakes (>10cm) or bifacially reduced cores. • Consists mostly of bifacially knapped handaxes and cleavers (Large Cutting Tools) - the Acheulean. • Regional variation in shape and form primarily affected by raw material. • Deliberate imposition of shape and form to LCTs evidenced through the presence of a mental construct in regards to LCT form with a degree of conceptual standardisation. Final LCT form remains a fluid concept with no evidence for an increase in artefact symmetry or standardised form through time.	• Hominins have a ToM which marks the beginnings of abstract thought reflected in the imposition of deliberate shape and form on lithic artefacts through the mental construct notion. • Evidence for goal directed behaviour associated with greater planning capabilities and complex imitative learning. • Social communication centered around visual display and gesture.	• With the attainment of a ToM, the body becomes a focal point for socially significant triadic visual display and gesture accompanied by limited vocalisation. • Complex imitative learning focuses on the body where individuals acquire the ability to recognise familiar actions performed by an 'other' and are able to repeat or perform novel actions constructed from a familiar repertoire. Visual display and social signalling are direct and context specific. • The body plays a reduced role in direct sexual selection evidenced through a reduction in sexual dimorphism. Reflecting a higher degree of female choice and an increasing importance in material culture?	• Internal • External

Table 9.1: Illustrating the revised methodology through which the Identity Model may be related to the Palaeolithic record. ToM = theory of mind, LCT = Large Cutting Tool.

Category of material culture (modified after Clark 1969: 31)	Description	Behavioural implications	Role of the body in social communication	Category of identity
3	• A shift from producing lithic tools from cores and flakes, to preparing cores to extract flakes of a particular form (PCT). • Prepared core technologies (e.g. Levallois) focuses on producing standardised flakes with the potential for later modification (e.g. into points or handaxes). • This type of lithic production also indicates the presence of composite tools. • Regional variation possibly driven by cultural influences rather than raw material, although raw material may still govern shape and size of artefact to a certain degree.	• Hominins have a commonality of understanding (cultural affinities) and a clear sense of shape and form that begin to play a role beyond the purely functional. • The capability to produce composite tools displays an ability for abstract thought beyond a functional level, which may manifests itself in the beginnings of cultural influences seen within the archaeological record such as the use of pigments. • Artefacts maintain a predominantly functional significance but may carry limited social meaning in regards to the creator (on an individual and group scale). • Social communication is centered around complex gesture and utterance incorporated within visual display.	• The body has a central role in social communication becoming a transmitter and receiver of social information centered around visual display and manual gesture accompanied by vocal utterance. • The body also plays an important role in identity perpetuation, the social boundaries of the body begin to be extended through material culture and behavioural display on a limited individual and group basis. Visual display and social signalling may begin to be indirect and context independent. • Material culture remains predominantly functional within this category, although pigment use may suggest complex visual displays with culturally significant social signals. • Sexual dimorphism reaches levels similar to modern humans indicating a greatly reduced role of the body in direct sexual selection possibly indicating active female choice in mate selection with an emphasis on skilled visual display and material culture as selection drivers.	• Internal • External • Intex • Perpetuated Intex • Collective
4 - 5	• Continued emphasis on flake production with a predetermined shape and form. • Flake blanks within this category are primarily concerned with composite tool production with limited secondary shaping. • This category includes an expanded repertoire of complex bone tools (such as harpoon heads). • In addition, material culture with a purely non-utilitarian design enter the record in the form of ornamentation (beads), art and figurines (humanoid and anthropomorphic). • Clear evidence for regional variation in material culture production on a cultural basis.	• Hominins have a commonality of understanding, a clear sense of shape and form, and the capacity for fully symbolic and functional abstract thought evidenced through the presence of non-utilitarian and composite material culture and behaviours (such as burial). • Social communication is centered around visual display, gesture and grammatical language. • Artefacts carry social meaning in relation to the creator and user (individual and group) and are now fully complicit in identity propagation.	• The body maintains a prominent role in social communication as a transmitter and receiver of social information centered around visual display (enhanced through bodily ornamentation), manual gesture and grammatical language. • The body's boundaries are now fully extended through material culture (through ornamentation, figurines, art and tool production) on an individual and group basis with material culture adopting a functional and symbolic role. Visual display and social signalling now completely indirect and context independent. • The body plays a full role in identity perpetuation through visual, vocal display and material culture. • The body may play a more important role in sexual selection aided through ornamentation, although skilled visual display in material culture production may still play an important role.	• Internal • External • Intex • Perpetuated Intex • Collective • Abstract • Perpetuated Abstract

Table 9.1 continued: Illustrating the revised methodology through which the Identity Model may be related to the Palaeolithic record. ToM = theory of mind, LCT = Large Cutting Tool.

Based on the data analysed and presented within this thesis, the major changes in how the Identity Model relates to the archaeological record from the initial predictions given in table 4.3 to those seen in table 9.1 concern material culture categories 2 and 3. Specifically, the lack of standardisation (such as symmetry) seen within final tool form and manufacture of LCTs and retouched tools in material culture category 2 may suggest that despite previous academic convention (Ronen 1982; Mellars 1989; 1991; Saragusti *et al* 1998; Kohn and Mithen 1999; Ambrose 2001; Wenban-Smith 2004; Foley and Gamble 2009; table 4.3), social signalling within the Acheulean may not have included artefacts of material culture – or at least not in the way we currently perceive that material culture should be included within social broadcasts through mechanisms of standardisation. Rather, if material culture is not included within systems of social communication, then the Identity Model would predict that the hominins concerned must still be within a second order of intentionality cognitive bracket where social communications are mainly governed or mediated through visual display centred on the body, and not external mechanisms such as material culture.

However, there is an important point to re-iterate here from table 9.1, the deliberate imposition of form and shape upon LCTs through mental constructs and a sense of 'conceptual standardisation' does indicate a limited ability of abstract thought as expected with a cognitive ability equivalent to a second order of intentionality / ToM. The issue is that the sense of the abstract in the Acheulean hominin is not developed enough to include or extend itself into the lithic artefacts under manufacture which would allow them to become a proxy for the maker. In this sense the Acheulean LCT can still be examined from an embodied cognition point of view as echoing the idea that artefacts "might themselves count as proper parts of extended cognitive processes" (Wheeler and Clark 2008: 3566). The lack of symmetry or standardisation in LCT manufacture shows that the Acheulean LCT as part of an extended cognitive process suggests that the Acheulean hominin has a limited sense of the abstract. In order to be able to conceive of the abstract in the first place a second order of intentionality must be in place, and therefore the Acheulean hominin must have a ToM as a minimum cognitive threshold. As discussed above, a third order of intentionality must be in place in order for material culture to be actively included and utilised within systems of social communication and visual display. Certainly through our current understanding and based on the data presented within this thesis, this would appear to be largely absent in the Acheulean – material culture category 2 record.

In terms of changes regarding material culture category 3 from table 4.3 to table 9.1, the Identity Model predicts that a minimum of a third-order of intentionality is required to incorporate material culture into social communiqués and visual display. As discussed above, in regards to composite tool manufacture, the ability to mentally hold multiple *chaîne opératoires* and to negotiate the social environments associated with knowledge transfer and raw material resource management would require a minimum of third-order intentionality, if not potentially fourth-order. Therefore, it can be reasonably assumed that once evidence for composite tool manufacture enters the archaeological record, as evidenced primarily through the presence of PCT manufacture, the hominins involved must have reached a minimum of a third-order of intentionality. According to the Identity Model predictions – through notions of embodied cognition that the artefacts become part of the extended cognitive process (Wheeler and Clark 2008: 3566), i.e. artefacts are evidence for the cognitive threshold achieved by the creators – once a third order of intentionality has been achieved it would be possible on a cognitive level to incorporate material culture into increasingly more complex systems of visual display. Certainly as discussed above there is much anthropological evidence to suggest that that the hafts of composite tools are prime surfaces in which social signalling may be incorporated within visual display (Barham and Mitchell 2008; Barham 2010). However the potential use of pigmentation coinciding with the appearance of composite technologies in the archaeological record (as discussed above - Clark *et al* 1947; Clark 1974; Thevenin 1976; Marshack 1981; Roebrucks 1984; Wreschner 1985; Beaumont and Morris 1990; Bednarik 1992; Barham 2000; Clark and Brown 2001; McBrearty 2001 cited in Barham 2002: 188, table 2) may also provide (at the time of writing) circumstantial evidence for the potential inclusion of material culture use in social signalling. Certainly the innate cognitive ability (third order intentionality) for such complex behaviour is in place as evidenced through composite technology so it is with evidence for PCT that I would suggest researchers look for the first use of material culture in social communication as we would understand it to be.

Furthermore, in contrast to table 4.3, table 9.1 illustrates how the results of the lithic analysis presented within this thesis suggest that social signalling may not have been expressed through Palaeolithic tool manufacture in the way that has been previously assumed. From the results presented within this thesis there would appear to be a genuine lack of standardisation in LCT and non-PCT flake form and manufacture, and PCT flake retouch imposition. Given the wide range of sites examined on a regional United Kingdom scale and on an international scale from the Middle East and Southern Africa, I do not think that the lack of standardisation is a reflection of the scale of analysis conducted here nor are the results a reflection of more prosaic local factors (such as individual preference, raw material constraints or re-sharpening). Rather I believe that the results presented within this thesis are a genuine reflection of hominin behaviour where standardisation in artefact manufacture simply does not mean the same to the Middle Pleistocene hominin as it does for us modern humans. I am not suggesting that social signalling through lithic tool manufacture within the Palaeolithic was absent, only that our current framework of understanding does not necessarily correspond to the patterns evident within the data presented within this thesis. Furthermore, the discussions on visual display and PCT above have highlighted the importance of looking beyond the lithic evidence to inform and expand our interpretations of hominin behaviour.

By examining the connections stated within material culture categories 2 and 3 in tables 4.3 and 9.1 between the Identity Model and the archaeological record I hope by inference to ascertain that the suppositions for material culture categories 1 and 4 -5 are also reasonable. To test the suppositions for categories 1 and 4-5 would be one of area for future work (see Chapter 10) before the Identity Model could be said to be truly applicable through all material culture categories.

The final result to be displayed within the context of this thesis, are how the results of the data analysis and the application of the Identity Model to the archaeological record given in table 9.1 affects the position of the Social Brain Hypothesis and the predictions for hominin cognitive abilities reflect against the cognitive abilities suggested from the archaeological record. Figure 2.2 (page 15), table 2.1 (page 20) and figure 2.4 (page 21) show the current position of the Social Brain Hypothesis and it's cognitive predictions expressed as orders of intentionality against the hominin phylogeny. Figure 9.1 below shows a reinterpretation of how the orders of intentionality map onto the hominin phylogeny based on the examination of the lithic artefacts through the Identity Model given within this thesis.

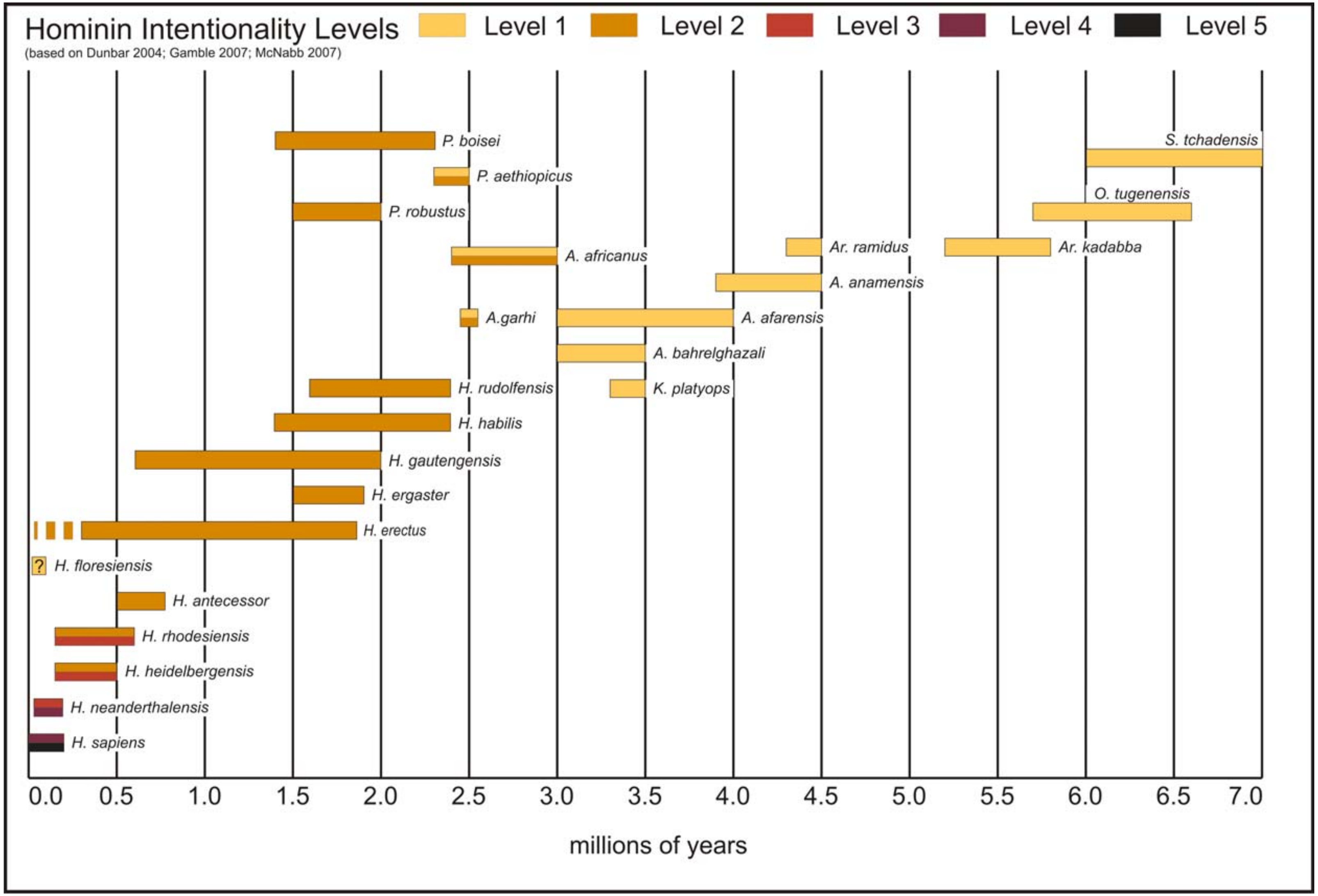


Figure 9.1: Summarising the view of hominin intentionality according to the application of the Identity Model to the archaeological record (based on table 9.1).

From figure 9.1 it can be seen that the archaeological evidence would suggest a much later movement into the sphere of third-order intentionality with *H. rhodesiensis* and *H. heidelbergensis* over the potential *H. ergaster* or *H. erectus* suggestion within the Social Brain Hypothesis (table 2.1 and figure 2.4). The third-order suggestion for *H. rhodesiensis* and *H. heidelbergensis* results from the presence of material culture category 3 artefacts appearing around 300,000 years ago in Africa (and by inference, composite technology), where they were the only species present at that stage to have produced the artefacts (Barham 2010). In Europe the species involved in manufacturing PCT were late *H. heidelbergensis* and *H. neanderthalensis*. In contrast to the Social Brain Hypothesis, there was found to be no evidence within the data presented for this thesis that the hominins of the Acheulean (*H. ergaster* or *H. erectus*) were using artefacts as a proxy for culturally significant communications or composite technologies. This would in turn suggest that these hominins were operating under a second-order of intentionality and had not attained the third-order echelon as predicted within the Social Brain Hypothesis.

The implications for the Social Brain Hypothesis and the Identity Model are relatively clear. The Social Brain Hypothesis, based on group and brain size may provide a good measure of hominin cognitive *potential* through time, whereas the Identity Model through notions of intex and perpetuated intex within a collective identity allow an assessment of *realised* hominin cognitive potential based upon the archaeological record. The result is that there would appear to be a gap between cognitive potential based on brain size, and the behavioural markers that imply a realisation of that potential. Evolutionarily speaking, it would subsequently appear that physiological changes (such as increasing brain size) may result in behavioural changes and not vice versa. The question still remains as to what the driving factors are behind changes in hominin physiology? In this respect I believe that the Social Brain Hypothesis still supplies us with the most holistic (and potentially realistic) answer, increasingly complex social interactions resulting from increasing groups sizes drove brain encephalisation. The Identity Model and its relation to the archaeological record (table 9.1) allow researchers a new and innovative heuristic in relating the markers of hominin behaviour within the archaeological record into a frame work of social interaction through a system of identity creation and perpetuation.

9.4 Summary

The purpose of this chapter was to discuss the cognitive and behavioural relevance of PCT and composite tools in relation to the Identity Model and the Social Brain Hypothesis. From this discussion, it was reasoned that the hominins of the Middle Palaeolithic or material culture category 3 artefacts suggested a realised minimum of third-order of intentionality. With a third-order of intentionality the concepts of intex and perpetuated intex had the capacity to be formed, although conclusive evidence at the time of writing for material culture (in the form of lithic or organic artefacts) use in complex systems of visual display (such as intex and perpetuated intex) is largely absent from the archaeological record. The potential use of pigments within body decoration would suggest that behaviourally speaking, intex and perpetuated intex within a collective identity could have been expressed through increasingly complex visual displays of the body enhanced through pigmentation broadcasting culturally significant social signals with accompanying vocalisations.

According to the Identity Model and its correlation to the archaeological record, fully grammatical language would only be possible with a fully developed notion of the abstract and its expression in the physical world through ornamentation and art. From our current knowledge of the archaeological record this capability seems to be linked to the rise of the modern human in Africa and their movement into Europe (with some controversy). However, this discussion is outside of the bounds of this thesis and a potential subject for future work. The final chapter shall focus on concluding the thesis and reiterating the results presented here and their implications for future research.

Chapter 10 – Summary, Conclusions and Future Research

The primary focus of this thesis has been to assess the predictions of hominin cognitive ability and behavioural complexity made through the Social Brain Hypothesis (based on group and brain size estimates) against the archaeological record. The method through which I have tried to achieve this has been twofold, through a theoretical construction of my own imagining termed the Identity Model (Chapter 3), and through the correlation of the Identity Model to the archaeological record (tables 4.3 and 9.1) which was then tested against a number of Lower and Middle Palaeolithic sites from the United Kingdom, Israel and South Africa. I shall now summarise the content of this thesis before commenting on the final conclusions and avenues for future research.

10.1 Summary

Chapter 1 laid out the structure of the thesis and offered some general background information on the theme of investigation to be followed throughout. Chapter 2 gave a detailed account of the background theory surrounding this thesis, the Social Brain Hypothesis. The Social Brain Hypothesis is a theory that explains the development of the 'human' through the primary push of social drivers where increasing group size led to increasing complexity on social relations resulting in brain encephalisation. Within the literature review I highlighted some problematic points concerned with the Social Brain Hypothesis, and identified areas that I would address through my own theoretical model (the Identity Model) and methodological predictions. The next section of the literature review dealt with theoretical stances toward the body which I explored from an archaeological standpoint. I identified a number of areas where our understanding of the importance of the body within the archaeological record remained wanting (primarily discarding the misguided dualistic view of body and mind as two separate components). I subsequently offered up my own definition of what constitutes a body in order to create an holistic heuristic perception of the body incorporating the mind as an essential component of the physical body itself. Next I examined the role of the body as a vehicle for social communication in both humans and primates, and how to relate the role of the body into the development of grammatical language through the presence of mirror neurons found within both human and primate brains.

Chapter 3 referred to the Identity Model and its application to the archaeological record. The Identity Model offers a theoretical perspective on the construction of individual and group identity through the Palaeolithic linked to a scale of cognitive complexity, the orders of intentionality, and the development of language from non-linguistic societies based on visual display to fully grammatical syntax. Within non-linguistic societies, I suggest that the vehicle for identity comprehension and perpetuation would have been the body. Similarly, the body would have played a central and primary role in visual display irrespective of degree of complexity. However, embedded within the Identity Model are the notions that material culture / behaviour could only be imbued with culturally significant social meaning once the ability to construct proxies had been achieved. I further offered that the ability to formulate a proxy was only attainable once a minimum of third to fourth-order intentionality has been realised and notions of intex and perpetuated intex were expressed within the framework of a collective identity. Within this third-order intentionality mentality, communication systems were predicted to have been governed by complex visual displays with accompanied vocalisations, but not necessarily fully grammatical language. Within the Identity Model framework it was hypothesised that fully grammatical language would only have been possible once hominins had the ability to conceive of complex abstract notions, such as the supernatural, that were linked to group identities (abstract identity). Furthermore, the only way to express such complex abstract notions would be through grammatical language and the markers of grammatical language such as ornamentation and art (the perpetuated abstract). The central point being that the ability to construct complex abstract notions and their expression would only be possible with a fifth-order of intentionality.

Chapter 4 related the Identity Model to the archaeological record (table 4.3) using Clark's (1969) technological modes as a heuristic within widely held beliefs relating to hominin behaviour and cognition in respect to tool manufacture. There were two central tenants where categories of identity construction within the Identity Model may be visible within the archaeological record. The first is through perpetuated intex (marked at a third-order of intentionality – table 3.1) where it was predicted that material culture / behaviour would be included within an individual's identity broadcast through complex visual display within a non- grammatically lingual society. The second would be through perpetuated abstract (marked at a fifth-order of intentionality – table 3.1) where it was predicted that material culture / behaviour would be incorporated in the physical expression of abstract notions (such as the supernatural) through grammatical language and its markers of art and ornamentation. In regards to the context of this thesis, and at the time of writing, the appearance of art and ornamentation within the Palaeolithic has only been associated uncontrovertibly with the appearance of modern humans who have an innate ability for fifth-order intentionality and grammatical language. Therefore it was decided that the area where the use of the Identity Model in assessing the archaeological record would contribute most to our understanding of hominin evolution, cognitive ability and behavioural constructions would be to examine when material culture / behaviour became incorporated within culturally meaningful social communications such as those described within intex and perpetuated intex as described within the Identity Model.

The time periods under examination subsequently fell between two distinct technological periods, material culture category 2 (tables 4.3 and 9.1) – or mode 2 technologies often termed the Acheulean, and a component of the Lower Palaeolithic, and material culture category 3 (tables 4.3 and 9.1) - or mode 3 technologies often associated with the Middle Palaeolithic. Traditionally, many researchers within the Palaeolithic have assumed that the LCTs of material culture category 2 were highly symmetrical and standardised in form which would suggest that they were incorporated within culturally meaningful systems of social communication (Saragusti *et al* 1998; Kohn and Mithen 1999; Ambrose 2001; Wenban-Smith 2004; Foley and Gamble 2009; Hodgson 2009). If this were the case then according to the Identity Model, the material culture category 2 hominins would operate under a third-order of intentionality as a minimum with the LCTs becoming active agents of intex perpetuation within a collective identity. However, to my knowledge at the time of writing, only one large study examining the presence of symmetry on a large data set has been published (Marshal *et al* 2002). However, differences in methodology, assemblage selection and the poor quality of the published photographs in the Marshal *et al* (2002) database excluded this study from forming a useful component or comparison for this thesis. Therefore, within this thesis I aimed at creating a database where Lower and Middle Palaeolithic assemblages could be compared across a regional temporal framework with two international control studies in order to assess the deliberate imposition of form and symmetry on artefacts from two distinct periods of the Pleistocene. The purpose being to test whether the evidence for material culture / behaviour and their incorporation into culturally significant systems of communication were present within both material culture category 2 and 3 artefacts; or just within one or the other.

The results of the data analysis (Chapter 5 for methodology, Chapters 6 for site histories, Chapter 7 for a results summary and Chapter 8 for a discussion of the results) suggested that there was a distinct lack of symmetry and standardisation of form within Lower and Middle Palaeolithic LCTs. This in turn could indicate that these artefacts were not included within perpetuations of intex or culturally significant social communication. Furthermore, a lack of standardisation was observed within retouch imposition on flake tool typologies and artefact proportions for flakes, flake tools and cores within material culture categories 2 and 3, further insinuated that lithic artefacts may not have been directly included within culturally significant social communications. However, what I have established within the data set for this thesis is that if lithic artefacts were included in social signals, they were not done so through our current expectation or understanding of standardisation in artefact form.

In order to try and access the cognitive and behavioural potential of Lower and Middle Palaeolithic hominins, I decided to focus upon a key behavioural difference between material culture category 2 and 3 artefacts, and that was the appearance (as evidenced through PCT points) of composite tools and evidence for pigment use within material culture category 3 hominins (Chapter 9). Due to the cognitive challenges required to have a detailed working knowledge of multiple *chaîne opératoires* and negotiating the increasing complex social interactions (in terms of mental states of other individuals within the group) required to co-ordinate the construction of a composite tool, it has been suggested here that a minimum of a third-order of intentionality was required to successfully produce a composite. Furthermore, with the advent of material culture category 3 artefacts was a virtually simultaneous use of anthropogenically modified pigments (based on knowledge at the time of writing). The potential use of pigmentation within visual display and the body would suggest that a sense of intex had been achieved and perpetuated within a collective identity. This in turn implies that a minimum of a third to fourth-order of intentionality may have been realised by the hominins utilising material culture category 3 artefacts. The degree of behavioural complexity seen within composite tool and pigment use does not seem to be reflected within material culture category 2 artefacts, and by inference hominin behaviour for the Lower Palaeolithic or Acheulean.

Therefore, based on the evidence presented within this thesis, I proposed that Acheulean hominins operated under a second-order of intentionality, with social co-ordination being organised through visual displays centred on the body. With the attainment of a third-order of intentionality within the Middle Palaeolithic (material culture category 3 artefacts), social co-ordination could have been organised through complex visual displays incorporating external influences (such as pigmentation, and possibly composite tools) expanding the boundary of the body and allowing the expression of individual identities through perpetuated intex within a collective group identity.

10.2 Conclusion

In testing the predictions of the Social Brain Hypothesis in regards to hominin cognitive ability, I have presented here a new and innovative theoretical stance on identity construction and perpetuation within the Palaeolithic termed the Identity Model. The Identity Model offers a mechanism for the construction of individual and group identities within non-lingual and lingual societies, and relates the categories of identity to scales of cognitive complexity through the orders of intentionality. By relating the Identity Model to the archaeological record (table 9.1) I have presented a heuristic framework that allows researchers to assess the cognitive and behavioural implications of the Palaeolithic record through the filter of identity construction and propagation. The discursive framework suggested in table 9.1 allows a further assessment of the Palaeolithic framework stretching from the simple chopping tools of the material culture category 1 to the ornaments and beads of the Upper Palaeolithic / material culture category 4 - 5. By testing two of the material culture categories (2 and 3) within this thesis, I have shown that the links allowing an assessment of the archaeological record through the Identity Model would seem to have significantly altered our perceptions of hominin behaviour and cognitive ability The results have shown that long held assumptions regarding the behavioural and cognitive abilities of material culture category 2 hominins in respect to the use of material culture within systems of social communication were in fact not supported through a close analysis of the archaeological record. This in turn would suggest that the hominins of the Lower Palaeolithic operated under a second-order of intentionality at best and not the third-order previously proposed. Furthermore, based on the archaeological evidence at the time of writing, I have also suggested that the hominins of the Middle Palaeolithic were perhaps the more likely candidates to use material culture / behaviour to extend the boundaries of their bodies and communicate in a complex system of visual display. Central to this tenant is the presence of composite technologies and use of pigmentation in visual display that I suggest required a minimum of a third to fourth-order of intentionality in order to successfully work.

The ultimate conclusion must be that by examining the archaeological record through the heuristic of the Identity Model, I have shown that the predictions of the Social Brain Hypothesis, in terms of hominin cognitive abilities did not quite match the behavioural evidence of the archaeological record. The Social Brain Hypothesis, based on predicted brain and group size suggests that the hominins of the Acheulean had the potential for a third-order of intentionality, whilst those of the Middle Palaeolithic had the potential for a fourth to fifth-order of intentionality (figure 9.1). The archaeological record as assessed within this thesis through the theoretical framework of the Identity Model instead suggests that the hominins of the Acheulean realised a second-order of intentionality, whilst the hominins of the Middle Palaeolithic realised a third to fourth-order of intentionality. This in turn intimates that the Social Brain Hypothesis predicts the *potential* cognitive ability of ancient hominin species whilst the archaeology, through the filter of the Identity Model, illustrates the *realised* cognitive ability, and the two are not necessarily mutually exclusive. Based on the results and discussions of this thesis, it would appear that cognitive potential must be in place before it can be realised. This in turn suggests that physiological changes must occur before behavioural ones.

The question that remains then is what drove physiological changes within hominin evolution? In answer to this I still believe that the Social Brain Hypothesis is essentially correct and it was the increasingly complex social interactions driven by increasing group size that lie at the heart of the evolution of the big brained modern human. The contribution of this thesis to the current knowledge state of Palaeolithic studies has been to suggest a re-examination of long held cognitive and behavioural assumptions in relation to the imposition of standardised form on lithic artefacts. This thesis has also provided a new theoretical discursive framework through which such a re-examination may take place in order to allow researchers to get closer to the understanding our hominin ancestors.

10.3 Future Research

The results and the new theoretical model for examining the cognitive and behavioural abilities of our hominin ancestors (the Identity Model) presented within this thesis allow for a number of future research avenues. However, three of the most immediate possibilities are given below:

1. Examine assemblages from material culture category 1 (the Oldowan) in order to test whether the behavioural assumptions (see table 9.1) based upon the known archaeological record are correct. This would also allow an assessment of the material culture category 1 and 2 assemblages in order ascertain whether the difference between Acheulean and Oldowan assemblages is as great as the difference between Acheulean and PCT (material culture category 3) assemblages. Such an assessment would also allow researchers to evaluate the archaeological record in order to establish whether identity constructions and visual displays were carried out as predicted by the Identity Model for the Oldowan.
2. Examine assemblages from material culture categories 4-5 technologies in order to test whether the behavioural assumptions (see table 9.1) based upon the known archaeological record are correct. This would allow for an assessment of Upper Palaeolithic PCT blade industries against the PCT industries of the Middle Palaeolithic, in order to establish whether retouch imposition on Upper Palaeolithic retouch tools are as standardised as Monnier (2006) predicts. If so then it may be possible to suggest with a greater degree of certainty that the composite tools of the Upper Palaeolithic were included within complex visual displays and within individual and group identity construction and perpetuation. If not, then it may seem that lithic tools in all their various forms (composite or not) may not have been incorporated within identity constructions and visual displays as researchers have often assumed. If this is the case then identity constructions and display may be linked to more organic forms of representation such as the pigment use of the Middle Palaeolithic, and the more durable symbolic display such as bead ornamentation and art (including wall and portable art such as figurine carvings) of the Upper Palaeolithic. Either way, the tenants of the Identity Model remain intact in terms of the cognitive abilities of the hominins under study, what will change is how exactly the Identity Model is applied to the archaeological record. Although the

broad application shown in table 9.1 and put forward as a positive result of this thesis would still be upheld.

3. The lithic analysis conducted for this thesis has been largely based on the British Palaeolithic sequence. In order for the conclusions drawn here to be truly tested as a statement of universal hominin behaviour (if indeed such a statement can be achieved), it would be prudent to extend the database into a wider geographic and temporal analysis of the Acheulean and Middle Palaeolithic. Such an expansion would include Western, Central and Eastern Europe, more sites within the Middle Eastern context and inclusion of the African Lower and Middle Stone Ages. By extending the data set under examination into all known areas of hominin occupation, researchers would be able to assess the influence of regional variability upon hominin behavioural and cognitive expressions. I suspect that regional responses to shifting climate and local raw materials will show a very complex picture of hominin behaviour that may not allow for such broad statements on cognitive ability and behaviour as have been put forward within this thesis. Only once such an inclusive analysis has been conducted could the Identity Model and its application to the archaeological record be truly justified and put forward as a new and innovative method of accessing hominin cognitive and behavioural capabilities.

Appendix 1 – Hominin Phylogeny

A brief description of the members of the hominin species are set out below in relation to genus. I shall begin with the oldest and progress through the fossil record detailing each species, temporal span, holotype site location, hypothesised behavioural practices (based on species morphology), details on the palaeoenvironment (where possible), and current position within the Social Brain Hypothesis (SBH) - in terms of projected group size and order of intentionality. I shall not be detailing a summary of the morphological characteristics for each hominin species due to the fact that extensive and detailed reviews have been done previously (Klein 1999; Strait, Grine and Moniz 1997; Wood and Richmond 2000; Wood and Lonergan 2008) and the highly technical osteoarchaeological language, although vitally important in the classification of species and of great interest to palaeontologists, may detract from the crucial behavioural and cognitive traits that I wish to highlight through this section. I shall follow the hominin phylogeny laid out in Figure A1.1 which was the most up to date phylogeny at the time of writing, with text describing each species following below.

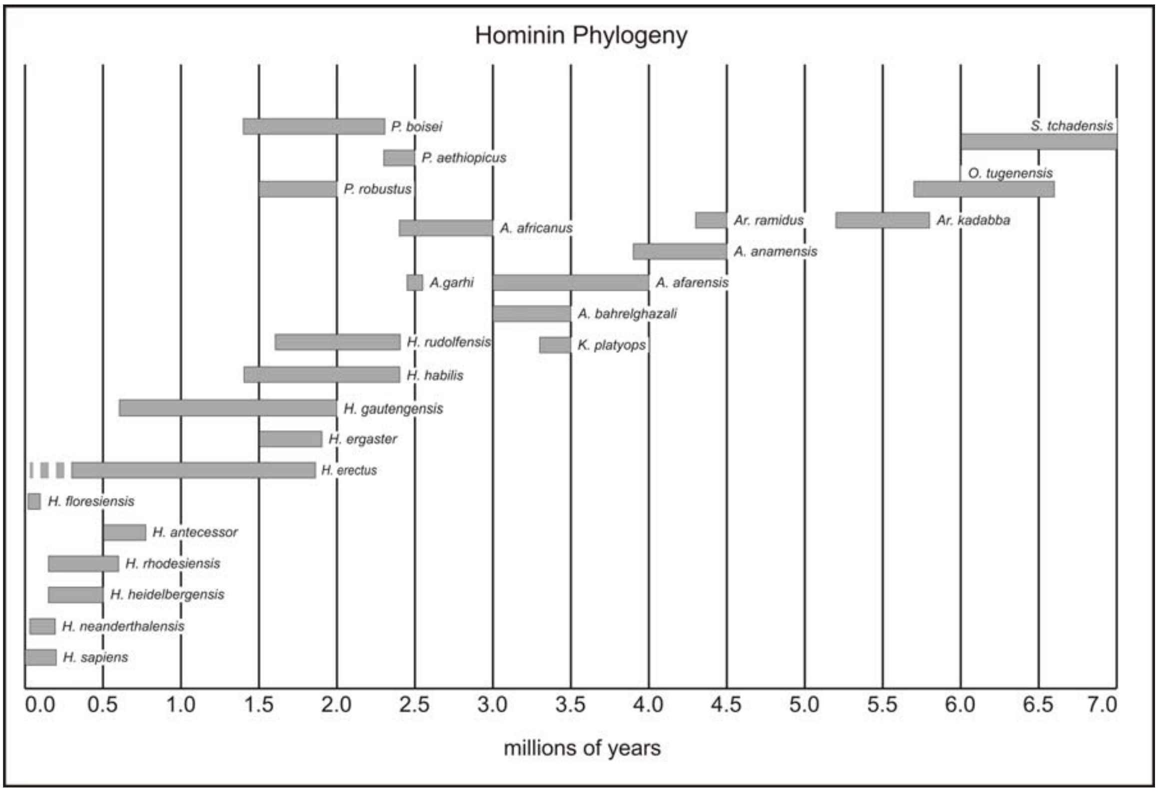


Figure A1.1: Diagram illustrating the hominin phylogeny to be followed within this thesis.

Genus - ***Sahelanthropus***

Species - *Sahelanthropus tchadensis* (*S. tchadensis*).

Temporal Range - c. 7 - 6 million years ago.

Holotype Site - Toros Menalla - Chad.

Behavioural Traits - It is uncertain whether *S. tchadensis* can be classed as a full hominin or a separate clade of ape-like hominins, however *S. tchadensis* is likely to be close phylogenetically to the last common ancestor between humans and chimpanzees. Little can be said about the behavioural characteristics of this hominin due to a lack of post cranial skeleton, however the cranial morphology suggests that *S. tchadensis* may have had some bipedal locomotive ability.

Palaeoenvironment - Insufficient evidence available to ascertain the palaeoenvironment of *S. tchadensis.*

SBH position
• Group size - Unknown due to insufficient data.
• Cranial capacity: varies from 320 – 380cm^3.
• Order of intentionality - Unknown due to insufficient data, but presumed to be first-order intentionality similar to that of current primates.

References Data from Brunet *et al* 2002; Brunet *et al* 2005; Zollikofer *et al* 2005; Wood and Lonergan 2008.

Genus - ***Orrorin***

Species - *Orrorin tugenensis* (*O. tugenensis*).

Temporal Range - c. 6.6 – 5.7 million years ago.

Holotype Site - Kapsomin, Lukeino Formation, Tugen Hills, Baringo - Kenya.

Behavioural Traits - It is uncertain whether *O. tugenensis* can be classed as a full hominin, however it does seem that *O. tugenensis* may have been partially bipedal with arboreal adaptations. Any more inferences on behaviour cannot be made due to insufficient evidence.

Palaeoenvironment - Insufficient evidence available to ascertain the palaeoenvironment of *O. tugenensis.*

SBH position
• Group size - Unknown due to insufficient data.

	• Cranial capacity – Unknown due to insufficient fossil evidence.
	• Order of intentionality - Unknown due to insufficient data, but presumed to be first-order intentionality similar to that of current primates.
References	Data from Senut *et al* 2001; Wood and Lonergan 2008.

Genus	- ***Ardipithecus***

Species	- *Ardipithecus kadabba* (*Ar. kadabba*).
Temporal Range	- c. 5.8 – 5.2 million years ago.
Holotype Site	- Central Awash Complex and the Western Margin, Middle Awash - Ethiopia.
Behavioural Traits	- Based on limited evidence it has been suggested that *Ar. kadabba* has a more ape like morphology than *Ar. ramidus* and may not be a direct ancestor to the developed hominin line as *Ar. ramidus* may be. Little can be inferred from the fossil evidence as to the behavioural traits of this potential hominin ancestor.
Palaeoenvironment	- Insufficient evidence available to ascertain the palaeoenvironment of *Ar. kadabba*.
SBH position	• Group size - Unknown due to insufficient data.
	• Cranial capacity - Unknown due to insufficient fossil evidence.
	• Order of intentionality - Unknown due to insufficient data, but presumed to be first-order intentionality similar to that of current primates.
References	Data from Haile-Selassie 2001; Wood and Lonergan 2008.

Species	- *Ardipithecus ramidus* (*Ar. ramidus*).
Temporal Range	- c. 4.5 – 4.3 million years ago.
Holotype Site	- Aramis, Middle Awash - Ethiopia.
Other Site Examples	- Possibly at Tabarin and Lothagam - Kenya.
Behavioural Traits	- *A. ramidus*, so far as has been discovered, is the first hominid to display basic morphologically modern characteristics making *A. ramidus* the most primitive known hominin. Current thinking believes *A. ramidus* to have weighed around 40 kilograms, with small chewing teeth (based on incisor size and enamel coverage,

	A. ramidus may have had a diet similar to that of a chimpanzee), with a more bipedal form of locomotion than living apes. As of the time of writing there is little information known about the size of brain and the extent of sexual dimorphism within this hominin is currently unknown although it may be assumed to have been significant suggesting male–male competition may have been an important behavioural trait of the species possibly resulting in a polygnous reproductive strategy.
Palaeoenvironment	- Based on plant and faunal remains found in stratigraphic association with *A. ramidus*, it is thought that the hominin may have occupied a woodland habitat.
SBH position	• Group size - Unknown due to insufficient data. • Cranial capacity – Unknown due to insufficient fossil evidence. • Order of intentionality - Unknown due to insufficient data, but presumed to be first-order intentionality similar to that of current primates.
References	Data from White *et al* 1994, 1995; WoldeGabriel *et al* 1994; Klein 1999; Wood and Richmond 2000; Wood and Lonergan 2008.

Genus	- ***Australopithecus***

Species	- *Australopithecus anamensis* (*A. anamensis*)
Temporal Range	- c. 4.5 – 3.9 million years ago.
Holotype Site	- Kanapoi, southwest of Lake Turkana - Kenya
Other Site Examples	- Allia Bay, East Lake Turkana - Kenya
Behavioural Traits	- Based on estimates from the proximal and distal tibias, *A. anamensis* is thought to have weighed around 50 kilograms for a male and 33 kilograms for a female. Large incisors suggest a frugivorous diet, however the thick enamel on the teeth may advocate a hominin capable of a strong bite with teeth resistant to wear which may have enabled the processing of nuts and grains. Tibia morphology suggests the first evidence for habitual bipedalism, however, evidence of curved fingers coupled with radius, ulna and humerus morphology advocate capabilities for

	arboreal movement were still maintained. Sexual dimorphism is presumed to be substantial due to differences in canine root size between male and female fossil specimens and the difference in projected mass between the sexes (males weighing 51 kilograms, females weighing 33 kilograms). This in turn could suggest fervent male – male competition possibly resulting in a polygnous reproductive strategy.
Palaeoenvironment	- Based on mammalian macro and micro fauna found in association with the *A. anamensis* remains at Kanapoi, it is suggested that the hominin occupied an assortment of habitats including riverine woodlands and gallery forests.
SBH position	• Group size - Unknown due to insufficient data. • Cranial capacity – Unknown due to insufficient fossil evidence. • Order of intentionality - Unknown due to insufficient data, but presumed to be first-order intentionality similar to that of current primates.
References	Data from Leakey *et al* 1995; Ward *et al* 1999; Klein 1999; McHenry and Coffing 2000; Wood and Richmond 2000; White *et al* 2006; Wood and Lonergan 2008.

Species	- <u>Australopithecus afarensis</u> (*A. afarensis*)
Temporal Range	- c. 4.0 – 3.0 million years ago.
Holotype Site	- Laetoli Beds, Laetoli - Tanzania
Other Site Examples	- Hadar, Middle Awash, Fejej, Lower Omo Valley - Ethiopia; Koobi Fora, Allia Bay and South Turkwell - Kenya.
Behavioural Traits	- Based on post cranial remains a male *A. afarensis* is presumed to have weighed 45 kilograms with a stature of 1.51 metres, whilst females may have weighed around 29 kilograms with a stature of 1.05 metres. The chewing teeth (molars and premolars) are larger than those of a chimpanzee, yet the incisors are smaller. Similar to *A. anamensis*, *A. afarensis* has thick enamel which suggests that nuts and grains may have been important to diet. Based on the shape of the pelvis and lower limbs, *A. afarensis* was well adapted to bipedal movement, although, it is still undetermined whether *A. afarensis* walked with a bent-hip, bent-

	knee gait or on extended hindlimbs (like modern humans). However, it seems plausible (based on forelimb and phalange morphology) that *A. afarensis* maintained some arboreal locomotive adaptations. Significant sexual dimorphism seen within the *A. afarensis* fossils suggest once more that male – male competition may have been prolific resulting in a polygnous reproductive strategy.
Palaeoenvironment	- *A. afarensis* was capable of living in ecologically diverse environments ranging from savannah, riparian woodland and closed woodland. This indicates a hominin capable of multiple foraging techniques and strategies which may also contribute to the explanation of why the hominin was not entirely bipedal but maintained arboreal adaptations.
SBH position	• Group size – circa 60 individuals. • Average stature: male 1.51m; female 1.05m • Cranial capacity: varies from 387 – 550cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *A. afarensis* occupied first-order intentionality.
References	Data from Stern and Susman 1983; Latimer *et al* 1987; Aiello and Dunbar 1993; Klein 1999; McHenry and Coffing 2000; Wood and Richmond 2000; De Miguel and Henneberg 2001; Alemseged *et al* 2006; Raichlen *et al* 2008; Wood and Lonergan 2008.

Species	- *Australopithecus bahrelghazali* (*A. bahrelghazali*)
Temporal Range	- c. 3.5 – 3.0 million years ago.
Holotype Site	- Bahr el ghazal region - Chad.
Behavioural Traits	- Not much at present can be said about the projected behavioural traits of this hominin. The enamel thickness of *A. bahrelghazali* is similar to that found in *A. afarensis* which may suggest a similar diet of nuts and grains. Sexual dimorphism is unknown but may presume to be similar to *A. afarensis*.

Palaeoenvironment - Based on associated fauna found with *A. bahrelghazali* it would seem that this hominin occupied both open and wooded environments similar to that of *A. afarensis*.

SBH position • Group size - Unknown due to insufficient data.
• Cranial capacity – Unknown due to insufficient fossil evidence.
• Order of intentionality - Unknown due to insufficient data, but presumed to be first-order intentionality.

References Data from Wood and Richmond 2000; Wood and Lonergan 2008.

Species - *Australopithecus africanus* (*A. africanus*)

Temporal Range - c. 3.0 – 2.4 million years ago.

Holotype Site - Taung - South Africa.

Other Site Examples - Sterkfontein, Makapansgat and Gladysvale - South Africa

Behavioural Traits - Based on current evidence, it would appear that *A. africanus* has a sexual dimorphism range not dissimilar to *A. afarensis* with similar physique (males weighting 41 kg and 1.38 metres tall and females weighing 30 kg and 1.15 metres tall) but larger chewing teeth. The brain of *A. africanus* is larger than *A. afarensis* with an average estimated size of 452 cc, but the skull is not as ape like as *A. afarensis*. *A. africanus* was well adapted to bipedal motion although the forelimbs of *A. africanus* are longer than expected when compared to hind-limb joint size, contrasting sharply to the more 'human' like proportions of *A. afarensis*. Curved phalange morphology may indicate a continued arboreal adaptation in locomotion similar to that of *A. afarensis*. Although the distal phalanx suggests that *A. africanus* had a thumb that was robust and equipped with a broad fleshy tip. Furthermore a broad distal radius permitted wrist extension which may be associated with tool manipulation. Isotope analysis of *A. africanus* teeth suggest that the hominin ate foods that had high levels of ^{13}C suggesting a diet of grasses or the flesh of animals or insects who themselves ate a diet rich in ^{13}C.

Palaeoenvironment - Flora and faunal remains found in association with *A. africanus* suggest that this hominin occupied open woodland and bushland.

SBH position • Group size – circa 65 individuals.

	• Average stature: male 1.38m; female 1.15m
	• Cranial capacity: varies from 428 – 560cm^3.
	• Order of intentionality – based on cranial capacity and predicted group size it is thought that *A. africanus* occupied first to second-order intentionality. An interesting point to note here is that the first hominin that may have broken the theory of mind barrier is also the first hominin to display physiological changes that may relate to tool use. Could regular tool use in terms of the deliberate knapping sequences seen in the Oldowan be a proxy for theory of mind development?
References	Data from Marzke 1971; Aiello and Dunbar 1993; Marzke 1997; Reed 1997; Sponheimer and Lee-Thorp 1999; McHenry and Coffing 2000; Wood and Richmond 2000; De Miguel and Henneberg 2001; Dunbar 2003; Wood and Lonergan 2008.

Species	- <u>*Australopithecus garhi*</u> (*A. garhi*)
Temporal Range	- c. 2.5 million years ago.
Holotype Site	- Bouri, Middle Awash - Ethiopia.
Behavioural Traits	- Little is currently known about this hominin however an extended femur could indicate that *A. garhi* was habitually bipedal, although long forelimbs suggest a remnant arboreal adaptation in terms of locomotion. Interestingly, cut-marks have been found on faunal remains at nearby localities which may indicate that *A. garhi* (or a contemporary hominin such as *P. aethiopicus* or *H. rudolfensis*) were manipulating carcasses for meat.
Palaeoenvironment	- faunal remains found in similar horizons to *A. garhi* suggest an open woodland habitat.
SBH position	• Group size – circa 65 individuals (Grove *pers comm*.).
	• Cranial capacity: circa 450cm^3.
	• Order of intentionality - Unknown due to insufficient data, but presumed to be first to second order intentionality.
References	Data from Asfaw *et al* 1999; de Heinzelin et al 1999; Wood and Richmond 2000; De Miguel and Henneberg 2001; Wood and Lonergan 2008; Grove *pers comm*.

Genus - ***Kenyanthropus***

Species -<u>*Kenyanthropus platyops*</u> (*K. platyops*).
Temporal Range - c. 3.5 – 3.3 million years ago.
Holotype Site - Lomekwi, Turkana - Kenya
Behavioural Traits - Little is known of the behavioural traits of *K. platyops*, however, the cranial size and teeth enamel thickness is comparable to *A. afarensis* and *A. africanus* which could suggest a similar diet to the australopithecines, although molar size is significantly reduced, more comparable to *H. rudolfensis*. Given the lack of post cranial skeletal material for *K. platyops*, it was not possible at the time of writing to determine locomotion or degree of sexual dimorphism within this species.
Palaeoenvironment - Based on faunal remains from Lomekwi sites it is suggested that *K. platyops* occupied a wet woodland environment.
SBH position • Group size – Unknown due to insufficient data.
• Cranial capacity - Unknown due to insufficient fossil evidence.
• Order of intentionality - Unknown due to insufficient data, but presumed to be first to second order intentionality.
References Data from Leakey *et al* 2001; Wood and Lonergan 2008.

Genus - ***Paranthropus***

Species - <u>*Paranthropus aethiopicus*</u> (*P. aethiopicus*).
Temporal Range - c. 2.5 – 2.3 million years ago.
Holotype Site - Lake Turkana - Kenya
Other Site Examples - Possibly Shungura Formation, Omo region – Ethiopia.
Behavioural Traits - Not much can be said about the behavioural traits of *P. aethiopicus* due to the lack of post cranial skeletal information, however, based on the size of incisor, it is thought that this hominin may have processed its food more than *P. robustus* or *P. boisei*. Based on current evidence it is difficult to ascertain the extent to which *P. aethiopicus* was sexual dimorphic, however it can be assumed that some sexual dimprohism was present. The lack of a post cranial skeleton makes it difficult to ascertain

	whether *P. aethiopicus* was fully bipedal or not, however, it can be assumed as with all other australopithecines and paranthropines that this hominin had a combined bipedal locomotion with an apelike ability to climb.
Palaeoenvironment	- Based on faunal remains found in similar horizons to *P. aethiopicus*, it is thought that this hominin occupied an environment ranging from bushland to open woodland.
SBH position	• Group size – between 60 - 69 individuals (Grove *pers comm.*). • Cranial capacity – varies from 400 – 490cm^3. • Order of intentionality - based on cranial capacity and predicted group size it is thought that *P. aethiopicus* occupied first to second-order intentionality.
References	Data from Walker *et al* 1986; Klein 1999; Wood and Richmond 2000; De Miguel and Henneberg 2001; Wood and Lonergan 2008; Grove *pers comm*.

Species	- *Paranthropus boisei* (*P. boisei*).
Temporal Range	- c. 2.3 – 1.4 million years ago.
Holotype Site	- Olduvai Gorge - Tanzania.
Other Site Examples	- Peninj, Natron - Tanzania; Shungura Formation, Omo Region and Konso Gardula - Ethiopia; Koobi Fora, Baringo Region, West Turkana - Kenya; Malema - Malawi.
Behavioural Traits	- Based on current evidence, *P. boisei* seems to have a large sexual dimorphism (males weighing around 49 kilograms and 1.37 metres tall, females weighing around 34 kilograms and 1.24 metres tall). Interestingly, *P. boisei* had small canines which would suggest that if there was male-male competition for females then the males used other methods to signal their threats than their teeth. Based on the large crowned and thick enamel of the teeth it is thought that *P. boisei* may have subsisted mainly on seeds or hard covered fruits. Similar to *A. afarensis*, it is thought that *P. boisei* may have been bipedal with arboreal locomotive adaptations.

Palaeoenvironment	- It has been suggested that *P. boisei* may have occupied more open environments such as savannah and open or scrub woodland.
SBH position	• Group size – between 67 - 74 individuals (Grove *pers comm*.). • Average stature: male 1.37m; female 1.24m • Cranial capacity: varies from 475 – 545cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *P. boisei* occupied second-order intentionality.
References	Data from Aiello and Dunbar 1993; Reed 1997; McHenry and Coffing 2000; Wood and Richmond 2000; De Miguel and Henneberg 2001; Wood and Lonergan 2008; Grove *pers comm*.

Species	- *Paranthropus robustus* (*P. robustus*).
Temporal Range	- c. 2.0 – 1.5 million years ago.
Holotype Site	- Swartkrans - South Africa.
Other Site Examples	- Kromdraai, Drimolen, Gondolin and possibly Sterkfontein - South Africa.
Behavioural Traits	- Based on current evidence, it would appear as with *P. boisei*, that sexual dimorphism within *P. robustus* was quite high (males weighing 40 kilograms and 1.32 metres tall, females weighing 32 kilograms and 1.10 metres tall). *P. robustus* had small canines which would suggest that if there was male-male competition for females then the males used other methods to signal their threats than their teeth. Based on isotope analysis of *P. robustus* tooth enamel it is thought that this hominins diet included substantial components of C-4 foods such as grasses, sedges, tubers and / or, the animals or insects that feed on such food. Bone tools have been found in association with *P. robustus* remains with wear patterns that are consistent with digging (potentially for tubers or roots). Based on hip and pelvic morphology it is thought that *P. robustus* was bipedal however, unlike the previous hominin species examined thus far, evidence for an arboreal adaptation would appear to be greatly reduced in *P. robustus* forelimb morphology. Developed hand bones would suggest precision

	thumb and refined manipulation control in the fingers possibly associated with tool use.
Palaeoenvironment	- It has been suggested that *P. robustus* may have occupied more open environments such as savannah or bush / wooded grassland.
SBH position	• Group size – between 65 - 72 individuals (Grove *pers comm*.). • Average stature: male 1.32m; female 1.10m • Cranial capacity: varies between 450 – 530cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *P. robustus* occupied second-order intentionality. Note the confirmed presence of bone tools and physiological changes which may coincide with the attainment of a theory of mind.
References	Data from Susman 1988; Aiello and Dunbar 1993; Reed 1997; McHenry and Coffing 2000; Wood and Richmond 2000; De Miguel and Henneberg 2001; Harcourt-Smith and Aiello 2004; Sponheimer *et al* 2006; Wood and Lonergan 2008; Grove *pers comm*.

Genus	- ***Homo***

Species	- <u>*Homo rudolfensis*</u> (*H. rudolfensis*).
Temporal Range	- c. 2.4 – 1.6 million years ago.
Holotype Site	- Koobi Fora - Kenya
Other Site Examples	- Olduvai Gorge - Tanzania; Uraha - Malawi; and maybe the Shungura Formation - Ethiopia.
Behavioural Traits	- Based on current evidence, it is estimated that *H. rudolfensis* was drastically reduced in its degree of sexual dimorphism, falling into line with modern humans (males weighing 60 kilograms and 1.6 metres tall, females weighing 51 kilograms and 1.5 metres tall). The brain volume is substantially larger than that of any australopith being estimated at circa 752 cm^3. The postcanine teeth would suggest that *H. rudolfensis* had a similar dietary requirement as that of the australopiths, but due to a lack of past cranial evidence, any inferences on locomotion and adroitness cannot be made.

Palaeoenvironment	- Insufficient evidence available to ascertain the palaeoenvironment of *H. rudolfensis.*
SBH position	• Group size – between 80 - 98 individuals (Grove *pers comm*.). • Average stature: male 1.60m; female 1.50m • Cranial capacity: varies between 752 – 825cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. rudolfensis* occupied second-order intentionality.
References	Data from Aiello and Dunbar 1993; Wood 1999; McHenry and Coffing 2000; Wood and Richmond 2000; De Miguel and Henneberg 2001; Dunbar 2003; Wood and Lonergan 2008; Grove *pers comm*.

Species	- *Homo habilis* (*H. habilis*).
Temporal Range	- c. 2.4 – 1.4 million years ago.
Holotype Site	- Olduvai Gorge - Tanzania.
Other Site Examples	- Shungura Formation, Omo Region, Hadar Formation - Ethiopia; Koobi Fora - Kenya.
Behavioural Traits	- Current evidence suggests that *H. habilis* is closer to the australopiths than other species of Homo, and this is reflected in their degree of sexual dimorphism (male weighs 37 kilograms and 1.31 metres tall, female weighs 32 kilograms and 1.00 metres tall). The brain size however is significantly larger than those of the australopiths coming in at 612 cm^3. In terms of locomotion, *H. habilis* was bipedal however this hominin did retain a degree of arboreal adaptation. The hand morphology of *H. habilis* suggests that this hominin was capable of manufacturing lithic tools, and is commonly associated with the Oldowan technocomplex. Based on mandible size, (and despite smaller teeth and jaw) *H. habilis* is thought to have had a diet similar to those of the australopiths.
Palaeoenvironment	- It is thought that *H. habilis* did not occupy one particular type of habitat seeming to dwell in both open and wooded environments.
SBH position	• Group size – between 70 - 86 individuals (Grove *pers comm*.). • Average stature: male 1.31m; female 1.00m

• Cranial capacity: varies between 509 – 687cm^3.

• Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. habilis* occupied second-order intentionality.

References — Data from Leakey *et al* 1965; Susman 1988; Aiello and Dunbar 1993; McHenry and Coffing 2000; Wood and Richmond 2000; De Miguel and Henneberg 2001; Dunbar 2003; Wood and Lonergan 2008; Grove *pers comm*.

Species - <u>*Homo gautengensis*</u> (*H. gautengensis*).

Temporal Range - c. 2.0 – 0.6 million years ago.

Holotype Site - Sterkfontein – South Africa.

Other Site Examples - Drimolen and Swartkrans, South Africa

Behavioural Traits - Little can be inferred from the remains of *H. gautengensis* other than it may have been a bipedal omnivore however, based on evidence for stone tool and fire use, this hominin had the ability to plan ahead and process food to limited extent. From the large molar and premolar teeth it is thought that this hominin may also have included plant material within its diet that required a high degree of chewing. From the fragmentary skeletal remains, it is thought that *H. gautengensis* stood just over a metre tall and weighed about fifty kilograms although there is currently no data on cranial capacity.

Palaeoenvironment - Flora and faunal remains found at Sterkfontein, Swartkrans and Drimolen suggest that this hominin occupied open woodland and bushland.

SBH position

• Group size - Unknown due to insufficient data.

• Stature c. 1m.

• Cranial capacity – unknown.

• Order of intentionality - Unknown due to insufficient data but presumably first to second order-intentionality at a minimum.

References - Curnoe 2010

Species	- *Homo ergaster* (*H. ergaster*).
Temporal Range	- c. 1.9 – 1.5 million years ago.
Holotype Site	- Koobi Fora – Kenya.
Other Site Examples	- Narikotome, West Turkana - Kenya; Swartkrans - South Africa; possibly Dmanisi - Georgia.
Behavioural Traits	- Based on current evidence, it is thought that *H. ergaster* may be an earlier, more primitive form of *H. erectus* seen through differences in the mandibular premolars and vault and base of the cranium. However, *H. ergaster* is the first hominin to exhibit modern human-sized chewing teeth and post cranial skeleton. *H. ergaster* seems to have been committed to long range bipedalism and the dental morphology suggests that the food eaten was different to that of the australopiths, or it was prepared before ingestion (possibly using lithic tools to process the food, cooking or a combination of the two). In terms of sexual dimorphism, the differences similarly approach those of modern humans with males weighing 66 kilograms and 1.80 metres tall, and females weighing 56 kilograms and 1.60 metres tall. Brain capacity is estimated at 871 cm^3, significantly higher than previous australopiths and contemporary hominins.
Palaeoenvironment	- Insufficient evidence available to ascertain the palaeoenvironment of *H. ergaster*.
SBH position	• Group size – between 91 - 99 individuals (Grove *pers comm*.). • Average stature: male 1.80m; female 1.60m • Cranial capacity: varies between 750 – 848cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. ergaster* occupied second-order intentionality.
References	Data from Aiello and Dunbar 1993; McHenry and Coffing 2000; Wood and Richmond 2000; De Miguel and Henneberg 2001; Dunbar 2003; Wood and Lonergan 2008; Grove *pers comm*.

Species	- <u>*Homo erectus*</u> (*H. erectus*).
Temporal Range	- c. 1.8 million years ago – 300 thousand years ago (although there may be the possibility of isolated populations lasting until as late as 40 - 30 thousand years ago in Southwest Asia)
Holotype Site	- Trinil, Java - Indonesia.
Other Site Examples	- Sangiran, Sambungmachan - Indonesia; Zhoukoudian, Lantian - China; Olduvai Gorge - Tanzania; Melka Kunture - Ethiopia; Thomas Quarry - Morocco.
Behavioural Traits	- Cranial and dental morphology indicates that *H. erectus* consumed a diet more similar to that of modern humans than that of the australopiths. Post cranial morphology indicates habitual bipedalism and erect posture. Sexual dimorphism within this hominin is currently thought to have been significant (with stature ranging from 1.20 – 1.46 metres for females and up to 1.85 metres for males) suggesting male–male competition may have been an important behavioural trait of the species possibly resulting in a polygnous reproductive strategy. Unfortunately, there is currently insufficient evidence relating to *H. erectus* dexterity, but it is certain that this hominin created lithic tools of the Acheulean tradition.
Palaeoenvironment	- Based on the fossil evidence for *H. erectus* being found outside of Africa, it is assumed that this hominin could adapt and successfully occupy a more temperate and seasonal environment than those encountered previously.
SBH position	• Group size – between 90 - 127 individuals (Grove *pers comm*.). • Average stature: male 1.85m; female 1.20 – 1.46m • Cranial capacity: a large range between 727 – 1225cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. erectus* occupied second to third-order intentionality.
References	Data from Aiello and Dunbar 1993; Swisher *et al* 1996; Wood and Richmond 2000; De Miguel and Henneberg 2001; Dunbar 2003; Simpson *et al* 2008; Wood and Lonergan 2008; Yokoyama *et al* 2008; Grove *pers comm*.

Species	- <u>*Homo antecessor*</u> (*H. antecessor*).
Temporal Range	- c. 1.2 million years ago – 500 thousand years ago.
Holotype Site	- Gran Dolina - Spain.
Other Site Examples	- Possibly Ceprano - Italy.
Behavioural Traits	- The facial morphology for *H. antecessor* is similar to that of modern humans however the hominin does possess large and primitive crowns and teeth roots. Based on radii morphology it appears that *H. antecessor* was not cold climate adapted, so may have originated in Africa. Hand morphology would indicate a well developed level of dexterity, whilst the pedal remains indicate fully modern bipedalism. Due to insufficient evidence, the degree of sexual dimorphism within this hominin is currently indeterminate. *H. antecessor* is associated with the Acheulean Industry and cut marks on the skeletal remains of this hominin indicate deliberate defleshing or episodes of cannibalism.
Palaeoenvironment	- Faunal evidence found in association with *H. antecessor* remains indicates a temperate environment.
SBH position	• Group size – between 120 - 138 individuals (Grove *pers comm.*). • Cranial capacity: varies between 1125 – 1390cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. antecessor* occupied third-order intentionality.
References	Data from Bermudez de Castro *et al* 1997; Fernandez-Jalvo *et al* 1999; Wood and Richmond 2000; De Miguel and Henneberg 2001; Dunbar 2003; Carbonell *et al* 2008; Wood and Lonergan 2008; Grove *pers comm.*

Species	- <u>*Homo rhodesiensis*</u> (*H. rhodesiensis)*
Temporal Range	- c. 600 - 120 thousand years ago.
Holotype Site	- Broken Hill Mine, Kabwe - Zambia.
Other Site Examples	- Due to the confusion surrounding terminology relating to *H rhodesiensis* and *H. heidelbergensis*, I shall treat the African claims to *H. heidelbergensis* as *H. rhodesiensis*, whilst the *H. heidelbergensis* claims in Europe shall remain as *H.*

	heidelbergensis. Some of the African sites include: Bodo d'Ar, Omo – Ethiopia; Swanscombe – South Africa.
Behavioural Traits	- The first hominin to have a brain a similar size to modern humans (1280 cm^3) and the post cranial skeleton exhibits signs (robust long bones and large lower limb joints) of habitual long distance bipedalism. *H. rhodesiensis* has been associated with lithic (Levallois and Middle Stone Age) and bone technocomplexes. Due to insufficient evidence, the degree of sexual dimorphism within this hominin is currently indeterminate but may presumed to be present on a degree similar to that of *H. heidelbergensis*.
Palaeoenvironment	- *H. rhodesiensis* seems to have been able to adapt to a wide range of paleoenvironments.
SBH position	• Group size – between 129 - 134 individuals (Grove *pers comm*.). • Cranial capacity: varies between 1250 – 1325cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. rhodesiensis* occupied third to fourth-order intentionality.
References	Data from Clark et al 1947; Johanson and Edgar 1996; Wood and Richmond 2000; De Miguel and Henneberg 2001; Dunbar 2003; Mitchell 2002: 69; Wood and Lonergan 2008; Grove *pers comm*.

Species	- <u>*Homo heidelbergensis*</u> (*H. heidelbergensis)*
Temporal Range	- c. 500 - 120 thousand years ago.
Holotype Site	- Mauer, Heidelberg - Germany.
Other Site Examples	- Due to the confusion surrounding terminology relating to *H rhodesiensis* and *H. heidelbergensis*, I shall treat the African claims to *H. heidelbergensis* as *H. rhodesiensis*, whilst the *H. heidelbergensis* claims in Europe shall remain as *H. heidelbergensis*. Some of the European sites include: Steinheim – Germany; Caune de l'Arago – France; Petralona – Greece; Sima de los Huesos – Spain; Boxgrove – United Kingdom.
Behavioural Traits	- Along with *H. rhodesiensis*, this hominin seems to have had a brain size comparable to that of modern humans and the post

	cranial skeleton exhibits signs (robust long bones and large lower limb joints) of habitual long distance bipedalism. Sexual dimorphism in this hominin is present and considered to be significantly higher than that seen in modern humans. In Europe, *H. heidelbergensis* is associated with the Acheulean technocomplex.
Palaeoenvironment	- There is no consistent type of palaeoenvironment occupied by *H. heidelbergensis*, although the hominin skeletal remains do display adaptations to cold weather environments.
SBH position	• Group size – between 123 - 142 individuals (Grove *pers comm*.). •Cranial capacity – varies between 1165 – 1430cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. heidelbergensis* occupied third to fourth-order intentionality.
References	Data from Johanson and Edgar 1996; Rightmire 1998; Wood and Richmond 2000; De Miguel and Henneberg 2001; Rosas et al 2002; Dunbar 2003; Wood and Lonergan 2008; Grove *pers comm*.

Species	- <u>*Homo neanderthalensis*</u> (*H. neanderthalensis* / Neanderthals).
Temporal Range	- c. 300 - 28 thousand years ago.
Holotype Site	- Feldhofer Cave, Elberfield - Germany
Other Site Examples	- Neanderthal fossils have been found throughout Europe (except Scandanavia), the Near East, Levant and Western Asia (see Stringer and Gamble 1993 for a comprehensive list).
Behavioural Traits	- Sexual dimorphism in *H. neanderthalensis* seems to be similar to that in modern humans (the average stature for Neanderthals being estimated at circa 1.60 metres), with skeletal morphology suggesting that the Neanderthals were well adapted to cold climate conditions. Dental wear analysis further insinuates that the Neanderthals may have used their incisors as tools, either as a vice, or in food preparation or both. Skeletal morphology of the Neanderthals further suggests that these hominins were particularly robust on the forelimbs which may indicate extensive

use of these limbs in foraging and /or hunting, whilst the lower limb morphology indicates that the Neanderthals were long range bipeds. The overall skeletal morphology indicates that these hominins were incredibly strong, whilst the hand morphology suggests that Neanderthals were capable of powerful grip and fine manipulations. The brain size of Neanderthals is directly comparable to that of modern humans (although the endocranial volume is on average larger), and the result of this is reflected in their complicated tool kit commonly called the Levallois Industry. It is currently unclear whether Neanderthals had grammatical speech and their symbolic capabilities are constantly a topic under debate. Evidence for anthropomorphic manipulations of Neanderthal fossil remains from Moula-Guercy and Krapina, suggest that the Neanderthals did have a limited symbolic capacity, although the issue of deliberate burial is another matter of debate.

Palaeoenvironment - Palaeoenvironmental, geographical and anatomical data suggest that the Neanderthals occupied cold northern environments.

SBH position • Group size – between 126 - 161 individuals (Grove *pers comm*.).

• Average stature: 1.60m

• Cranial capacity: varies between 1172 – 1740cm^3.

• Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. neanderthalensis* occupied fourth to fifth-order intentionality.

References Data from Russell 1987; Aiello and Dunbar 1993; Defleur *et al* 1999; Wood and Richmond 2000; De Miguel and Henneberg 2001; Dunbar 2003; Sawyer and Maley 2005; Wood and Lonergan 2008; Grove *pers comm*.

Species - <u>*Homo floresiensis*</u> (*H. floresiensis*).

Temporal Range - c. 95 - 12 thousand years ago.

Holotype Site - Liang Bua, Flores - Indonesia.

Behavioural Traits - Little can be inferred from the remains of *H. floresiensis* except that this hominin has a small brain capacity of 380 cm^3 (well below that of any Homo species, but more akin to those of the early australopiths), a weight of 25-30 kilograms and a stature of approximately 1 metre. Despite the small brain size of *H. floresiensis,* lithic tools have been found in direct association with the remains.

Palaeoenvironment - Based on the small stature of *H. floresiensis,* it is thought that this hominin may have occupied a habitat similar to equatorial rainforest.

SBH position

• Group size - Unknown due to insufficient data.
• Average stature: 1.00m
• Cranial capacity – 380cm^3.
• Order of intentionality - Unknown due to insufficient data but presumably first order at a minimum.

References Data from Brown *et al* 2004; Brumm *et al* 2006; Wood and Lonergan 2008.

Species - *Homo sapiens* (*H. sapiens* / anatomically modern humans).

Temporal Range - c. 200 thousand years ago to the present.

Holotype Site - None has been specified

Other Site Examples - Fossil evidence for *H. sapiens* has been found on all continents with the exception of Antarctica.

Behavioural Traits - The first evidence for anatomically modern human morphology comes from Africa and the Near East, although it is currently difficult to clearly distinguish a boundary between anatomically modern humans and *H. heidelbergensis* due to the presence of a graded series of fossils that are not archaic enough to be assigned to *H. heidelbergensis,* nor derived enough to be fully anatomically modern human (for example, *Homo sapiens idaltu).* *H. sapiens* have a relative lack of sexual dimorphism, with average stature for males being 1.75 metres and 1.60 metres for females, indicating a social structure where male-male competition has changed from a purely physical confrontation to a possible combination of physical and mental attributes. The reduction of sexual dimorphism through the hominin species may also reflect changes in social structure and deliberate choice by

	females in partner selection. Behavioural characteristics of anatomically modern humans include fully grammatical speech, the physiological and psychological skill to manufacture small lithic tools and symbolic capabilities (such as art, and personal ornamentation).
Palaeoenvironment	- Evidence for *H. sapiens* have been found in a variety of habitats ranging from cold high altitude, warm coastal and dry arid environs.
SBH position	• Group size – between 129 - 160 individuals (Grove *pers comm*.). • Average stature: males 1.75m, females 1.60m. • Cranial capacity: varies between 1304 – 1600cm^3. • Order of intentionality – based on cranial capacity and predicted group size it is thought that *H. sapiens* occupied fifth-order intentionality.
References	Data from Linaeus 1758 cited in Wood and Lonergan 2008; Aiello and Dunbar 1993; McHenry and Coffing 2000; Wood and Richmond 2000; De Miguel and Henneberg 2001; Clark *et al* 2003; Dunbar 2003; White *et al* 2003; Wood and Lonergan 2008; Grove *pers comm*.

Appendix 2 – Site by site lithic analysis

All measurements and observations were recorded within a statistical analysis software programme *SPSS Statistics 17.0*, and all tables and graphs relating to the comparison of the eleven sites are subsequently derived from the *SPSS* analysis package. All of the following site analyses refer back to the methodology given in Chapter 5 in regards to data collection, processing and research agenda. Site histories and interpretations have already been given for each site below in Chapters 6, 7 and 8 above, what follows below are detailed lithic analyses not offered within the main document.

<u>United Kingdom</u>

High Lodge

The site history and details for High Lodge can be found in Chapter 6. All the artefacts examined from High Lodge were knapped from flint, a common raw material found within Suffolk (Ashton *et al* 1992a). As previously mentioned, a total of 1615 artefacts were examined from High Lodge spanning four contexts – Beds C2, D and E as one assemblage, and 392 artefacts labelled Sand and Gravels (presumably Bed F) as a second broadly contemporaneous assemblage (table A2.1) (Chapter 6; McNabb 2007: 114).

		Context / Level									
		Bed C2		Bed D		Bed E		Sand and Gravel		**Total**	
Artefact Type	LCT	0	*.0%*	0	*.0%*	0	*.0%*	16	*1.0%*	**16**	***1.0%***
	Flake	740	*45.8%*	236	*14.6%*	29	*1.8%*	284	*17.6%*	**1289**	***79.8%***
	Flake tool	47	*2.9%*	22	*1.4%*	1	*.1%*	45	*2.8%*	**115**	***7.1%***
	Debitage	24	*1.5%*	15	*.9%*	0	*.0%*	28	*1.7%*	**67**	***4.1%***
	Core	78	*4.8%*	23	*1.4%*	6	*.4%*	19	*1.2%*	**126**	***7.8%***
	Hammer Stone	1	*.1%*	1	*.1%*	0	*.0%*	0	*.0%*	**2**	***.1%***
	Total	**890**	***55.1%***	**297**	***18.4%***	**36**	***2.2%***	**392**	***24.3%***	**1615**	***100.0%***

Table A2.1: Showing the relationship between artefact type and context for High Lodge.

Table A2.2 shows the relationship between artefact type, context and completeness.

		Completeness					
		Unbroken		Broken		**Total**	
Artefact Type	LCT	15	*.9%*	1	*.1%*	**16**	***1.0%***
	Flake	1093	*67.7%*	196	*12.1%*	**1289**	***79.8%***
	Flake tool	105	*6.5%*	10	*.6%*	**115**	***7.1%***
	Debitage	30	*1.9%*	37	*2.3%*	**67**	***4.1%***
	Core	121	*7.5%*	5	*.3%*	**126**	***7.8%***
	Hammer Stone	2	*.1%*	0	*.0%*	**2**	***.1%***
	Total	**1366**	***84.6%***	**249**	***15.4%***	**1615**	***100.0%***

Table A2.2: Showing the relationship between artefact type, context and completeness for High Lodge

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed from High Lodge 1366. Table A2.3 shows the relationship between artefact type and condition.

		Artefact Condition							
		Abraded		Fresh		Lightly Abraded		**Total**	
Artefact Type	LCT	4	*.3%*	5	*.4%*	6	*.4%*	**15**	***1.1%***
	Flake	36	*2.6%*	906	*66.3%*	151	*11.1%*	**1093**	***80.0%***
	Flake tool	8	*.6%*	72	*5.3%*	25	*1.8%*	**105**	***7.7%***
	Debitage	2	*.1%*	27	*2.0%*	1	*.1%*	**30**	***2.2%***
	Core	2	*.1%*	97	*7.1%*	22	*1.6%*	**121**	***8.9%***
	Hammer Stone	0	*.0%*	0	*.0%*	2	*.1%*	**2**	***.1%***
	Total	**52**	***3.8%***	**1107**	***81.0%***	**207**	***15.2%***	**1366**	***100.0%***

Table A2.3: Showing the relationship between artefact type and artefact condition for High Lodge.

Table A2.3 shows that the majority of unbroken artefacts from High Lodge are classified as fresh (81.0%) with a small minority classed as lightly abraded (15.2%) or abraded (3.8%). This pattern of artefact condition would suggest that the majority of the artefacts from High Lodge have not been subjected to a large degree of post depositional movement and abrasion and reinforces the broadly contemporary nature of the separate contexts.

I shall now examine the more specific elements to the High Lodge assemblage by looking at the LCTs, Flakes, Flake Tools and Cores in greater depth.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. From table A2.2 above it can be seen that the 15 LCTs from High Lodge come in a range of condition types (fresh, lightly abraded and abraded) within the sands and gravels. The varying conditions of the artefacts would suggest that some post depositional movement has occurred, however it was not so great that all the LCTs were affected. Therefore as stated above, I believe that it is reasonable to treat the LCTs from High Lodge as one broadly contemporaneous assemblage and I shall proceed accordingly.

In order to assess imposition of form and symmetry upon the LCTs of High Lodge, table A2.4 shows that from the limited sample available, there are symmetrical elements to LCT form, however full symmetry in LCT form was not an apparently important factor in LCT production.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	.0%	6.7%	6.7%	6.7%	.0%	.0%	.0%	.0%	**20.0%**
	Convergent with a Square Tip	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	.0%	6.7%	.0%	.0%	**6.7%**
	Convergent with a Generalised Tip	.0%	.0%	13.3%	20.0%	.0%	26.7%	.0%	.0%	**60.0%**
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	6.7%	.0%	.0%	**6.7%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	6.7%	.0%	.0%	.0%	.0%	**6.7%**
	Wide with Convex Tip	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Total	**.0%**	**6.7%**	**20.0%**	**33.3%**	**.0%**	**40.0%**	**.0%**	**.0%**	**100.0%**

Total N = 15

Table A2.4: Showing the relationship between Tip Shape and Symmetry by Eye for High Lodge.

In terms of symmetrical tip shape only 4 (26.7%) out of the potential 15 (100%) display any evidence for tip symmetry however, from such a small sample it is difficult to tell whether this is truly significant in regards to symmetry imposition or just a general artifice of tip construction. Certainly, table A2.4 would suggest that tip shapes with a convergent element were being targeted, and possibly related to tip symmetry where the majority of symmetrical tips, also have a convergent element to them. Figures A2.1 and A2.2 below examine the relationship between symmetry, tip shape and artefact proportion.

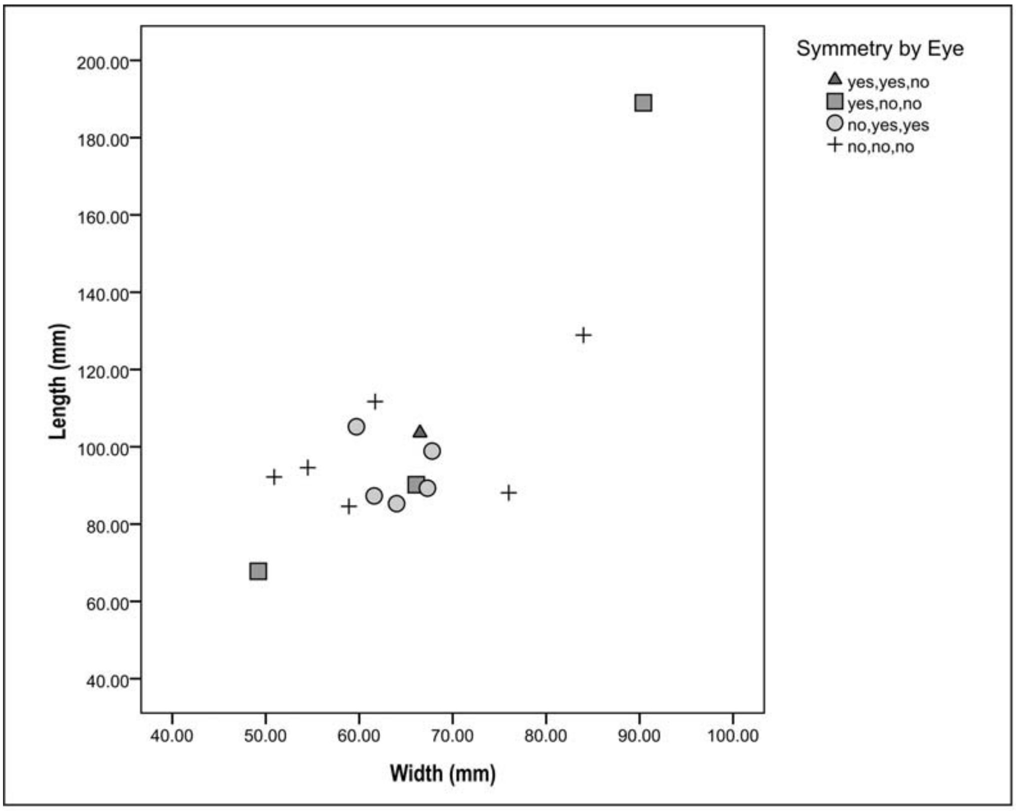


Figure A2.1: Showing the relationship between LCT proportion and symmetry for High Lodge.

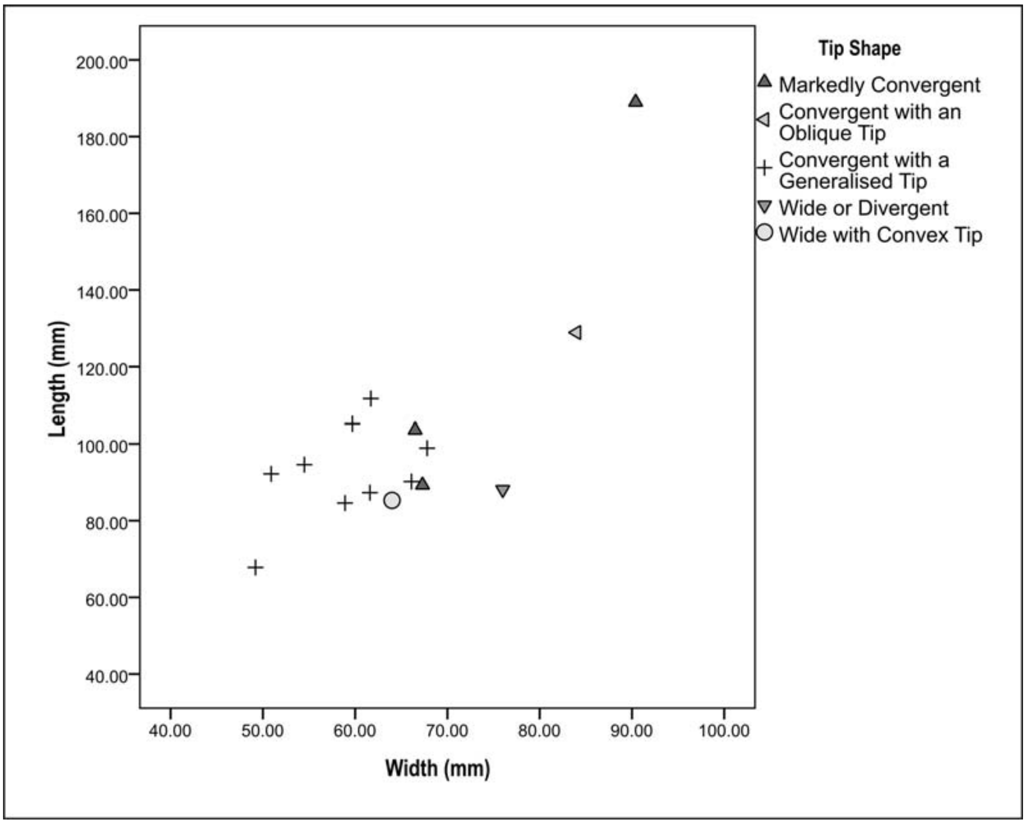


Figure A2.2: Showing the relationship between LCT proportion and tip shape for High Lodge.

I emphasise again that on such a small sample it is difficult to ascertain whether there are any genuine patterns within the LCTs relating to artefact proportion and symmetry and tip shape. However, a Kruskal Wallis H Test (Ebdon 1977:68) shows that there is no statistically significant relationship (to 0.05 significance) between observed symmetry and length (x^2 = 0.792; df = 3; p = 0.851), width (x^2 = 0.465; df = 3; p = 0.927), or thickness (x^2 = 1.032; df = 3; p = 0.794). A Kruskal Wallis H Test would also suggest that neither is there a statistically significant relationship between tip shape and length (x^2 = 4.767; df = 4; p = 0.312), width (x^2 = 8.389; df = 4; p = 0.078) or thickness (x^2 = 3.622; df = 4; p = 0.460) and the visual distribution of LCTs in figures A2.1 and A2.2 would seem to support this. This would imply that neither tip form or symmetry are linked to LCT proportion, which may reinforce the point that symmetry and particular tip shape do not play any culturally significant roles in regards to standardisation of LCT size and form for LCT production at High Lodge.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of High Lodge (table A2.5).

		Flaking Extent Second Face					
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	26.7%	6.7%	20.0%	.0%	.0%	**53.3%**
	Complete Marginal	.0%	.0%	.0%	.0%	.0%	**.0%**
	Partial Marginal	13.3%	.0%	.0%	.0%	.0%	**13.3%**
	Partial	6.7%	.0%	.0%	6.7%	.0%	**13.3%**
	Substantial	.0%	.0%	6.7%	6.7%	6.7%	**20.0%**
	Total	**46.7%**	**6.7%**	**26.7%**	**13.3%**	**6.7%**	**100.0%**

Total N = 15

Table A2.5: Showing the relationship between Flaking Extent of the first and second LCT face for High Lodge.

From the small sample of LCTs at High Lodge there would appear to be no consistent pattern in regards to LCT shaping and thinning. Interestingly the two sides of the LCTs seem to be often knapped in different ways, with the first face having less LCTs that are worked in a partial marginal fashion than the second face, and more LCTs that are worked in a substantial fashion. The second face would also appear to have LCTs that were worked in a complete marginal fashion, in contrast to the first face which have none. Therefore, it would seem that the patterns of secondary working support the idea that there are no clear patterns of standardisation in shaping and thinning within the LCTs from High Lodge.

Another way to ascertain whether there is any standardisation in LCT manufacture is through the amount of edge working seen on the LCT. A relative index of edge working extent was described in Chapter 5 and applied to symmetry and tip shape in tables A2.6 and A2.7 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	.0%	.0%	.0%	.0%	**.0%**
	yes,yes,no	.0%	.0%	6.7%	.0%	**6.7%**
	yes,no,no	.0%	.0%	20.0%	.0%	**20.0%**
	no,yes,yes	.0%	20.0%	13.3%	.0%	**33.3%**
	no,no,yes	.0%	.0%	.0%	.0%	**.0%**
	no,no,no	.0%	33.3%	6.7%	.0%	**40.0%**
	no,yes,no	.0%	.0%	.0%	.0%	**.0%**
	yes,no,yes	.0%	.0%	.0%	.0%	**.0%**
	Total	**.0%**	**53.3%**	**46.7%**	**.0%**	**100.0%**

Total N = 15

Table A2.6: Showing the relationship between Symmetry and Edge Working for High Lodge.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Tip Shape	Markedly Convergent	.0%	6.7%	13.3%	.0%	**20.0%**
	Convergent with a Square Tip	.0%	.0%	.0%	.0%	**.0%**
	Convergent with an Oblique Tip	.0%	6.7%	.0%	.0%	**6.7%**
	Convergent with a Generalised Tip	.0%	33.3%	26.7%	.0%	**60.0%**
	Wide or Divergent	.0%	.0%	6.7%	.0%	**6.7%**
	Wide or Divergent with an Oblique Bit	.0%	6.7%	.0%	.0%	**6.7%**
	Wide with Convex Tip	.0%	.0%	.0%	.0%	**.0%**
	Total	**.0%**	**53.3%**	**46.7%**	**.0%**	**100.0%**

Total N = 15

Table A2.7: Showing the relationship between Tip Shape and Edge Working for High Lodge.

Tables A2.6 and A2.7 show that the LCTs from High Lodge are more or less split equally between a ‘medium to low’ and a ‘medium to high’ index of working, with a slight majority favouring the ‘medium to low index’. This would seem to support the general conclusion that there does not appear to be any definitive standardised approach to LCT working at High Lodge.

Conclusion

I would stress again at this point that from such a small sample, any patterns seen within the data should be treated with some degree of speculation. However, based on the early date for High Lodge (MIS 13) the apparent lack of standardisation in LCT secondary working, initial thinning and shaping, imposition of tip shapes and a lack of absolute symmetry within the LCT assemblage, the patterns described seem to fit with the precedent offered in table 4.3 (Chapter 4). As stated above, there is only one raw material present at High Lodge, flint. Given the range in LCT proportion there would appear to be no impact of raw material beyond original blank size on LCT production.

Flake and Flake Tool Analysis

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. The debitage pieces whose presence has been noted are those pieces that are above 20mm and generally encompass flakes that are clearly waste products yet their size precluded them from immediate dismissal from the analysis. In order to get an understanding on the number of detached pieces recorded from High Lodge, table A2.8 shows the breakdown of flakes, flake tools and recorded debitage in relation to the flake types described in Chapter 5.

		Artefact Type							
		Flake		Flake tool		Debitage		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R2 - Denticulated scraper	0	*.0%*	6	*.5%*	0	*.0%*	**6**	***.5%***
	R3 - Side scraper	0	*.0%*	14	*1.1%*	0	*.0%*	**14**	***1.1%***
	R4 - End / Traverse scraper	0	*.0%*	15	*1.2%*	0	*.0%*	**15**	***1.2%***
	R5 - Flake with scraper retouch	0	*.0%*	31	*2.5%*	0	*.0%*	**31**	***2.5%***
	R6 - Scraper used as wedge	0	*.0%*	1	*.1%*	0	*.0%*	**1**	***.1%***
	R7 - Retouched point (awl)	0	*.0%*	3	*.2%*	0	*.0%*	**3**	***.2%***
	R8 - Retouched point (projectile)	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R9 - Retouched notch	0	*.0%*	6	*.5%*	0	*.0%*	**6**	***.5%***
	R10 - Retouch non diagnostic	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R12 - Multiple tool	0	*.0%*	12	*1.0%*	0	*.0%*	**12**	***1.0%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R14 - Utilised flake with no retouch	0	*.0%*	17	*1.4%*	0	*.0%*	**17**	***1.4%***
	R15 - Flake with edge damage	284	*23.1%*	0	*.0%*	2	*.2%*	**286**	***23.3%***
	R16 - Flake with no retouch	809	*65.9%*	0	*.0%*	28	*2.3%*	**837**	***68.2%***
	Total	**1093**	***89.0%***	**105**	***8.6%***	**30**	***2.4%***	**1228**	***100.0%***

Table A2.8: Showing the breakdown between flakes, flake tools and debitage in relation to flake type for High Lodge.

As can be seen there are far more flakes than flake tools present within the detached artefacts studied from High Lodge which may suggests two possible explanations, firstly that the hominins did not need to adapt the flakes they were producing for specific tasks (through retouch) on a regular basis, rather preferring to use the unmodified edge of flakes. Or secondly, retouch tools were favoured for curation and removed from the site and transported elsewhere whilst unretouched flakes were left at the site of production. In terms of tool type being produced, table A2.8 illustrates that there would not appear to be any dominant tool form or type preferred by the knappers. This in turn suggests that tool form is more opportunistic in nature – hominins were adapting any edge that was conducive to limited reshaping. A generic scraper type of retouch is the predominant type seen in table A2.8 which may suggest that the knappers were more concerned with producing a functional edge, rather than producing a particular tool type such as a side scraper.

Table A2.9 (below) shows the relationship between flake type and Toth type (Toth 1985) illustrating that all but one category of Toth type (Toth type 1 – cortex on butt and dorsal wholly cortical) is present within the High Lodge assemblages. Of particular dominance are Toth types 5 (some cortex on the dorsal but none on the butt) at 58.3% and Toth type 6 (no cortex at all) at 30.9% of the flakes, flake tools and (recorded) debitage pieces at High Lodge. This would suggest that the majority (58.2%) of the detached pieces from High Lodge come from flint nodules and cores that were toward the beginning of the reduction sequence, with 30.9% of the detached pieces coming toward the end of the reduction sequence. The importance of this would suggest that there is no preference for flakes with or without cortex. This pattern is echoed in the distribution of Toth type through the flakes with retouch present, where types 2, 3, 5 and 6 are present. This could reinforce the idea that flakes were not being produced with a specific tool form or aesthetic in mind, rather the hominins were taking advantage of original flake edges that were conducive to retouch as the need arose.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R2 - Denticulated scraper	.0%	.1%	.0%	.0%	.4%	.0%	**.5%**
	R3 - Side scraper	.0%	.0%	.1%	.0%	.9%	.2%	**1.1%**
	R4 - End / Traverse scraper	.0%	.0%	.2%	.0%	.8%	.2%	**1.2%**
	R5 - Flake with scraper retouch	.0%	.0%	.0%	.0%	1.8%	.7%	**2.5%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	.0%	.0%	.1%	**.1%**
	R7 - Retouched point (awl)	.0%	.0%	.0%	.0%	.2%	.1%	**.2%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R9 - Retouched notch	.0%	.0%	.0%	.0%	.4%	.1%	**.5%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	.0%	.2%	.0%	.5%	.3%	**1.0%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	.1%	.0%	.9%	.4%	**1.4%**
	R15 - Flake with edge damage	.0%	1.2%	1.0%	.7%	13.8%	6.7%	**23.3%**
	R16 - Flake with no retouch	.0%	3.0%	1.9%	2.5%	38.6%	22.1%	**68.2%**
	Total	**.0%**	**4.3%**	**3.3%**	**3.2%**	**58.2%**	**30.9%**	**100.0%**

Total N = 1228

Table A2.9: Showing the relationship between flake type and Toth type for High Lodge.

In terms of the technological make up of the High Lodge detached pieces, table A2.10 shows that all of the detached pieces are non-PCT in character.

		Flake Technology Type	
		Non-PCT	
Flake Type	R1 - Denticulated edge	0	*.0%*
	R2 - Denticulated scraper	6	*.5%*
	R3 - Side scraper	14	*1.1%*
	R4 - End / Traverse scraper	15	*1.2%*
	R5 - Flake with scraper retouch	31	*2.5%*
	R6 - Scraper used as wedge	1	*.1%*
	R7 - Retouched point (awl)	3	*.2%*
	R8 - Retouched point (projectile)	0	*.0%*
	R9 - Retouched notch	6	*.5%*
	R10 - Retouch non diagnostic	0	*.0%*
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*
	R12 - Multiple tool	12	*1.0%*
	R13 - Unretouched flake used as a wedge	0	*.0%*
	R14 - Utilised flake with no retouch	17	*1.4%*
	R15 - Flake with edge damage	286	*23.3%*
	R16 - Flake with no retouch	837	*68.2%*
	Total	**1228**	***100.0%***

Table A2.10: Showing the relationship between flake type and flake technology type for High Lodge.

Of the 105 flake tools seen in table A2.8, only 88 have retouched present on at least one edge (table A2.11).

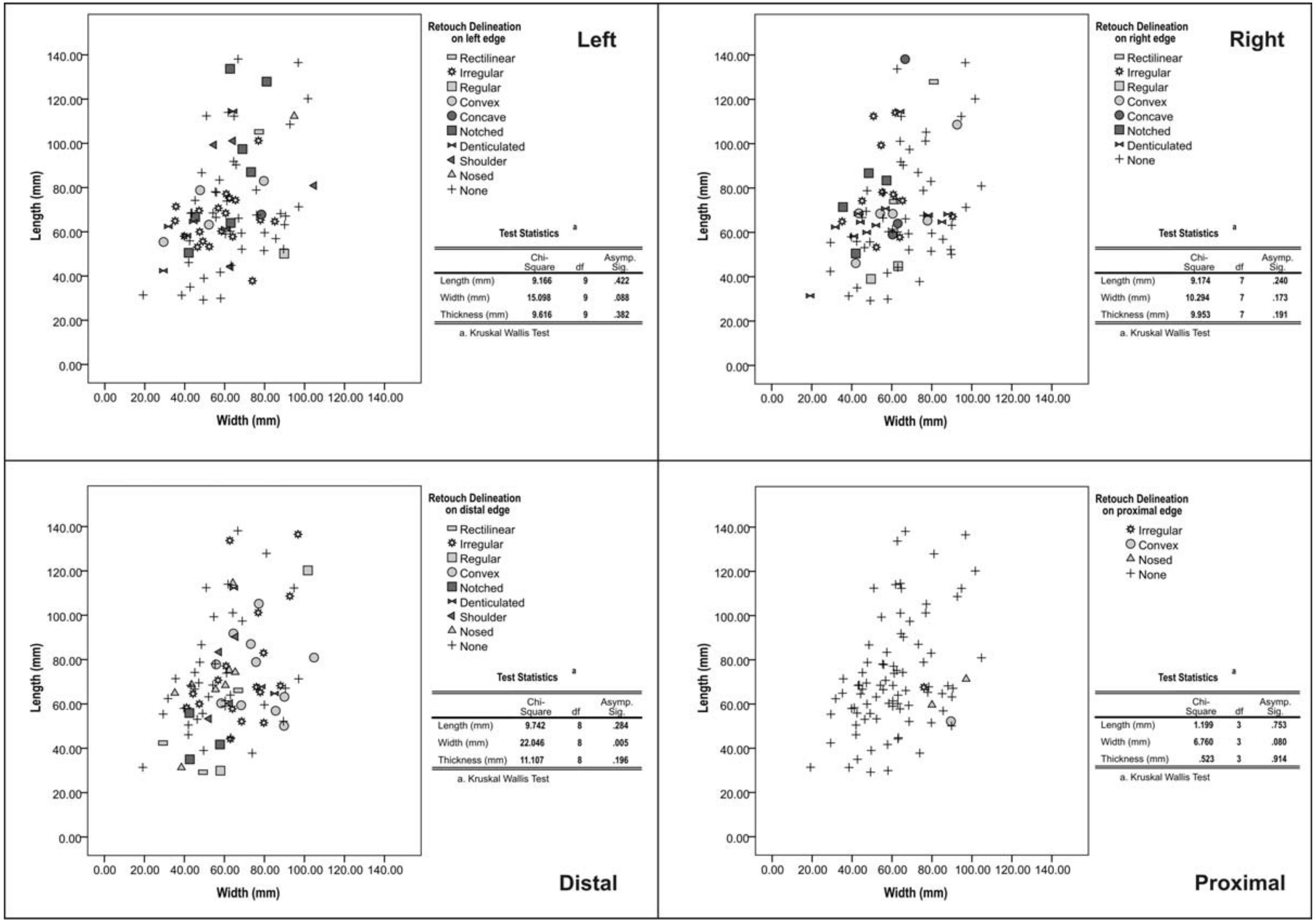
		Artefact Type			
		Flake	Flake tool	Debitage	**Total**
Retouch present on left edge	Yes	0	44	0	**44**
	No	0	44	0	**44**
	Total	**0**	**88**	**0**	**88**
Retouch present on distal edge	Yes	0	51	0	**51**
	No	0	37	0	**37**
	Total	**0**	**88**	**0**	**88**
Retouch present on right edge	Yes	0	40	0	**40**
	No	0	48	0	**48**
	Total	**0**	**88**	**0**	**88**
Retouch present on proximal edge	Yes	0	4	0	**4**
	No	0	84	0	**84**
	Total	**0**	**88**	**0**	**88**

Table A2.11: Showing the relationship between retouch presence and artefact type for High Lodge.

The following tests below regarding retouch and flake proportion are only conducted on the 88 unbroken detached pieces that have retouch present on at least one of their edges.

Retouch Delineation

Figure A2.3 (below) shows the relationship between retouch delineation and flake proportion where there would appear to be a large spread of retouch delineation types present within the High Lodge flake tools. According to a Kruskal Wallis H Test (Ebdon 1977:68) there is no statistical significance (to 0.05 significance) between flake length, width, or thickness and retouch delineation for the left, right and proximal edges (figure A2.3). There would however appear to be a statistical significance between flake width and retouch delineation on the distal (x^2 = 22.046; df = 8; p = 0.005) but not between flake length and thickness. This result would seem to suggest that the delineation of retouch on the distal edge is directly related to the width of the flake. However, as the general pattern of retouch delineation in terms of flake proportion and relative delineation distribution for the distal edge bears a close resemblance to the corresponding retouch delineation patterns for the left and right edges, it is unlikely that retouch delineation on the distal edge is deliberately planned (in terms of overall flake shape), but rather a result of opportunistic manipulation of the flake edge. A further pattern that emerges from figure A2.3 is that where retouch is present on the proximal edge, it is only on relatively wide flakes (although this observation is not statistically significant), probably because the wide nature of the flakes make it possible to sustain the retouch and is probably a result of opportunistic manipulation of the flake edge rather than a deliberately planned tool form.



Left — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	9.166	9	.422
Width (mm)	15.098	9	.088
Thickness (mm)	9.616	9	.382

a. Kruskal Wallis Test

Right — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	9.174	7	.240
Width (mm)	10.294	7	.173
Thickness (mm)	9.953	7	.191

a. Kruskal Wallis Test

Distal — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	9.742	8	.284
Width (mm)	22.046	8	.005
Thickness (mm)	11.107	8	.196

a. Kruskal Wallis Test

Proximal — Test Statistics[a]

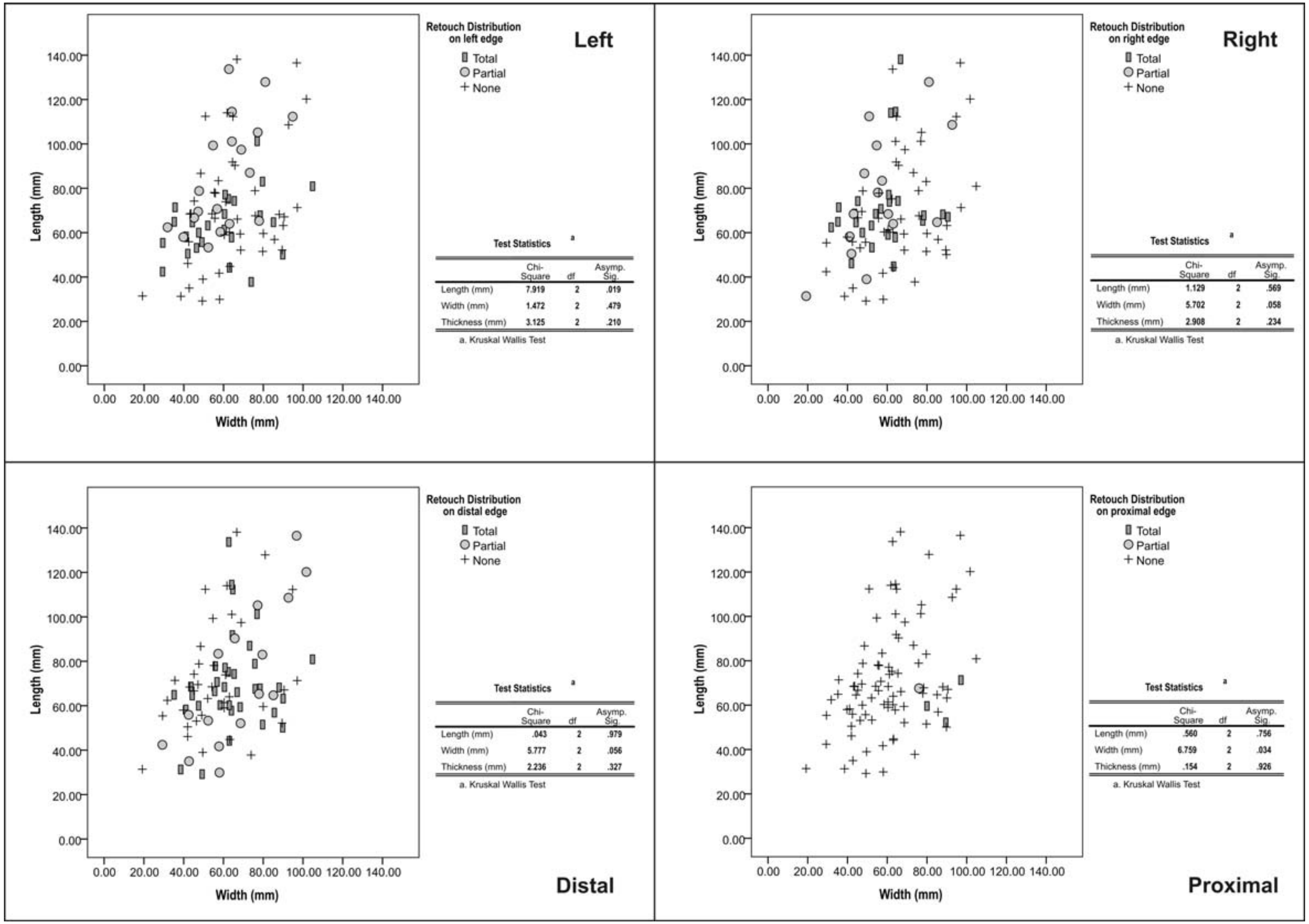
	Chi-Square	df	Asymp. Sig.
Length (mm)	1.199	3	.753
Width (mm)	6.760	3	.080
Thickness (mm)	.523	3	.914

a. Kruskal Wallis Test

Figure A2.3: Showing the relationship between flake proportion and retouch delineation for High Lodge.

Retouch distribution

Figure A2.4 (below) shows the relationship between flake proportion and retouch distribution where there appears to be two main retouch distribution types, Total and Partial. Kruskal Wallis H Tests (Ebdon 1977:68) would indicate that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch distribution except in the cases of flake length / retouch distribution on the left edge (x^2 = 7.919; df = 2; p = 0.019) and flake width / retouch distribution on the proximal edge (x^2 = 6.759; df = 2; p = 0.034) (figure A2.4). For the proximal edge this would seem to make sense as retouch presence on the proximal edge is clearly related to flake width (with only flakes that are wider than they are long having retouch on the proximal), although with only four examples of retouch on the proximal edge I wonder how truly significant this relationship really is. When looking at the left edge in relation to retouch distribution and length, it is curious that a similar statistically significant relationship is not evident for the right edge. The only explanation that I can think of to elucidate this statistical association is that it may have something to do with the handedness of the hominin users of the retouched tools, i.e. the hominins may have been predominately right handed which means they preferred to use the left edge of the tool, and subsequently retouched that edge preferentially. However this is purely a speculative statement and if it was the situation we would expect to see a statistically significant relationship between flake length and retouch throughout all the retouch categories of delineation, distribution, position and extent, which is simply not the case (figures A2.3 – A2.6). Furthermore, if the patterns of retouch distribution are examined for all the left, right and distal edges in figure A2.4, there would not appear to be a preferential edge that contains a greater degree of Total or Partial retouch. This in turn would indicate that retouch distribution is governed more by opportunistic retouch imposition in regards to the naked flake edge, rather than through deliberate tool design.



Left — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	7.919	2	.019
Width (mm)	1.472	2	.479
Thickness (mm)	3.125	2	.210

a. Kruskal Wallis Test

Right — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	1.129	2	.569
Width (mm)	5.702	2	.058
Thickness (mm)	2.908	2	.234

a. Kruskal Wallis Test

Distal — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.043	2	.979
Width (mm)	5.777	2	.056
Thickness (mm)	2.236	2	.327

a. Kruskal Wallis Test

Proximal — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.560	2	.756
Width (mm)	6.759	2	.034
Thickness (mm)	.154	2	.926

a. Kruskal Wallis Test

Figure A2.4: Showing the relationship between flake proportion and retouch distribution for High Lodge.

Retouch Position

Figure A2.5 (below) shows the relationship between flake proportion and retouch position where there appears to be two main type of retouch position, Direct and Inverse. The Kruskal Wallis H Tests (Ebdon 1977:68) would indicate that to a 0.05 significance level, there is a statistically significant relationship between retouch position and flake width for the right (x^2 = 8.734; df = 3; p = 0.033), distal (x^2 = 18.625; df = 3; p = 0.000) and proximal edges (x^2 = 6.759; df = 2; p = 0.034) (figure A2.5). For retouch on the distal edge, there would appear to be a broad correlation in respect to the fact that the wider the flake, the greater the presence of direct retouch, which may explain the statistically significant relationship seen here. Furthermore, the statistically significant relationship between width and retouch position for the proximal edge may reflect the familiar fact that the four flakes that have retouch present on the proximal are wider than they are long. In terms of explaining the statistically significant relationship between retouch position and the right edge, the only pattern that I can see in figure A2.5 is that overall, on flakes that tend to be wider than they are long, there would appear to be less retouch present. However, if the distribution pattern between retouch position and flake width / length are examined for all four edges (figure A2.5), there would not appear to be any obvious relationships between flake proportion and retouch position (the pattern retouch distribution in relation to flake proportions is not dissimilar to those of flakes that have no retouch present) which would seem to reinforce the idea that retouch position is more a result of opportunistic flaking in relation to the suitability of the original flake edge, rather than any deliberate form imposition on behalf of the knapper.

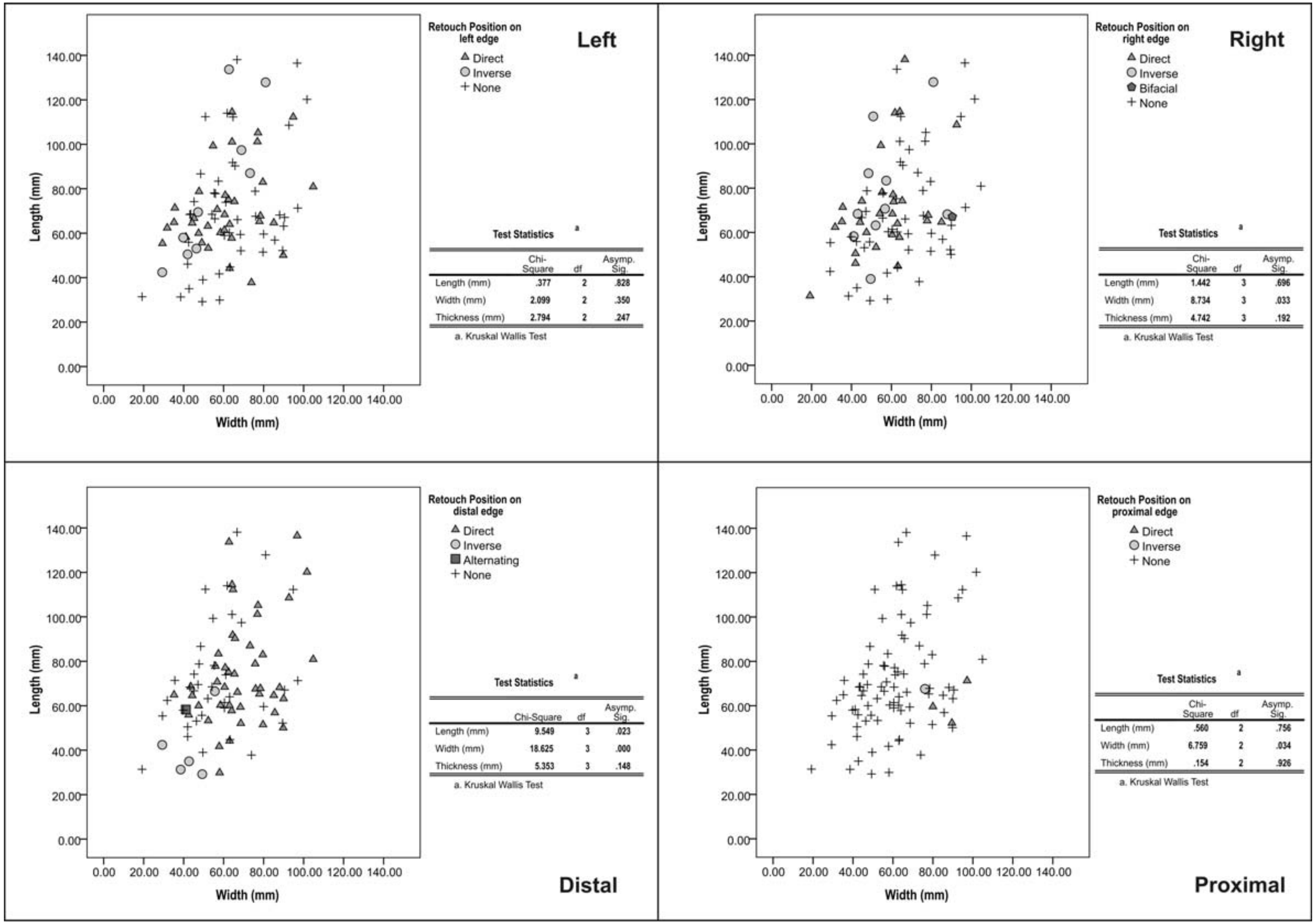
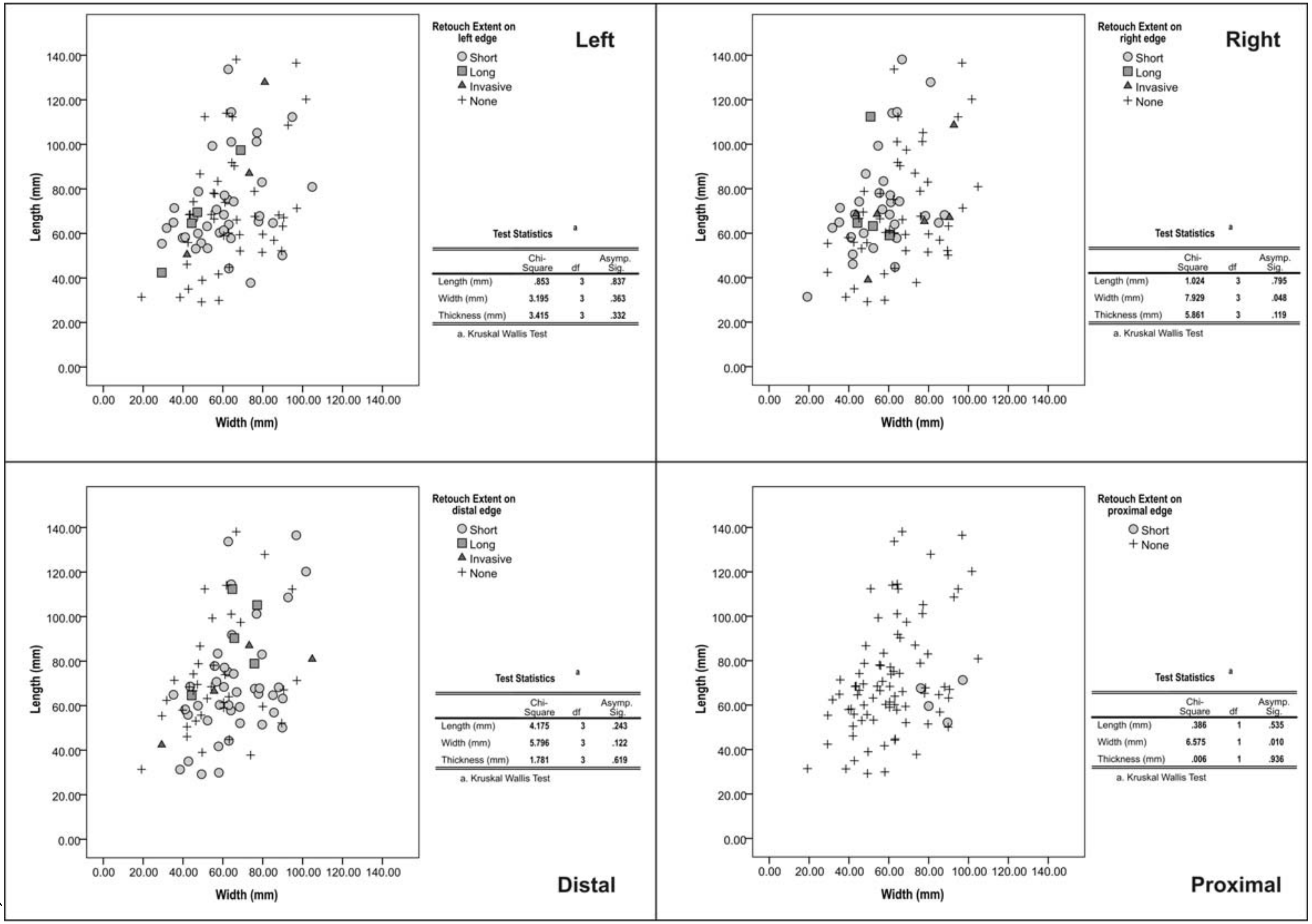


Figure A2.5: Showing the relationship between flake proportion and retouch position for High Lodge.

Retouch Extent

Figure A2.6 (below) shows the relationship between flake proportion and retouch extent, with short retouch being the dominant form of retouch through all four edges. The Kruskal Wallis H Tests (Ebdon 1977:68) would indicate that to a 0.05 significance level, there is a statistically significant relationship between flake width and retouch extent on the right (x^2 = 7.929; df = 3; p = 0.048) and proximal edges (x^2 = 6.575; df = 1; p = 0.010) (figure A2.6). As with retouch position above, for the right edge, retouch extent would appear to be present on flakes that are longer than they are wider, suggesting that the length of edge is the primary factor in retouch imposition on the right. Similarly, the relationship between retouch extent and width is probably related to the fact that the only flakes with retouch present on them are wider than they are long. However, what is a significant point to pull out of figure A2.6 is the fact that the predominant form of retouch extent present within the High Lodge assemblage is short. Short retouch is not invasive across the surface of the flake (either direct or inverse) and therefore is limited to edge manipulation only. Given that the consistent pattern of retouch distribution on flake edges has matched the distribution of flake edges with no retouch present (figures A2.3 – A2.6), I would propose that there is no evidence of deliberate form imposition in terms of artefact aesthetic present within the High Lodge assemblage. Rather the retouch would appear to be functional in character and limited to edge modification that mirrors the shape of the original edge (personal observation), rather than deliberately changing it to a different preconceived form.



Left — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.853	3	.837
Width (mm)	3.195	3	.363
Thickness (mm)	3.415	3	.332

a. Kruskal Wallis Test

Right — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	1.024	3	.795
Width (mm)	7.929	3	.048
Thickness (mm)	5.861	3	.119

a. Kruskal Wallis Test

Distal — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	4.175	3	.243
Width (mm)	5.796	3	.122
Thickness (mm)	1.781	3	.619

a. Kruskal Wallis Test

Proximal — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.386	1	.535
Width (mm)	6.575	1	.010
Thickness (mm)	.006	1	.936

a. Kruskal Wallis Test

Figure A2.6: Showing the relationship between flake proportion and retouch extent for High Lodge.

Conclusion

In summary, given that the only raw material present within this assemblage was flint, a raw material renowned for it's knapping versatility coupled with the fact that a range of artefact sizes has been produced from small debitage pieces to large flakes and flake tools it is deemed that raw material did not adversely affect artefact proportion or form imposition. From examining the detached pieces where retouch was present, it would appear that there are no patterns reflecting a specific retouched tool form. Rather, the patterns of retouch application on artefacts would seem to reflect a series of opportunistic knapping instances where the shape and form of the original unretouched edge has been followed through the retouch application. The comparatively small component of retouched tools verses unretouched flakes would also indicate that either hominins curated retouched tools and transported them around the landscape or that retouched tools were produced as and when a need arose. Given the range of flake sizes there would appear to be no degree of standardisation in terms of flake proportion for both retouched and unretouched flakes.

Cores

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. As expected for an MIS 13 dated site, High Lodge does not contain any evidence for PCT (table A2.12).

		Artefact Type
		Core
Non-PCT Core - Generic Type	A1 - Alternate	8
	A2 - Alternate and Parallel	52
	A3 - Parallel single platform	9
	A4 - Parallel multiple platform	1
	A5 - Single	12
	A6 - Mixture of A1 - A5	24
	A7 - Other non-PCT	7
	Total	**113**
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	1
	B2 - Discoid	4
	B3 - Other	1
	Total	**6**

Table A2.12: Showing the relationship between Core Type and Artefact Type for High Lodge.

In terms of examining the cores of High Lodge for any form of standardisation in artefact proportion, figures A2.7 and A2.9 below show the relationships between length, width, non-PCT generic and non-PCT fixed margin cores.

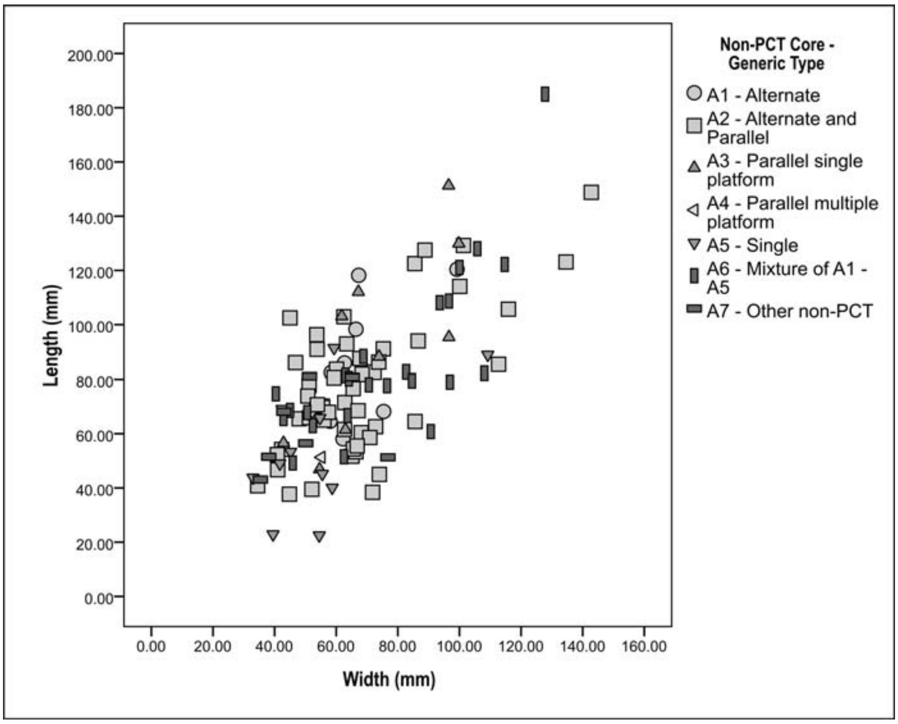


Figure A2.7: showing the relationship between artefact proportion and non-PCT generic cores for High Lodge.

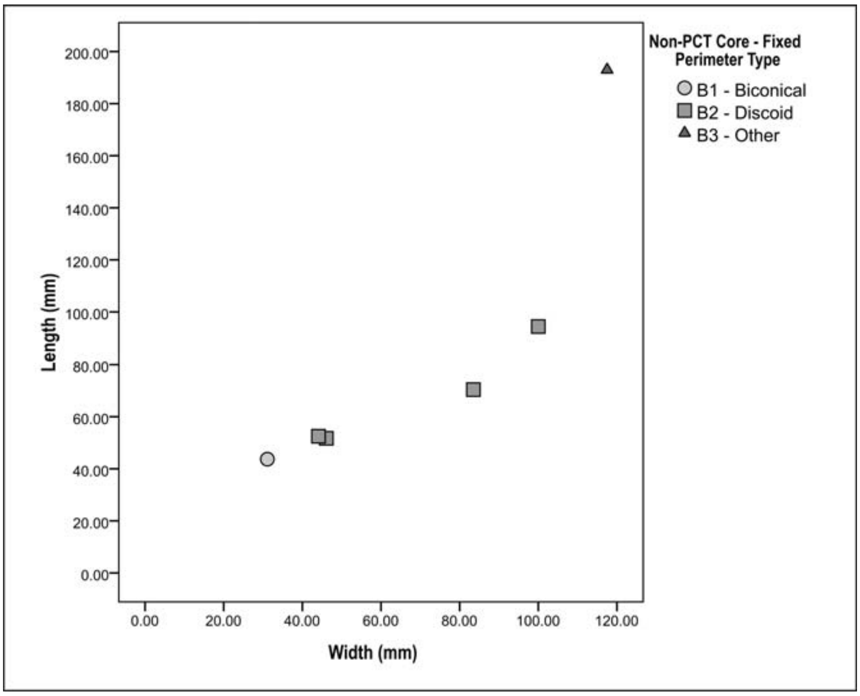


Figure A2.8: Showing the relationship between artefact proportion and non-PCT fixed margin cores for High Lodge.

From figures A2.7 and A2.8 it would seem that all cores for non-PCT generic and non-PCT fixed margin are being reduced and discarded through a whole range artefact proportions, which in turn would indicate that there is no predetermined or socially significant standard at which cores are being worked to. Rather the core pattern would seem to support the conclusions from the flake analysis where flakes and cores are worked through opportunistic knapping to fulfil a specific need at a specific time, and then being discarded.

Furthermore, given that there is only one raw material present within the High Lodge assemblage, and the large range of artefact proportions and core types, it would suggest that that raw material is not adversely affecting core reduction.

Conclusion

The artefacts from High Lodge as a whole would seem to indicate a lack of standardisation in working, proportion and reduction. Furthermore, raw material does not seem to have played an adverse role in artefact production at High Lodge.

Warren Hill – Sturge Collection

The site history and details for Warren Hill can be found in Chapter 6. All the artefacts examined from Warren Hill were knapped from flint, a common raw material found within Suffolk. Table A2.13 below shows the relationship between the LCTs from Warren Hill and their completeness.

		Completeness					
		Unbroken		Broken		**Total**	
LCT Type	Handaxe	524	***90.0%***	32	***5.5%***	**556**	***95.5%***
	Cleaver	17	***2.9%***	2	***.3%***	**19**	***3.3%***
	Knife	3	***.5%***	0	***.0%***	**3**	***.5%***
	Blank	4	***.7%***	0	***.0%***	**4**	***.7%***
	Total	**548**	***94.2%***	**34**	***5.8%***	**582**	***100.0%***

Table A2.13: Showing the relationship between LCT Type and Completeness for Warren Hill.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed below 548 (94.2% of the LCTs examined for this thesis). Table A2.14 shows the relationship between LCT type and condition.

		Artefact Condition							
		Abraded		Fresh		Lightly Abraded		**Total**	
LCT Type	Handaxe	2	*.4%*	171	*31.2%*	351	*64.1%*	**524**	***95.6%***
	Cleaver	0	*.0%*	6	*1.1%*	11	*2.0%*	**17**	***3.1%***
	Knife	0	*.0%*	2	*.4%*	1	*.2%*	**3**	***.5%***
	Blank	0	*.0%*	0	*.0%*	4	*.7%*	**4**	***.7%***
	Total	**2**	***.4%***	**179**	***32.7%***	**367**	***67.0%***	**548**	***100.0%***

Table A2.14: Showing the relationship between LCT Type and Artefact Condition for Warren Hill.

As can be seen the majority of LCTs are classified as lightly abraded (67.0%), followed by fresh (32.7%) and finally abraded (0.4%). I have already explained the distinction between lightly abraded and fresh artefacts for Warren Hill in Chapter 6 (above), however the abraded artefacts had fully rounded and dull flake scar ridges, rather than the slightly rounded flake scar ridges seen in the lightly abraded category. Despite this difference and the extremely low numbers, it is likely that the abraded artefacts are broadly associated with the lightly abraded artefacts, if not belonging to the same assemblage. For the purpose of the lithic analysis within this appendix I shall treat the LCTs from the fresh and lightly abraded / abraded as two distinct assemblages, however within the main text I will take Warren Hill as a broadly contemporaneous MIS 13 assemblage. It is clear from table A2.14 that the majority of the unbroken LCTs are handaxes (95.6%) with only very a very small minority of cleavers (3.1%), knives (0.5%) and blanks (0.7%). However, it is difficult to ascertain whether this handaxe bias in the fresh and lightly abraded / abraded assemblages reflects a genuine assemblage composition or just a result of collection prejudice.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. In order to assess the degree of working through flaking extents, form imposition through tip shape and symmetry upon the LCTs of Warren Hill. Table A2.15 shows the relationship between tip shape and LCT symmetry for the fresh assemblage.

			Symmetry by Eye								
			yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	Fresh	.6%	2.8%	2.8%	1.1%	.6%	3.9%	1.1%	.6%	**13.4%**
	Convergent with a Square Tip	Fresh	.6%	1.1%	.6%	1.1%	.6%	2.8%	.0%	.0%	**6.7%**
	Convergent with an Oblique Tip	Fresh	.0%	.0%	.6%	2.8%	.6%	3.4%	.6%	.0%	**7.8%**
	Convergent with a Generalised Tip	Fresh	5.6%	6.7%	1.7%	3.9%	3.9%	16.8%	1.7%	2.2%	**42.5%**
	Wide or Divergent	Fresh	.6%	.0%	.6%	1.7%	1.1%	5.6%	.0%	.0%	**9.5%**
	Wide with Convex Tip	Fresh	.6%	2.2%	3.9%	1.1%	1.1%	11.2%	.0%	.0%	**20.1%**
Total		**Fresh**	**7.8%**	**12.8%**	**10.1%**	**11.7%**	**7.8%**	**43.6%**	**3.4%**	**2.8%**	**100.0%**

Total N = 179

Table A2.15: Showing the relationship between Tip Shape and Symmetry by Eye for the Fresh Warren Hill Assemblage.

From table A2.15 it is clear that the hominins from Warren Hill did not place a high significance on absolute LCT symmetry (only 7.8% of the fresh assemblage described as symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 33.5% of the LCTs in table A2.15 display evidence for tip symmetry. However, as the 25.9% of LCTs with a symmetrical element to their tip form have a convergent element, the high degree of symmetry present within tip form may be a result of producing a convergent tip, rather than a genuine and conscious imposition of symmetry. So even though the hominins of Warren Hill are clearly capable of producing fully symmetrical LCTs on a variety of tip shapes, the overwhelming component of non-symmetrical (43.6%), and non-symmetrical tip shape (22.9%) would reinforce the initial observation that symmetry did not play a significant role in LCT production for the fresh assemblage at Warren Hill. However, in regards to tip shape there would appear to be an overall tendency for convergent tips over other types possibly hinting at a deliberate preference for a particular form being imposed on the LCTs.

Table A2.16 below shows the relationship between tip shape and symmetry for the lightly abraded and abraded assemblage.

			Symmetry by Eye									
			yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	Pdf[a]	**Total**
Tip Shape	Markedly Convergent	Abraded	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	1.1%	1.9%	1.4%	.3%	1.1%	4.6%	.5%	1.1%	.3%	**12.2%**
	Convergent with a Square Tip	Abraded	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.5%	1.1%	.5%	.0%	.5%	3.5%	.0%	.3%	.0%	**6.5%**
	Convergent with an Oblique Tip	Abraded	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.0%	.0%	.0%	.8%	1.1%	4.6%	.5%	.0%	.0%	**7.0%**
	Convergent with a Generalised Tip	Abraded	.0%	.0%	.0%	.0%	.0%	.3%	.0%	.0%	.0%	**.3%**
		Lightly Abraded	2.4%	2.7%	4.9%	3.8%	4.1%	24.4%	1.6%	1.1%	.3%	**45.3%**
	Wide or Divergent	Abraded	.0%	.0%	.0%	.0%	.3%	.0%	.0%	.0%	.0%	**.3%**
		Lightly Abraded	1.1%	.5%	1.4%	.5%	.5%	3.8%	.5%	.0%	.0%	**8.4%**
	Wide or Divergent with an Oblique Bit	Abraded	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	Abraded	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	1.1%	3.0%	1.9%	.8%	.5%	11.4%	.8%	.3%	.3%	**20.1%**
	Total	**Abraded**	**.0%**	**.0%**	**.0%**	**.0%**	**.3%**	**.3%**	**.0%**	**.0%**	**.0%**	**.5%**
		Lightly Abraded	**6.2%**	**9.2%**	**10.0%**	**6.2%**	**7.9%**	**52.3%**	**4.1%**	**2.7%**	**.8%**	**99.5%**

Total N = 369

a. Parallel distinctive features

Table A2.16: Showing the relationship between Tip Shape and Symmetry by Eye for the Lightly Abraded / Abraded Warren Hill Assemblage.

As with table A2.15, table A2.16 it is clear that the hominins from Warren Hill did not place a high significance on absolute LCT symmetry (only 6.2% of the lightly abraded / abraded assemblage described as symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 28.1% of the LCTs in table A2.16 display evidence for tip symmetry. However, as 19.0% of LCTs with a symmetrical element to their tip form have a convergent element, the degree of symmetry present within tip form may be a result of producing a convergent tip, rather than a genuine and conscious imposition of symmetry. So even though the hominins of the lightly abraded / abraded Warren Hill assemblage are clearly capable of producing fully symmetrical LCTs on a variety of tip shapes, the overwhelming component of non-symmetrical (52.3%), and non-symmetrical tip shape (18.2%) would reinforce the initial observation that symmetry did not play a significant role in LCT production. A further interesting category regarding symmetry is evident within the Warren Hill lightly abraded / abraded assemblage, parallel distinctive features totally 0.8% of the abraded assemblage. LCTs with parallel distinctive features are LCTs that have visually distinctive features located in parallel along opposite edges of the artefact such as notches or trimmed cavities. Given the extremely small number of LCTs within the lightly abraded / abraded assemblage at Warren Hill that display this type of form imposition it is unlikely that this is a meaningful example of socially significant form imposition. However, in regards to tip shape there would appear to be an overall tendency for convergent tips over other types possibly hinting at a deliberate preference for a particular form being imposed on the LCTs.

Figures A2.9 below examines the relationship between symmetry and artefact proportion for the fresh and lightly abraded / abraded assemblages.

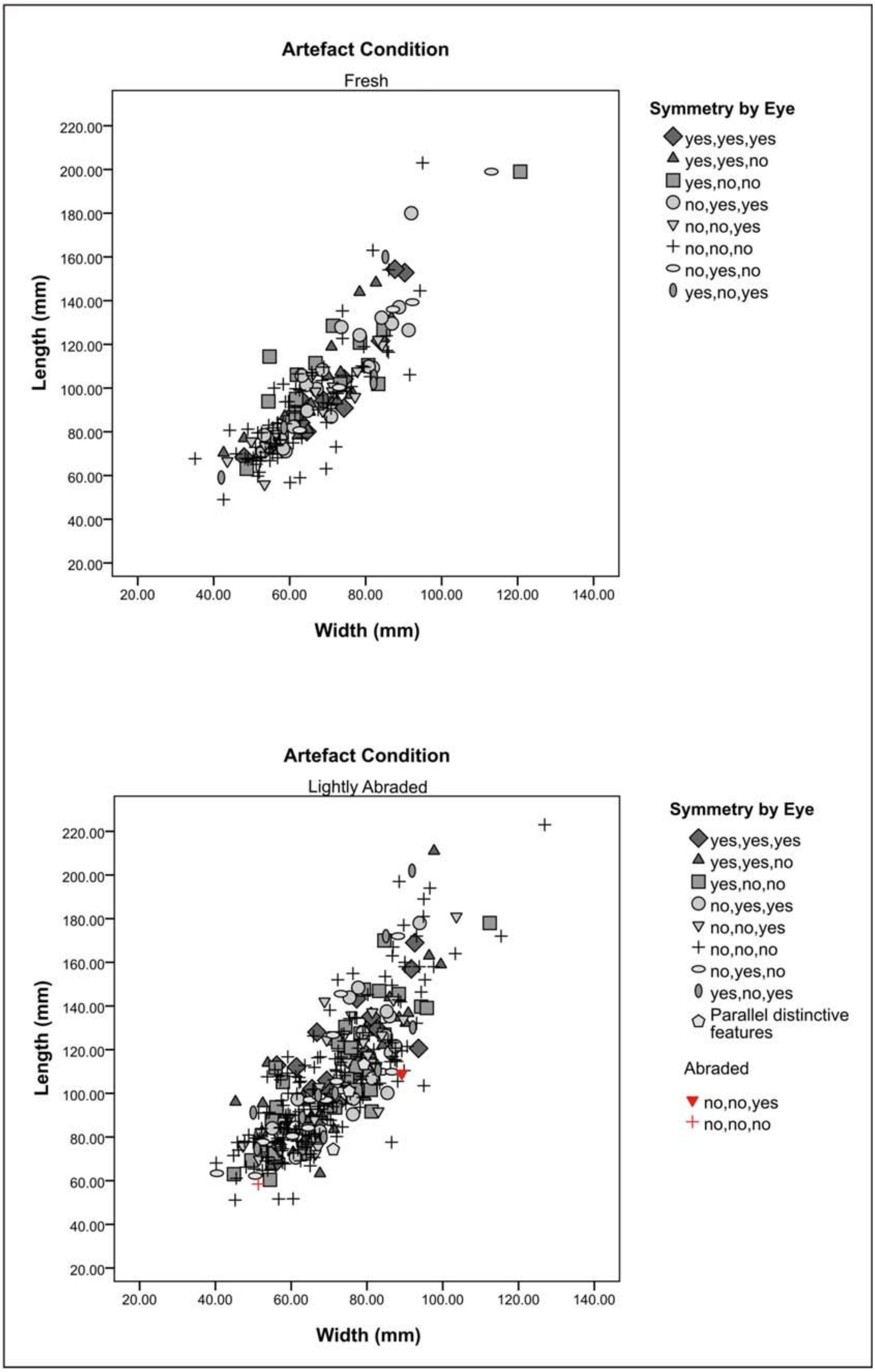


Figure A2.9: Showing the relationship between LCT proportion and symmetry for the fresh and lightly abraded / abraded assemblages for Warren Hill.

Figure A2.9 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. Furthermore, figure A2.9 shows that symmetry categories are not clustered in particular proportions as all symmetry categories are found in all artefact proportions for both the fresh and lightly abraded / abraded assemblages. This would suggest that symmetry and LCT proportion have no significant relationship for either assemblage. This idea seems to be supported by a Kruskal Wallis H Test (Ebdon 1977:68) which shows that there is no statistically significant relationship (to 0.05 significance) between observed symmetry and length (x^2 = 13.642; df = 8; p = 0.092), width (x^2 = 12.476; df = 8; p = 0.131) or thickness (x^2 = 6.931; df = 8; p = 0.544).

Figure A2.10 shows the relationship between tip shape and artefact proportion for the fresh and lightly abraded / abraded assemblages.

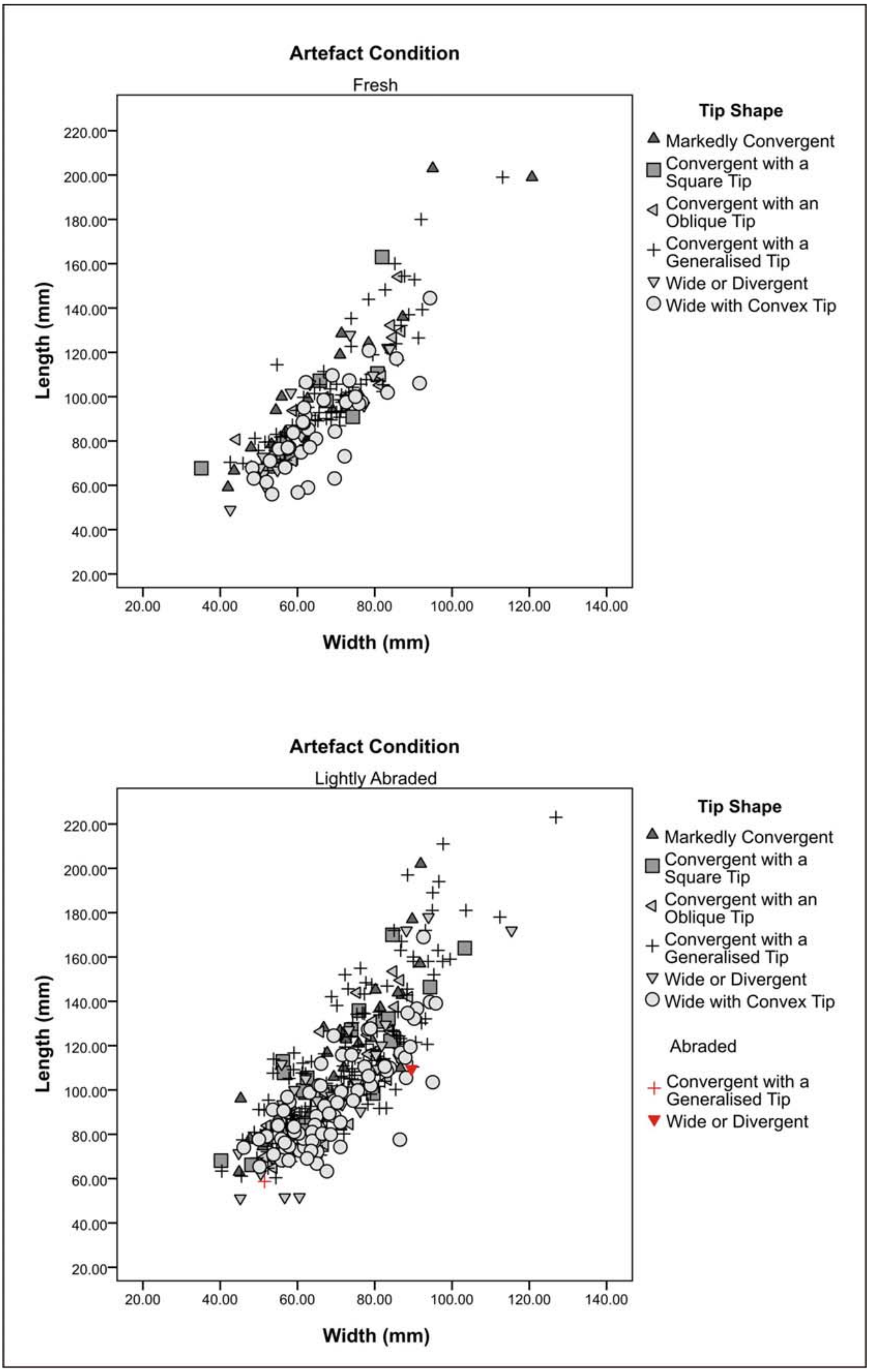


Figure A2.10: Showing the relationship between LCT proportion and tip shape for the fresh and lightly abraded / abraded assemblages for Warren Hill.

Figure A2.10 shows that there are no definitive relationships between artefact proportion and tips shape for the fresh and lightly abraded / abraded assemblages beyond the simple observations that LCTs with wide or convex tips seem to be generally smaller in proportion than convergent LCTs. A Kruskal Wallis H Test (Ebdon 1977:68) shows that there is no statistically significant relationship (to 0.05 significance) between observed tip shape and artefact condition (x^2 = 0.782; df = 5; p = 0.978), width (x^2 = 7.767; df = 5; p = 0.170) or thickness (x^2 = 5.834; df = 5; p = 0.323). However the Kruskal Wallis H Test does suggest a statistically significant relationship between tip shape and length (x^2 = 23.808; df = 5; p = 0.000). Looking at figure A2.10 it would seem that there is a general correspondence between LCTs that are longer and a tip shape with a convergent element. Interestingly, the imposition of symmetry within tip shape seems to be related to the presence of tips with a convergent element (table A2.16, figures A2.9 and A2.10).

The next criteria for assessment shall be the flaking patterns relating to the fresh LCTs of Warren Hill (table A2.17).

			Flaking Extent Second Face					
			Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	Fresh	39.1%	3.9%	2.2%	1.7%	5.0%	**52.0%**
	Complete Marginal	Fresh	4.5%	1.1%	1.1%	.6%	2.2%	**9.5%**
	Partial Marginal	Fresh	2.2%	1.7%	10.6%	2.8%	2.8%	**20.1%**
	Partial	Fresh	2.2%	.6%	2.2%	1.1%	1.7%	**7.8%**
	Substantial	Fresh	5.0%	1.1%	1.1%	.6%	2.8%	**10.6%**
	Total	**Fresh**	**53.1%**	**8.4%**	**17.3%**	**6.7%**	**14.5%**	**100.0%**

Total N = 179

Table A2.17: Showing the relationship between Flaking Extent of the first and second LCT face for the fresh assemblage for Warren Hill.

From table A2.17 it can be seen that a majority of the LCTs from the fresh assemblage have complete flaking extents on both faces. Furthermore, table A2.17 suggests that the first and second faces have been worked in similar fashions, possibly hinting at a potential form of standardisation in initial LCT shaping. Table A2.18 shows that the pattern of working both faces in a similar fashion is also present within the lightly abraded / abraded assemblage.

			Flaking Extent Second Face					
			Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	Abraded	.5%	.0%	.0%	.0%	.0%	**.5%**
		Lightly Abraded	26.3%	1.9%	7.3%	2.4%	5.1%	**43.1%**
	Complete Marginal	Abraded	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	3.3%	1.1%	2.2%	1.1%	.5%	**8.1%**
	Partial Marginal	Abraded	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	5.7%	1.1%	14.1%	1.9%	2.2%	**24.9%**
	Partial	Abraded	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	1.6%	.5%	2.2%	1.6%	.3%	**6.2%**
	Substantial	Abraded	.0%	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	5.1%	.3%	2.2%	1.4%	8.1%	**17.1%**
	Total	**Abraded**	**.5%**	**.0%**	**.0%**	**.0%**	**.0%**	**.5%**
		Lightly Abraded	**42.0%**	**4.9%**	**27.9%**	**8.4%**	**16.3%**	**99.5%**

Total N = 369

Table A2.18: Showing the relationship between Flaking Extent of the first and second LCT face for the lightly abraded / abraded assemblage for Warren Hill.

Tables A2.17 and A2.18 suggest that the LCTs from Warren Hill at both stages of occupation were shaped and thinned in a similar fashion with a preference for LCTs that were completely worked at the initial stage. However, whether this is an artifice for culturally significant form imposition or rather a result of original blank condition is difficult to establish without looking at the degree of edge working involved.

A relative index of edge working extent was described in Chapter 5 and applied to symmetry and tip shape in table A2.19 below for the fresh assemblage.

			Grouping based on sum of edge working				
			12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	Fresh	.0%	2.2%	5.0%	.6%	**7.8%**
	yes,yes,no	Fresh	1.7%	6.7%	4.5%	.0%	**12.8%**
	yes,no,no	Fresh	3.4%	5.6%	1.1%	.0%	**10.1%**
	no,yes,yes	Fresh	1.1%	6.7%	3.9%	.0%	**11.7%**
	no,no,yes	Fresh	.0%	6.1%	1.7%	.0%	**7.8%**
	no,no,no	Fresh	11.7%	25.7%	6.1%	.0%	**43.6%**
	no,yes,no	Fresh	.0%	2.8%	.6%	.0%	**3.4%**
	yes,no,yes	Fresh	.0%	2.2%	.6%	.0%	**2.8%**
	Total	**Fresh**	**17.9%**	**58.1%**	**23.5%**	**.6%**	**100.0%**

Total N = 179

Table A2.19: Showing the relationship between Symmetry and Edge Working for the fresh assemblage for Warren Hill.

From table A2.19 it can be seen that the majority of LCTs from the fresh assemblage have an overall low amount of edge working (17.9% at 12 - 24, 58.1% at 25 -36).

However, it is interesting to note that where symmetry is present, the majority of LCTs are located in the medium to high and high indexes of edge working. This would suggest a broad correlation between edge working and symmetrical form within the fresh assemblage, where symmetry is imposed through deliberate secondary edge working. Table A2.20 shows the relationship between flaking extent and symmetry for the lightly abraded / abraded assemblage.

			Grouping based on sum of edge working				
			12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Symmetry by Eye	yes,yes,yes	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.5%	4.9%	.5%	.3%	**6.2%**
	yes,yes,no	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.8%	6.8%	1.6%	.0%	**9.2%**
	yes,no,no	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	1.6%	6.8%	1.6%	.0%	**10.0%**
	no,yes,yes	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.5%	4.9%	.8%	.0%	**6.2%**
	no,no,yes	Abraded	.0%	.3%	.0%	.0%	**.3%**
		Lightly Abraded	1.1%	6.0%	.8%	.0%	**7.9%**
	no,no,no	Abraded	.3%	.0%	.0%	.0%	**.3%**
		Lightly Abraded	16.5%	33.3%	2.4%	.0%	**52.3%**
	no,yes,no	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	1.1%	2.7%	.3%	.0%	**4.1%**
	yes,no,yes	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.0%	1.1%	1.6%	.0%	**2.7%**
	Pdf[a]	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.0%	.3%	.5%	.0%	**.8%**
	Total	**Abraded**	**.3%**	**.3%**	**.0%**	**.0%**	**.5%**
		Lightly Abraded	**22.2%**	**66.7%**	**10.3%**	**.3%**	**99.5%**

Total N = 369

a. Parallel distinctive features

Table A2.20: Showing the relationship between Symmetry and Edge Working for the lightly abraded / abraded assemblage for Warren Hill.

Table 2.20 highlights seems to reiterate the trend seen in table A2.19 in that the vast majority of LCTs have a low (22.2%) and medium to low (66.7%) index in edge working. Furthermore the relationship between symmetry and edge working seen in table A2.19 is also present within table A2.20, although, not as pronounced. This is possibly due to the fact that edge working does not seem to be significant factor in LCT production for this lightly abraded / abraded assemblage in comparison to the fresh assemblage.

Tables A2.21 and A2.22 show the relationship between tip shape and edge working for the fresh and lightly abraded / abraded assemblages.

			Grouping based on sum of edge working				
			12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Tip Shape	Markedly Convergent	Fresh	2.8%	7.8%	2.8%	.0%	**13.4%**
	Convergent with a Square Tip	Fresh	.0%	4.5%	2.2%	.0%	**6.7%**
	Convergent with an Oblique Tip	Fresh	1.1%	5.0%	1.7%	.0%	**7.8%**
	Convergent with a Generalised Tip	Fresh	9.5%	20.1%	12.3%	.6%	**42.5%**
	Wide or Divergent	Fresh	.6%	6.7%	2.2%	.0%	**9.5%**
	Wide or Divergent with an Oblique Bit	Fresh	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	Fresh	3.9%	14.0%	2.2%	.0%	**20.1%**
	Total	**Fresh**	**17.9%**	**58.1%**	**23.5%**	**.6%**	**100.0%**

Total N = 179

Table A2.21: Showing the relationship between Tip Shape and Edge Working for the fresh assemblage for Warren Hill.

			Grouping based on sum of edge working				
			12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Tip Shape	Markedly Convergent	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	2.2%	8.1%	1.9%	.0%	**12.2%**
	Convergent with a Square Tip	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	1.1%	4.6%	.8%	.0%	**6.5%**
	Convergent with an Oblique Tip	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.5%	6.2%	.3%	.0%	**7.0%**
	Convergent with a Generalised Tip	Abraded	.3%	.0%	.0%	.0%	**.3%**
		Lightly Abraded	11.7%	29.5%	3.8%	.3%	**45.3%**
	Wide or Divergent	Abraded	.0%	.3%	.0%	.0%	**.3%**
		Lightly Abraded	1.9%	5.1%	1.4%	.0%	**8.4%**
	Wide or Divergent with an Oblique Bit	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	Abraded	.0%	.0%	.0%	.0%	**.0%**
		Lightly Abraded	4.9%	13.0%	2.2%	.0%	**20.1%**
	Total	**Abraded**	**.3%**	**.3%**	**.0%**	**.0%**	**.5%**
		Lightly Abraded	**22.2%**	**66.7%**	**10.3%**	**.3%**	**99.5%**

Total N = 369

Table A2.22: Showing the relationship between Tip Shape and Edge Working for the lightly abraded / abraded assemblage for Warren Hill.

Tables A2.21 and A2.22 show that the degree of edge working is not dependent on particular tip shapes from either assemblage. This would seem to imply that there does not appear to be any standardised method of edge working for the LCTs at Warren Hill.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry or form through tip shape, or edge working on the

LCTs present within the Warren Hill assemblages. However, there may be a hint of a standardised form of initial LCT working favouring the complete form of initial working for both assemblages. The majority of tip shapes for both assemblages have a convergent element, however, given the low degree of edge working in relation to convergent tip shape it is unlikely that this can be seen as culturally / socially significant in nature and probably linked to tool use and / or original blank form. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form for this Acheulean site, rather given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Flint is the only raw material type present in the Warren Hill assemblages. Flint is well a known raw material for its knapping versatility and therefore is unlikely to adversely limit artefact symmetry or form imposition beyond original blank size. From the analysis described above for the Warren Hill assemblages (MIS 13), LCT production would seem to fit the precedents offered in table 4.3 (Chapter 4).

Elveden

The site history and details for Elveden can be found in Chapter 6. All the artefacts examined from Elveden were knapped from flint, a common raw material found within Suffolk. Table A2.23 below shows the relationship between the LCTs from Elveden and their completeness.

		Artefact Type – LCT – Completeness					
		Unbroken		Broken		**Total**	
Collection	BM Excavation	4	*6.9%*	8	*13.8%*	**12**	***20.7%***
	Sieveking Excavation 1967	2	*3.4%*	0	*.0%*	**2**	***3.4%***
	Sturge Collection	38	*65.5%*	6	*10.3%*	**44**	***75.9%***
	Total	**44**	***75.9%***	**14**	***24.1%***	**58**	***100.0%***

Table A2.23: Showing the relationship between the LCT Collections and Artefact Completeness for Elveden.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed 44 (75.9% of the LCTs examined for this thesis). Table A2.24 shows the relationship between LCT collection and condition.

		Artefact Type – LCT – Artefact Condition					
		Fresh		Lightly Abraded		**Total**	
Collection	BM Excavation	1	*2.3%*	3	*6.8%*	**4**	***9.1%***
	Sieveking Excavation 1967	2	*4.5%*	0	*.0%*	**2**	***4.5%***
	Sturge Collection	21	*47.7%*	17	*38.6%*	**38**	***86.4%***
	Total	**24**	***54.5%***	**20**	***45.5%***	**44**	***100.0%***

Table A2.24: Showing the relationship between LCT collection and Artefact Condition for Elveden.

As can be seen from table A2.24, the composition of fresh and lightly abraded artefacts from Elveden are fairly comparable, indeed, the lightly abraded artefacts are only described as such due to a slight rounding to the flake scar ridges on the LCTs and are unlikely therefore to have undergone extensive post-depositional movement. Consequently I would concur with Ashton *et al* (2005) that the LCTs from Elveden should be treated as a broadly contemporaneous assemblage from MIS 11 and I shall proceed accordingly.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. In order to assess imposition of form and symmetry upon the LCTs of Elveden table A2.25 shows the relationship between tip shape and LCT symmetry.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	2.3%	.0%	4.5%	2.3%	.0%	9.1%	.0%	.0%	**18.2%**
	Convergent with a Square Tip	.0%	.0%	.0%	.0%	.0%	4.5%	.0%	.0%	**4.5%**
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	2.3%	2.3%	.0%	.0%	**4.5%**
	Convergent with a Generalised Tip	.0%	2.3%	9.1%	6.8%	4.5%	36.4%	.0%	4.5%	**63.6%**
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	.0%	.0%	2.3%	.0%	.0%	2.3%	.0%	.0%	**4.5%**
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	4.5%	.0%	.0%	**4.5%**
	Total	**2.3%**	**2.3%**	**15.9%**	**9.1%**	**6.8%**	**59.1%**	**.0%**	**4.5%**	**100.0%**

Total N = 44

Table A2.25: Showing the relationship between Tip Shape and Symmetry by Eye for Elveden.

From table A2.25 it is clear that the hominins from Elveden did not place a high significance on absolute LCT symmetry (only 2.3% of the assemblage described as symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 25.0% of the LCTs in table A2.25 display evidence for tip symmetry. However, as 22.7% of LCTs with a symmetrical element to their tip form also have a convergent element, the degree of symmetry present within tip form is probably a result of producing a convergent tip, rather than a genuine and conscious imposition of culturally significant symmetry. The overwhelming component of non-symmetrical (59.1%), and non-symmetrical tip shape (15.9%) would reinforce the initial observation that symmetry did not play a significant role in LCT production for in the assemblage at Elveden. However, in regards to tip shape there would appear to be an overall tendency for convergent tips over other types possibly hinting at a deliberate preference for a particular form being imposed on the LCTs.

Figure A2.11 below examines the relationship between symmetry and artefact proportion.

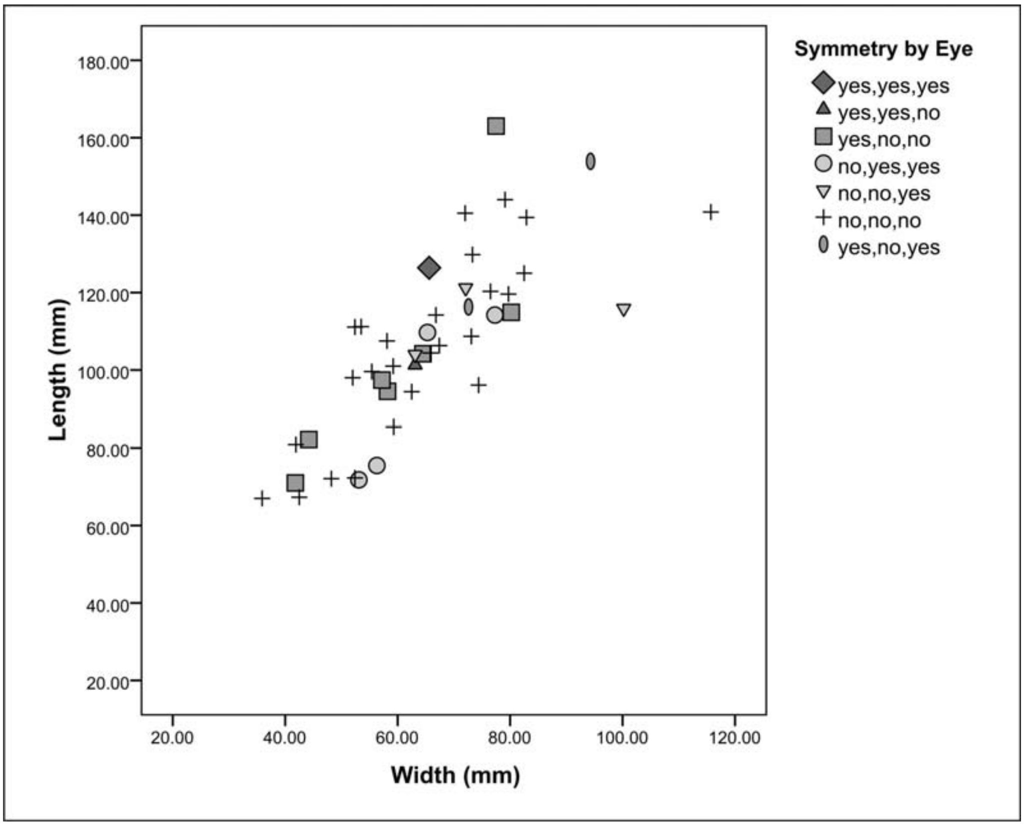


Figure A2.11: Showing the relationship between LCT proportion and symmetry for Elveden.

Figure A2.11 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. Furthermore, figure A2.11shows that symmetry categories are not clustered in particular proportions as all symmetry categories are found in all artefact proportions. This would suggest that symmetry and LCT proportion have no significant relationship for the Elveden. This trend would seem to be confirmed by a Kruskal Wallis H Test (Ebdon 1977:68) which shows that there is no statistically significant relationship (to 0.05 significance) between observed symmetry and length (x^2 = 6.301; df = 6; p = 0.390), width (x^2 = 4.195; df = 6; p = 0.650) or thickness (x^2 = 6.725; df = 6; p = 0.347).

Figure A2.12 shows the relationship between tip shape and artefact proportion for the fresh and lightly abraded / abraded assemblages.

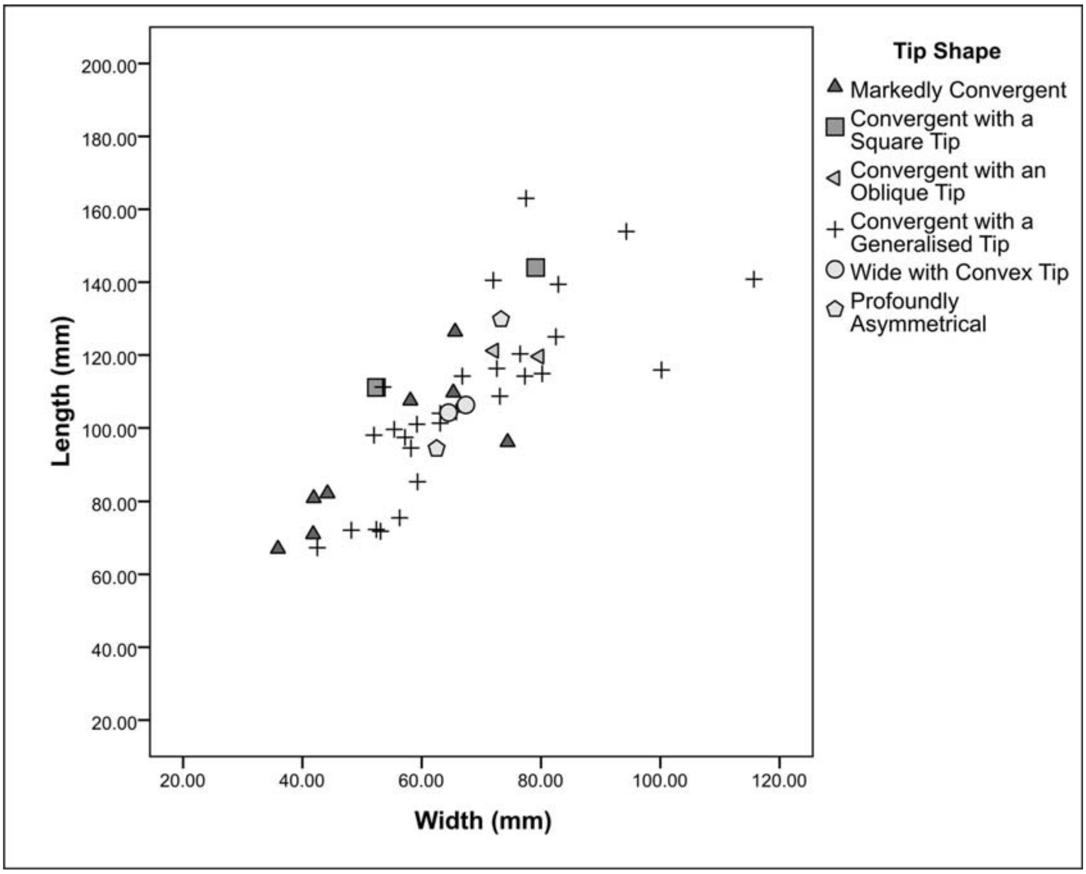


Figure A2.12: Showing the relationship between LCT proportion and tip shape for Elveden.

Figure A2.12 shows that there are no definitive relationships between artefact proportion and tips shape, a trend further supported by a Kruskal Wallis H Test (Ebdon 1977:68) where there would appear to be no statistically significant relationship (to 0.05

significance) between observed tip shape and length (x^2 = 6.144; df = 5; p = 0.292), width (x^2 = 6.147; df = 5; p = 0.292) or thickness (x^2 = 8.752; df = 5; p = 0.119). Therefore from figures A2.11 and A2.12, it would seem that there is no noteworthy relationship between LCT proportion and tip shape or symmetry in regards to standardisation of form imposition and artefact size.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of Elveden (table A2.26).

		Flaking Extent Second Face					
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	29.5%	2.3%	2.3%	11.4%	2.3%	**47.7%**
	Complete Marginal	2.3%	.0%	.0%	.0%	.0%	**2.3%**
	Partial Marginal	.0%	.0%	11.4%	.0%	.0%	**11.4%**
	Partial	4.5%	.0%	2.3%	.0%	2.3%	**9.1%**
	Substantial	11.4%	.0%	.0%	2.3%	15.9%	**29.5%**
	Total	**47.7%**	**2.3%**	**15.9%**	**13.6%**	**20.5%**	**100.0%**

Total N = 44

Table A2.26: Showing the relationship between Flaking Extent of the first and second LCT face for Elveden.

From table A2.27 it can be seen that the hominins seemed to have preferred a complete flaking initial thinning and shaping strategy. Furthermore, table A2.26 suggests that the first and second faces were initially worked in similar fashions, possibly hinting at a potential form of standardisation in preliminary LCT shaping. However, whether this is an artifice of culturally significant form imposition or rather a result of original blank condition is difficult to establish without looking at the degree of edge working involved.

A relative index of edge working extent was described in Chapter 5 and applied to symmetry and tip shape in table A2.27 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	.0%	2.3%	.0%	.0%	**2.3%**
	yes,yes,no	.0%	2.3%	.0%	.0%	**2.3%**
	yes,no,no	2.3%	13.6%	.0%	.0%	**15.9%**
	no,yes,yes	.0%	6.8%	2.3%	.0%	**9.1%**
	no,no,yes	.0%	4.5%	2.3%	.0%	**6.8%**
	no,no,no	31.8%	27.3%	.0%	.0%	**59.1%**
	no,yes,no	.0%	.0%	.0%	.0%	**.0%**
	yes,no,yes	.0%	2.3%	2.3%	.0%	**4.5%**
	Total	34.1%	**59.1%**	**6.8%**	**.0%**	**100.0%**

Total N = 44

Table A2.27: Showing the relationship between Symmetry and Edge Working for Elveden.

From table A2.27 it can be seen that the majority of LCTs have an overall low amount of edge working (34.1% at 12 - 24, 59.1% at 25 -36). This is possibly due to the fact that edge working does not seem to be significant factor in LCT production for this assemblage. This in turn could suggest in conjunction with the data from table A2.27 that if a standardisation in LCT manufacture was present, it did not extend to secondary edge working. Furthermore, there would seem to be a lack of a correlation between edge working and symmetrical form, which may further support the idea that symmetry and deliberate form imposition through standardised modes of initial and secondary working were not culturally significant.

Tables A2.28 shows the relationship between tip shape and edge working.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Tip Shape	Markedly Convergent	2.3%	13.6%	2.3%	.0%	**18.2%**
	Convergent with a Square Tip	2.3%	2.3%	.0%	.0%	**4.5%**
	Convergent with an Oblique Tip	2.3%	2.3%	.0%	.0%	**4.5%**
	Convergent with a Generalised Tip	20.5%	38.6%	4.5%	.0%	**63.6%**
	Wide or Divergent	.0%	.0%	.0%	.0%	**.0%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	2.3%	2.3%	.0%	.0%	**4.5%**
	Profoundly Asymmetrical	4.5%	.0%	.0%	.0%	**4.5%**
	Total	**34.1%**	**59.1%**	**6.8%**	**.0%**	**100.0%**

Total N = 44

Table A2.28: Showing the relationship between Tip Shape and Edge Working for the fresh assemblage for Elveden.

Table A2.28 shows that the degree of edge working is not dependent on particular tip shape. This would seem to support the general conclusion that there does not appear to be any definitive standardised system of LCT working (initial or secondary) imposed on the LCTs at Elveden.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry or form through tip shape or edge working on the LCTs present within the Elveden assemblage. However, there may be a hint of a standardised form of initial LCT working favouring the complete form of initial working for both assemblages. Although the majority of tip shapes are convergent, given the low degree of edge working in relation to convergent tip shape it is unlikely that this can be seen as culturally / socially significant in nature. This form imposition is probably linked to tool use and / or original blank form. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form for this Acheulean site, rather given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Flint is the only raw material type present in the Elveden assemblage. Flint is well a known raw material for its knapping versatility and therefore is unlikely to adversely limit artefact symmetry or form imposition beyond original blank size. From the analysis described above for the Elveden (MIS 11) assemblage, LCT production would seem to fit the precedents offered in table 4.3 (Chapter 4).

Hoxne - Upper Industry

The site history and details for the Hoxne Upper Industry can be found in Chapter 6. All the artefacts examined from the Hoxne Upper Industry were knapped from flint, a common raw material found within Suffolk and Norfolk. As mentioned above, a total of 1583 artefacts were examined from the Hoxne Upper Industry spanning seven contexts (as labelled in the British Museum) but belonging to a single MIS 11 assemblage (Ashton *et al* 2008) (table A2.29).

		Context / Level							
		Layer 6	Layer 6-7	Layer 6b	Layer 6x	Layer 7	Layer 7a	Layer 7b	**Total**
Artefact Type	LCT	15	0	5	8	2	0	0	**30**
	Flake	569	6	69	111	343	41	46	**1185**
	Flake tool	50	2	27	38	56	8	3	**184**
	Debitage	46	1	0	8	56	18	24	**153**
	Core	4	0	1	1	6	2	2	**16**
	Hammer Stone	0	0	0	0	2	0	1	**3**
	Core tool	5	0	2	2	2	0	1	**12**
	Total	**689**	**9**	**104**	**168**	**467**	**69**	**77**	**1583**

Table A2.29: Showing the relationship between artefact type and context for the Hoxne Upper Industry.

As discussed in Chapter 6, the Hoxne Upper Industry is to be taken as a single assemblage that has been moved post-depositionally into the 7 contexts seen in table A2.29. Table A2.30 shows the relationship between artefact type, context and completeness.

			Artefact Type							
			LCT	Flake	Flake tool	Debitage	Core	Hammer Stone	Core tool	**Total**
Context / Level	Layer 6	Unbroken	11	483	44	40	4	0	5	**587**
		Broken	4	86	6	6	0	0	0	**102**
		Total	**15**	**569**	**50**	**46**	**4**	**0**	**5**	**689**
	Layer 6-7	Unbroken	0	6	2	1	0	0	0	**9**
		Broken	0	0	0	0	0	0	0	**0**
		Total	**0**	**6**	**2**	**1**	**0**	**0**	**0**	**9**
	Layer 6b	Unbroken	5	59	26	0	1	0	2	**93**
		Broken	0	10	1	0	0	0	0	**11**
		Total	**5**	**69**	**27**	**0**	**1**	**0**	**2**	**104**
	Layer 6x	Unbroken	6	86	37	6	1	0	2	**138**
		Broken	2	25	1	2	0	0	0	**30**
		Total	**8**	**111**	**38**	**8**	**1**	**0**	**2**	**168**
	Layer 7	Unbroken	2	282	51	44	5	2	2	**388**
		Broken	0	61	5	12	1	0	0	**79**
		Total	**2**	**343**	**56**	**56**	**6**	**2**	**2**	**467**
	Layer 7a	Unbroken	0	34	8	13	2	0	0	**57**
		Broken	0	7	0	5	0	0	0	**12**
		Total	**0**	**41**	**8**	**18**	**2**	**0**	**0**	**69**
	Layer 7b	Unbroken	0	36	3	11	2	0	1	**53**
		Broken	0	10	0	13	0	1	0	**24**
		Total	**0**	**46**	**3**	**24**	**2**	**1**	**1**	**77**
	Total	Unbroken	24	986	171	115	15	2	12	**1325**
		Broken	6	199	13	38	1	1	0	**258**
		Total	**30**	**1185**	**184**	**153**	**16**	3	12	**1583**

Table A2.30: Showing the relationship between Artefact Type, Context and Completeness for the Hoxne Upper Industry.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed below 1325. Table A2.31 shows the relationship between artefact type, context and condition.

			Artefact Type															
			LCT		Flake		Flake tool		Debitage		Core		Hammer Stone		Core tool		**Total**	
Context / Level	Layer 6	Abraded	0	.0%	9	.7%	1	.1%	1	.1%	0	.0%	0	.0%	0	.0%	**11**	**.8%**
		Fresh	7	.5%	305	23.0%	35	2.6%	29	2.2%	2	.2%	0	.0%	3	.2%	**381**	**28.8%**
		Lightly Abraded	4	.3%	169	12.8%	8	.6%	10	.8%	2	.2%	0	.0%	2	.2%	**195**	**14.7%**
		Total	**11**	**.8%**	**483**	**36.5%**	**44**	**3.3%**	**40**	**3.0%**	**4**	**.3%**	**0**	**.0%**	**5**	**.4%**	**587**	**44.3%**
	Layer 6-7	Abraded	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	**0**	**.0%**
		Fresh	0	.0%	5	.4%	1	.1%	1	.1%	0	.0%	0	.0%	0	.0%	**7**	**.5%**
		Lightly Abraded	0	.0%	1	.1%	1	.1%	0	.0%	0	.0%	0	.0%	0	.0%	**2**	**.2%**
		Total	**0**	**.0%**	**6**	**.5%**	**2**	**.2%**	**1**	**.1%**	**0**	**.0%**	**0**	**.0%**	**0**	**.0%**	**9**	**.7%**
	Layer 6b	Abraded	0	.0%	1	.1%	0	.0%	0	.0%	1	.1%	0	.0%	0	.0%	**2**	**.2%**
		Fresh	5	.4%	50	3.8%	24	1.8%	0	.0%	0	.0%	0	.0%	2	.2%	**81**	**6.1%**
		Lightly Abraded	0	.0%	8	.6%	2	.2%	0	.0%	0	.0%	0	.0%	0	.0%	**10**	**.8%**
		Total	**5**	**.4%**	**59**	**4.5%**	**26**	**2.0%**	**0**	**.0%**	**1**	**.1%**	**0**	**.0%**	**2**	**.2%**	**93**	**7.0%**
	Layer 6x	Abraded	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	**0**	**.0%**
		Fresh	6	.5%	80	6.0%	37	2.8%	6	.5%	1	.1%	0	.0%	2	.2%	**132**	**10.0%**
		Lightly Abraded	0	.0%	6	.5%	0	.0%	0	.0%	0	.0%	0	.0%	0	.0%	**6**	**.5%**
		Total	**6**	**.5%**	**86**	**6.5%**	**37**	**2.8%**	**6**	**.5%**	**1**	**.1%**	**0**	**.0%**	**2**	**.2%**	**138**	**10.4%**
	Layer 7	Abraded	0	.0%	16	1.2%	1	.1%	2	.2%	0	.0%	0	.0%	0	.0%	**19**	**1.4%**
		Fresh	2	.2%	172	13.0%	34	2.6%	29	2.2%	1	.1%	2	.2%	1	.1%	**241**	**18.2%**
		Lightly Abraded	0	.0%	94	7.1%	16	1.2%	13	1.0%	4	.3%	0	.0%	1	.1%	**128**	**9.7%**
		Total	**2**	**.2%**	**282**	**21.3%**	**51**	**3.8%**	**44**	**3.3%**	**5**	**.4%**	**2**	**.2%**	**2**	**.2%**	**388**	**29.3%**
	Layer 7a	Abraded	0	.0%	4	.3%	0	.0%	1	.1%	0	.0%	0	.0%	0	.0%	**5**	**.4%**
		Fresh	0	.0%	25	1.9%	5	.4%	9	.7%	0	.0%	0	.0%	0	.0%	**39**	**2.9%**
		Lightly Abraded	0	.0%	5	.4%	3	.2%	3	.2%	2	.2%	0	.0%	0	.0%	**13**	**1.0%**
		Total	**0**	**.0%**	**34**	**2.6%**	**8**	**.6%**	**13**	**1.0%**	**2**	**.2%**	**0**	**.0%**	**0**	**.0%**	**57**	**4.3%**
	Layer 7b	Abraded	0	.0%	0	.0%	0	.0%	0	.0%	1	.1%	0	.0%	0	.0%	**1**	**.1%**
		Fresh	0	.0%	22	1.7%	0	.0%	5	.4%	1	.1%	0	.0%	0	.0%	**28**	**2.1%**
		Lightly Abraded	0	.0%	14	1.1%	3	.2%	6	.5%	0	.0%	0	.0%	1	.1%	**24**	**1.8%**
		Total	**0**	**.0%**	**36**	**2.7%**	**3**	**.2%**	**11**	**.8%**	**2**	**.2%**	**0**	**.0%**	**1**	**.1%**	**53**	**4.0%**
	Total	Abraded	0	.0%	30	2.3%	2	.2%	4	.3%	2	.2%	0	.0%	0	.0%	**38**	**2.9%**
		Fresh	20	1.5%	659	49.7%	136	10.3%	79	6.0%	5	.4%	2	.2%	8	.6%	**909**	**68.6%**
		Lightly Abraded	4	.3%	297	22.4%	33	2.5%	32	2.4%	8	.6%	0	.0%	4	.3%	**378**	**28.5%**
		Total	**24**	**1.8%**	**986**	**74.4%**	**171**	**12.9%**	**115**	**8.7%**	**15**	**1.1%**	**2**	**.2%**	**12**	**.9%**	**1325**	**100.0%**

Table A2.31: Showing the relationship between Artefact Type, Context and Condition for the Hoxne Upper Industry.

Table A2.31 shows that the majority of unbroken artefacts from the Hoxne Upper Industry are classified as fresh (68.6%), then lightly abraded (28.5%) and finally a small minority classed as abraded (2.9%). This pattern of condition would suggest that the majority of the Hoxne Upper Industry assemblage have not been subjected to a large degree of post depositional movement and abrasion, the lightly braded artefacts display slight rounding of the flake scars, although this can be caused through minimal post depositional movement. The abraded artefacts (2.9% of the entire unbroken assemblage) come from layers 6, 7, 7a and 7b, lending support to the idea that layers 7, 7a and 7b (A2ii) are derived from layers 6, 6x and 6b (A2iii) (figure 6.9, Chapter 6). A certain amount of abrasion is expected if artefacts have suffered post-depositional movement as at Hoxne, and the minimal numbers of abraded artefacts are not enough to indicate that there is a second assemblage mixed in with the established interpretation of a single assemblage (Ashton *et al* 2008). Similarly, table A2.30 would seem to support this interpretation where the majority of artefacts are unbroken (1325 / 1583 x 200 = 83.7%) and a minority of broken artefacts (258 / 1583 x 100 = 16.3%), where due to the difficulties in break analysis it was impossible to tell whether they happened as a result of post depositional processes or not. However, the fact that all contexts had an overwhelming majority of unbroken artefacts may suggest that the Hoxne Upper Industry assemblage minimal amounts of post-depositional movement and may be considered as a single assemblage.

I shall now examine the more specific elements to the Hoxne Upper Industry assemblage by looking at the LCTs, Flakes, Flake Tools and Cores in greater depth.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. From table A2.31 above it can be seen that the 24 unbroken LCTs from the Hoxne Upper Industry come in a predominantly fresh condition (20) with a few being lightly abraded (4). The varying conditions of the artefacts would suggest that a minimal amount of post-depositional movement has occurred, however not so much that assemblage integrity has been affected, therefore as stated above, I believe that it is reasonable to treat the LCTs one contemporaneous assemblage and I shall proceed accordingly.

In order to assess imposition of form and symmetry upon the LCTs of the Hoxne Upper Industry, table A2.32 shows the relationship between tip shape and symmetry.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	.0%	12.5%	8.3%	.0%	4.2%	25.0%	4.2%	.0%	**54.2%**
	Convergent with a Square Tip	.0%	.0%	4.2%	4.2%	.0%	4.2%	.0%	.0%	**12.5%**
	Convergent with an Oblique Tip	.0%	.0%	.0%	4.2%	4.2%	.0%	.0%	.0%	**8.3%**
	Convergent with a Generalised Tip	.0%	.0%	.0%	.0%	.0%	4.2%	.0%	.0%	**4.2%**
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	8.3%	.0%	.0%	**8.3%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	.0%	.0%	.0%	.0%	.0%	12.5%	.0%	.0%	**12.5%**
	Total	**.0%**	**12.5%**	**12.5%**	**8.3%**	**8.3%**	**54.2%**	**4.2%**	**.0%**	**100.0%**

Total N = 24

Table A2.32: Showing the relationship between Tip Shape and Symmetry by Eye for the Hoxne Upper Industry.

From table A2.32 it is clear that the hominins from the Hoxne Upper Industry did not place any significance on absolute LCT symmetry (0.0% of the assemblage described as symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 25.0% (6) of the LCTs in table A2.32 display evidence for tip symmetry. However, the 25.0% of LCTs with a symmetrical element to their tip form have a convergent element; the degree of symmetry present within tip form is probably a result of producing a convergent tip, rather than a genuine and conscious imposition of symmetry (reinforced by the lack of absolute symmetry within the assemblage). Furthermore, the overwhelming component of non-symmetrical (54.2%), and non-symmetrical tip shape (20.8%) would reinforce the initial observation that symmetry did not play a significant role in LCT production. In regards to tip shape there would appear to be an overall tendency for convergent tips over other types possibly hinting at a deliberate preference for a particular form, although this may be related to original blank form over any genuine presence of form imposition. Although from such a small sample (24 artefacts in total) any definitive patterns in the data would be difficult to prove

Figures A2.13 below examines the relationship between symmetry and artefact proportion.

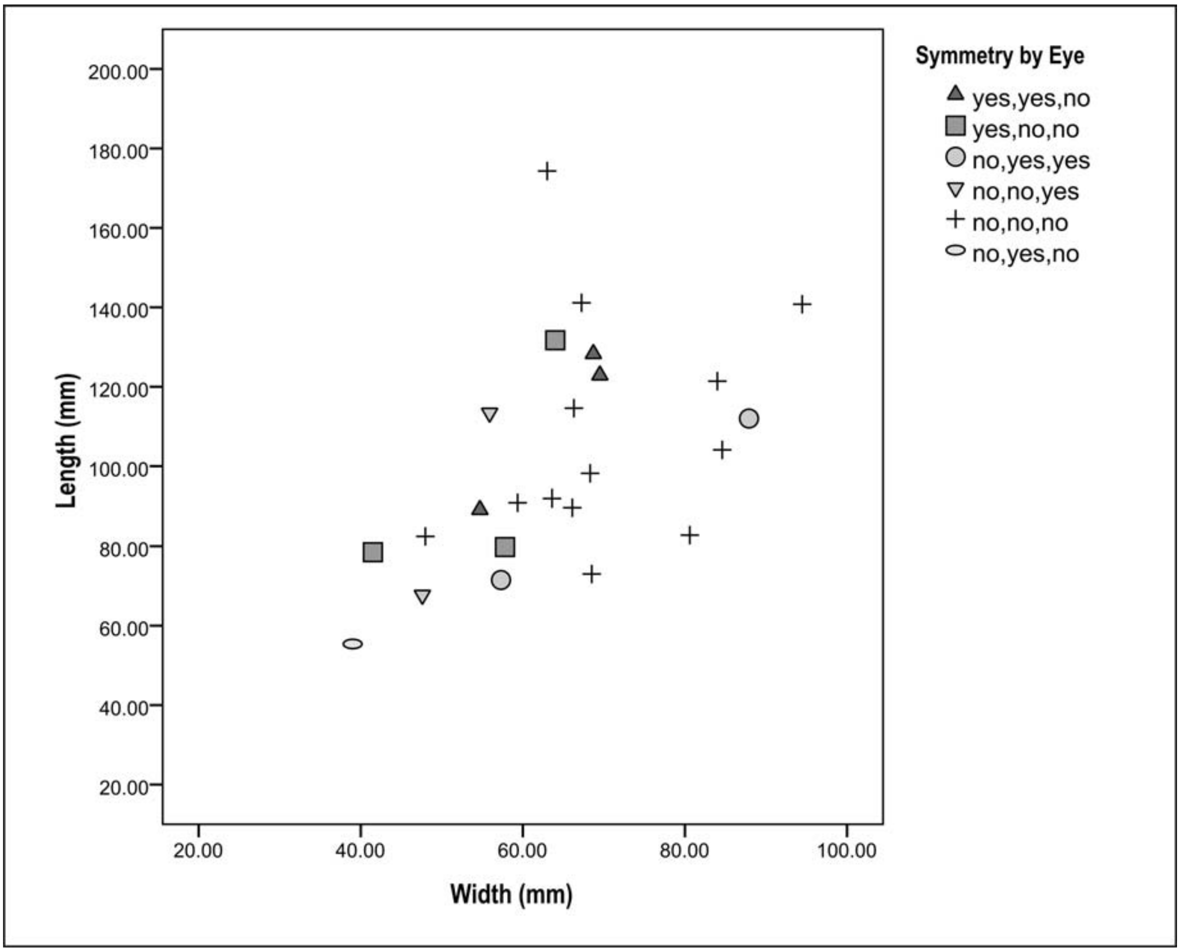


Figure A2.13: Showing the relationship between LCT proportion and symmetry for the Hoxne Upper Industry.

Figure A2.13 shows a broad correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. Furthermore, figure A2.13 shows that symmetry categories are not clustered through particular artefact proportions. This would suggest that symmetry and LCT proportion have no significant relationship in the Hoxne Upper Industry. A Kruskal Wallis H Test (Ebdon 1977:68) confirms that there is no statistically significant relationship (to 0.05 significance) between observed symmetry, length (x^2 = 5.208; df = 5; p = 0.391), width (x^2 = 8.918; df = 5; p = 0.112) or thickness (x^2 = 2.580; df = 5; p = 0.764).Which, would support the idea that symmetry and LCT proportion are not linked.

Figure A2.14 shows the relationship between tip shape and artefact proportion.

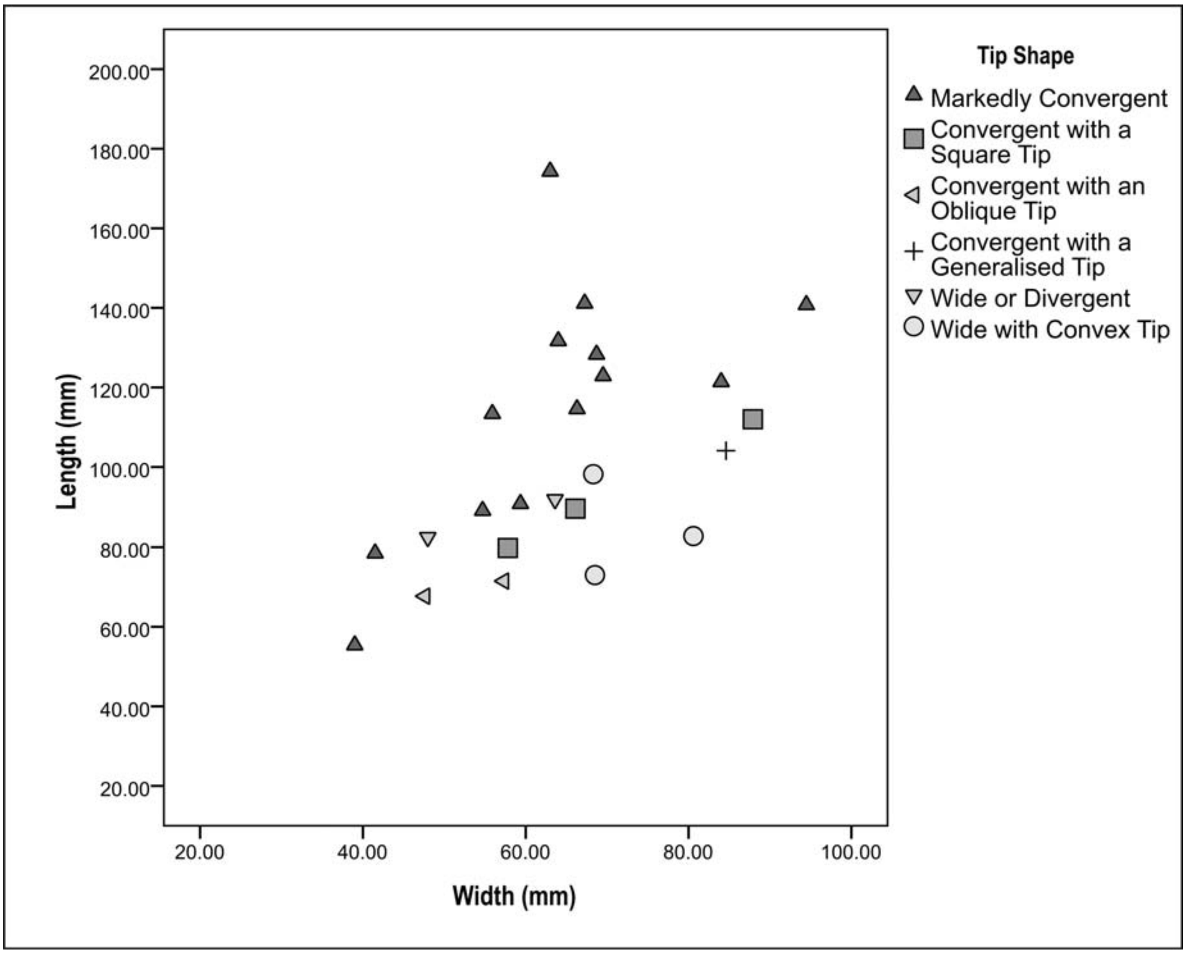


Figure A2.14: Showing the relationship between LCT proportion and tip shape for the Hoxne Upper Industry.

Figure A2.14 shows that there would appear to be no definitive relationships between artefact proportion and tips shape. A Kruskal Wallis H Test (Ebdon 1977:68) confirms that there is no statistically significant relationship (to 0.05 significance) between observed tip shape and length (x^2 = 8.639; df = 5; p = 0.124), width (x^2 = 7.003; df = 5; p = 0.220) or thickness (x^2 = 5.047; df = 5; p = 0.410). Therefore it would appear that artefact proportion is not related to specific form imposition constructed through tip shape. Figures A2.13 and A2.14 seem to reinforce the point that symmetry and particular tip shape do not play any culturally significant roles in regards to standardisation of LCT size and form for LCT production for the Hoxne Upper Industry.

The next criteria for assessing form imposition shall be through the flaking patterns relating to the LCTs of the Hoxne Upper Industry (table A2.33).

		Flaking Extent Second Face					
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	4.2%	.0%	12.5%	4.2%	33.3%	**54.2%**
	Complete Marginal	.0%	4.2%	.0%	.0%	.0%	**4.2%**
	Partial Marginal	4.2%	4.2%	8.3%	4.2%	8.3%	**29.2%**
	Partial	.0%	.0%	4.2%	4.2%	.0%	**8.3%**
	Substantial	.0%	.0%	.0%	4.2%	.0%	**4.2%**
	Total	**8.3%**	**8.3%**	**25.0%**	**16.7%**	**41.7%**	**100.0%**

Total N = 24

Table A2.33: Showing the relationship between Flaking Extent of the first and second LCT face for the Hoxne Upper Industry.

From the small sample of LCTs in the Hoxne Upper Industry there would appear to be no consistent pattern in regards to LCT shaping and thinning. Interestingly the two sides of the LCTs seem to be often knapped in different ways with the first face having significantly less LCTs that are worked in a complete fashion than the second face, and more LCTs that are worked in a substantial fashion. Therefore it would seem that there is no standardisation in shaping and thinning of the Hoxne Upper Industry LCTs.

Another way to ascertain whether there is any standardisation in LCT manufacture is through the amount of edge working. A relative index of edge working extent was described in Chapter 5 and applied to symmetry and tip shape in tables A2.34 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	.0%	.0%	.0%	.0%	**.0%**
	yes,yes,no	.0%	.0%	8.3%	4.2%	**12.5%**
	yes,no,no	.0%	8.3%	4.2%	.0%	**12.5%**
	no,yes,yes	.0%	.0%	8.3%	.0%	**8.3%**
	no,no,yes	.0%	.0%	4.2%	4.2%	**8.3%**
	no,no,no	4.2%	12.5%	16.7%	20.8%	**54.2%**
	no,yes,no	.0%	4.2%	.0%	.0%	**4.2%**
	yes,no,yes	.0%	.0%	.0%	.0%	**.0%**
	Total	**4.2%**	**25.0%**	**41.7%**	**29.2%**	**100.0%**

Total N = 24

Table A2.34: Showing the relationship between Symmetry and Edge Working for the Hoxne Upper Industry.

From table A2.34 it can be seen that the majority of LCTs have an overall high amount of edge working (41.7% at 37-48, 29.2% at 49-60). However this high degree of edge working is unlikely to represent culturally significant standardised working practices due to the lack of symmetry. Table A2.35 shows the relationship between tip shape and edge working

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Tip Shape	Markedly Convergent	.0%	20.8%	20.8%	12.5%	**54.2%**
	Convergent with a Square Tip	.0%	.0%	12.5%	.0%	**12.5%**
	Convergent with an Oblique Tip	.0%	.0%	4.2%	4.2%	**8.3%**
	Convergent with a Generalised Tip	.0%	.0%	.0%	4.2%	**4.2%**
	Wide or Divergent	.0%	.0%	.0%	8.3%	**8.3%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	4.2%	4.2%	4.2%	.0%	**12.5%**
	Total	**4.2%**	**25.0%**	**41.7%**	**29.2%**	**100.0%**

Total N = 24

Table A2.35: Showing the relationship between Tip Shape and Edge Working for the Hoxne Upper Industry.

Table A2.35 shows that tip shapes with a convergent element have a high degree of associated edge working. However, given the lack of form imposition evident through the symmetry analysis, it is likely that the high degree of edge working is more related to the knapping of a convergent tip. Furthermore, given the absolute lack of standardisation in the initial flaking extents (table A2.33) and the lack of symmetry, I do not believe that the high degree of edge working and convergent tip shape are examples of culturally significant form imposition. Rather I would propose that the high degree of edge working and convergent tip shapes are more a response to altering initial blank form on a functional level, rather than a cultural signal.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry or form initial flaking extent. There would appear to be a correlation between a convergent tip shape and the degree of edge working on the

LCTs present within the Hoxne Upper Industry assemblage however this is more likely to be a response to altering initial blank form to suit a functional requirement rather than a culturally significant modification. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip shape for this Acheulean site. Rather, given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Flint is the only raw material type present in the Hoxne Upper Industry. Flint is well a known raw material for its knapping versatility and therefore is unlikely to adversely limit artefact symmetry or form imposition beyond original blank size.

Flake and Flake Tool Analysis

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. The debitage pieces whose presence has been noted are those pieces that are above 20mm and generally encompass flakes that are clearly waste products yet their size precluded them from immediate dismissal from the analysis. In order to get an understanding on the number of detached pieces recorded from the Hoxne Upper Industry, table A2.36 shows the breakdown of unbroken flakes, flake tools and recorded debitage in relation to the flake types described in Chapter 5.

		Artefact Type							
		Flake		Flake tool		Debitage		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	3	*.2%*	0	*.0%*	**3**	***.2%***
	R2 - Denticulated scraper	0	*.0%*	17	*1.3%*	0	*.0%*	**17**	***1.3%***
	R3 - Side scraper	0	*.0%*	52	*4.1%*	0	*.0%*	**52**	***4.1%***
	R4 - End / Traverse scraper	0	*.0%*	8	*.6%*	0	*.0%*	**8**	***.6%***
	R5 - Flake with scraper retouch	0	*.0%*	48	*3.8%*	0	*.0%*	**48**	***3.8%***
	R6 - Scraper used as wedge	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R7 - Retouched point (awl)	0	*.0%*	2	*.2%*	0	*.0%*	**2**	***.2%***
	R8 - Retouched point (projectile)	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R9 - Retouched notch	0	*.0%*	4	*.3%*	0	*.0%*	**4**	***.3%***
	R10 - Retouch non diagnostic	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R12 - Multiple tool	0	*.0%*	32	*2.5%*	0	*.0%*	**32**	***2.5%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	2	*.2%*	0	*.0%*	**2**	***.2%***
	R14 - Utilised flake with no retouch	0	*.0%*	1	*.1%*	0	*.0%*	**1**	***.1%***
	R15 - Flake with edge damage	533	*41.9%*	2	*.2%*	15	*1.2%*	**550**	***43.2%***
	R16 - Flake with no retouch	453	*35.5%*	0	*.0%*	100	*7.9%*	**553**	***43.5%***
	Total	**986**	***77.4%***	**171**	***13.5%***	**115**	***9.0%***	**1272**	***100.0%***

Table A2.36: Showing the breakdown between flakes, flake tools and (recorded) debitage in relation to flake type for the Hoxne Upper Industry.

As can be seen there are far more flakes than flake tools present within the detached artefacts studied from the Hoxne Upper Industry which may suggests two possible explanations, firstly that the hominins did not need to adapt the flakes (through retouch) they were producing for specific tasks on a regular basis, rather preferring to use the unmodified edge of flakes. Or secondly, retouch tools were favoured for curation and removed from the site and transported elsewhere whilst unretouched flakes were left at the site of production. In terms of retouched tool type being produced, table A2.36 illustrates that there would not appear to be any dominant tool form or type preferred by the knappers (although side scrapers are the dominant flake tool type, their numbers are still relatively low). This in turn suggests that tool form was more opportunistic in nature – hominins were adapting any edge that was conducive to limited reshaping.

Table A2.37 shows the relationship between flake type and Toth type (Toth 1985) illustrating that all categories of Toth type are present within the Hoxne Upper Industry. Of particular dominance is Toth type 5 (some cortex on the dorsal but none on the butt) at 57.9% of the flakes, flake tools and (recorded) debitage pieces. This would suggest that the majority (57.9%) of the detached pieces from the Hoxne Upper Industry come from flint nodules and cores that were toward the beginning of the reduction sequence. The importance of this would suggest that there a preference for flakes with cortex. This could reinforce the idea that flakes were not being produced with a specific tool form or aesthetic in mind, rather the hominins were taking advantage of original flake edges that were conducive to retouch as the need arose.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	.1%	.0%	.0%	.2%	.0%	**.2%**
	R2 - Denticulated scraper	.0%	.2%	.0%	.1%	.9%	.2%	**1.3%**
	R3 - Side scraper	.0%	.6%	.2%	.0%	2.7%	.6%	**4.1%**
	R4 - End / Traverse scraper	.0%	.2%	.1%	.0%	.2%	.2%	**.6%**
	R5 - Flake with scraper retouch	.0%	.3%	.2%	.1%	2.2%	.9%	**3.8%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	.0%	.0%	.0%	.0%	.1%	.1%	**.2%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R9 - Retouched notch	.0%	.1%	.1%	.0%	.2%	.0%	**.3%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	.2%	.2%	.2%	1.7%	.3%	**2.5%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.2%	.0%	**.2%**
	R14 - Utilised flake with no retouch	.0%	.0%	.0%	.0%	.1%	.0%	**.1%**
	R15 - Flake with edge damage	.0%	8.5%	1.6%	1.5%	24.8%	6.9%	**43.2%**
	R16 - Flake with no retouch	.6%	5.8%	3.3%	1.6%	24.8%	7.4%	**43.5%**
	Total	**.6%**	**15.9%**	**5.6%**	**3.4%**	**57.9%**	**16.7%**	**100.0%**

Total N = 1272

Table A2.37: Showing the relationship between Flake Type and Toth type for the Hoxne Upper Industry.

In terms of the technological make up of the Hoxne Upper Industry detached pieces, table A2.38 shows that all of the detached pieces for the Hoxne Upper Industry are non-PCT in character. This is as to be expected for a MIS-11 Lower Palaeolithic occupation site.

		Flake Technology Type
		Non-PCT
Flake Type	R1 - Denticulated edge	.2%
	R2 - Denticulated scraper	1.3%
	R3 - Side scraper	4.1%
	R4 - End / Traverse scraper	.6%
	R5 - Flake with scraper retouch	3.8%
	R6 - Scraper used as wedge	.0%
	R7 - Retouched point (awl)	.2%
	R8 - Retouched point (projectile)	.0%
	R9 - Retouched notch	.3%
	R10 - Retouch non diagnostic	.0%
	R11 - Flaked flake or flaked flake spall (burin)	.0%
	R12 - Multiple tool	2.5%
	R13 - Unretouched flake used as a wedge	.2%
	R14 - Utilised flake with no retouch	.1%
	R15 - Flake with edge damage	43.2%
	R16 - Flake with no retouch	43.5%
	Total	**100.0%**

Total N = 1272

Table A2.38: Showing the relationship between flake type and flake technology type for the Hoxne Upper Industry.

Of the171 flake tools seen in table A2.36, only 166 have retouched present on at least one edge (table A2.39).

		Artefact Type			
		Flake	Flake tool	Debitage	**Total**
Retouch present on left edge	Yes	0	132	0	**132**
	No	0	34	0	**34**
	Total	**0**	**166**	**0**	**166**
Retouch present on distal edge	Yes	0	125	0	**125**
	No	0	41	0	**41**
	Total	**0**	**166**	**0**	**166**
Retouch present on right edge	Yes	0	132	0	**132**
	No	0	34	0	**34**
	Total	**0**	**166**	**0**	**166**
Retouch present on proximal edge	Yes	0	22	0	**22**
	No	0	144	0	**144**
	Total	**0**	**166**	**0**	**166**

Table A2.39: Showing the relationship between retouch presence and artefact type for the Hoxne Upper Industry.

The following tests below regarding retouch and flake proportion are only conducted on the 166 unbroken detached pieces that have retouch present on at least one of their edges.

Retouch Delineation

Figure A2.15 (below) shows the relationship between retouch delineation and flake proportion where there would appear to be a large spread of retouch delineation types present within the Hoxne Upper Industry flake tools. Although all flake tool edges display a variety of retouch delineations, there is a clear preference for irregular retouch on all four flake tool edges (figure A2.15). Irregular retouch is an unstructured form of retouch and probably related to the knapper following the shape of the original flake edge rather than imposing any particular preconceived form. However this would not appear to be linked to artefact proportion as a Kruskal Wallis H Test (Ebdon 1977:68) shows there is no statistically significant relationship (to 0.05 significance) between flake length, width, or thickness and retouch delineation for the right, distal and proximal edges (figure A2.15). There would however appear to be a statistical significance between flake width and retouch delineation on the left edge (x^2 = 25.533; df = 10; p = 0.004) but not between flake length and thickness (figure A2.15). This result would seem to suggest that the delineation of retouch on the left edge is influenced by the width of the flake. However, as there would not appear to be a specific pattern of retouch delineation and flake proportion in figure A2.15, it is likely that retouch delineation on the left edge is a result of opportunistic manipulation of the flake edge. A further pattern that emerges from figure A2.15 is that where retouch is present on the proximal edge, it is present on flake tools of a variety or proportions however this is probably a further result of opportunistic manipulation of the flake edge rather than a deliberately preconceived tool form.

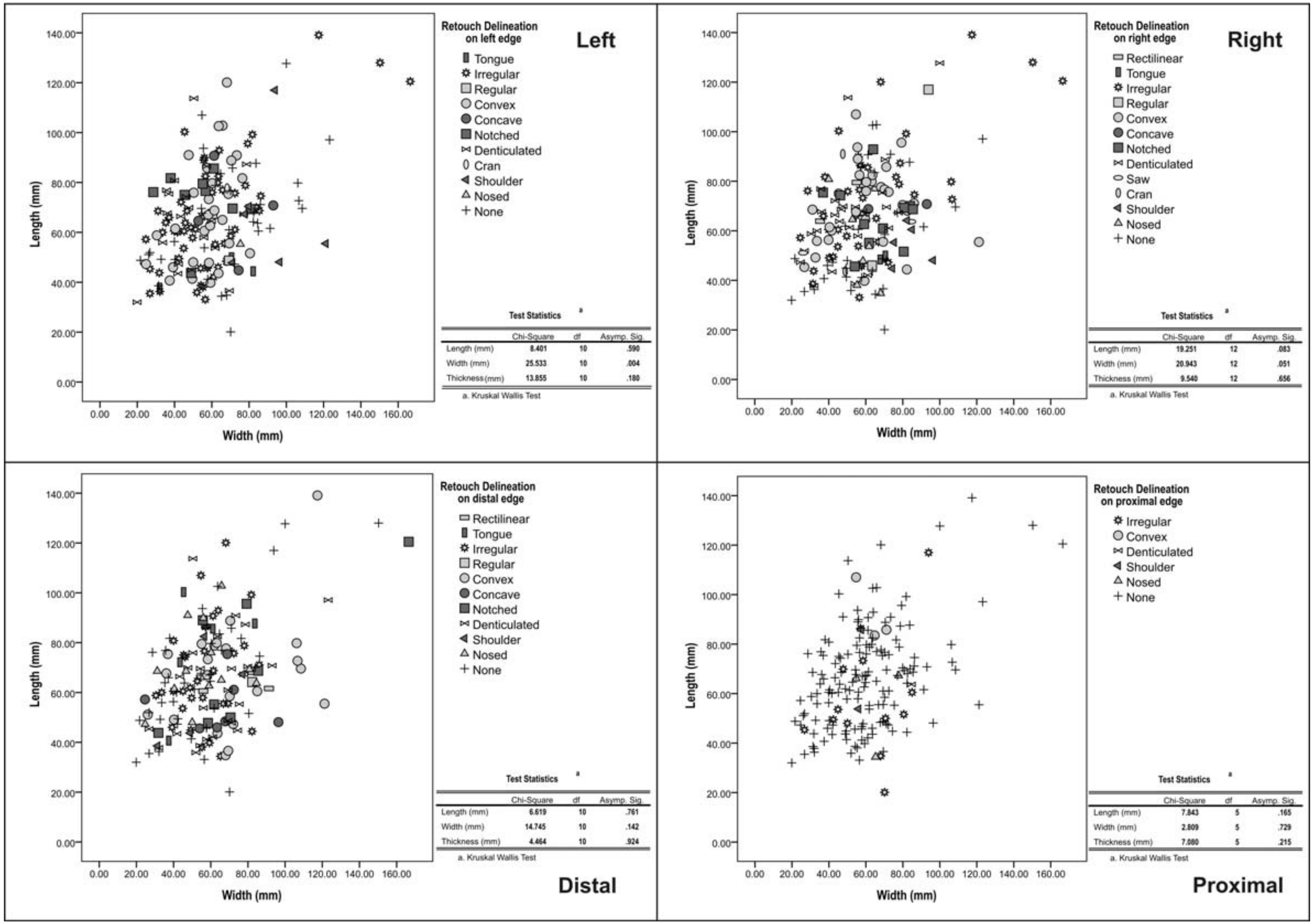


Figure A2.15: Showing the relationship between flake proportion and retouch delineation for the Hoxne Upper Industry.

Retouch distribution

Figure A2.16 (below) shows the relationship between flake proportion and retouch distribution. There appears to be clear preference for a total style of retouch distribution although discontinuous and partial retouch distributions are present. Total retouch implies that the entire edge has been retouched and may indicate that form is being imposed by the knapper, although the majority of irregular retouch present in figure A2.15 would imply that this was not the case. A Kruskal Wallis H Test (Ebdon 1977:68) would indicate that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch distribution except in the case of flake width / retouch distribution on the distal edge (x^2 = 8.999; df = 3; p = 0.029). By looking at figure A2.16 the only obvious relationship between retouch distribution and width for the distal edge is that the majority of the flake tools have a total distribution of retouch. The amount of edge for the distal is often influenced more by the width of the flake, rather than the length (the wider the flake, the greater the edge on the distal). If the patterns of retouch distribution are examined for all the left, right, distal and proximal edges in figure A2.16, there would not appear to be a preferential edge that contains a greater degree of total, discontinuous or partial retouch .Therefore, I propose that retouch distribution is governed more by opportunistic retouch imposition in regards to the naked flake edge, rather than through deliberate tool design.

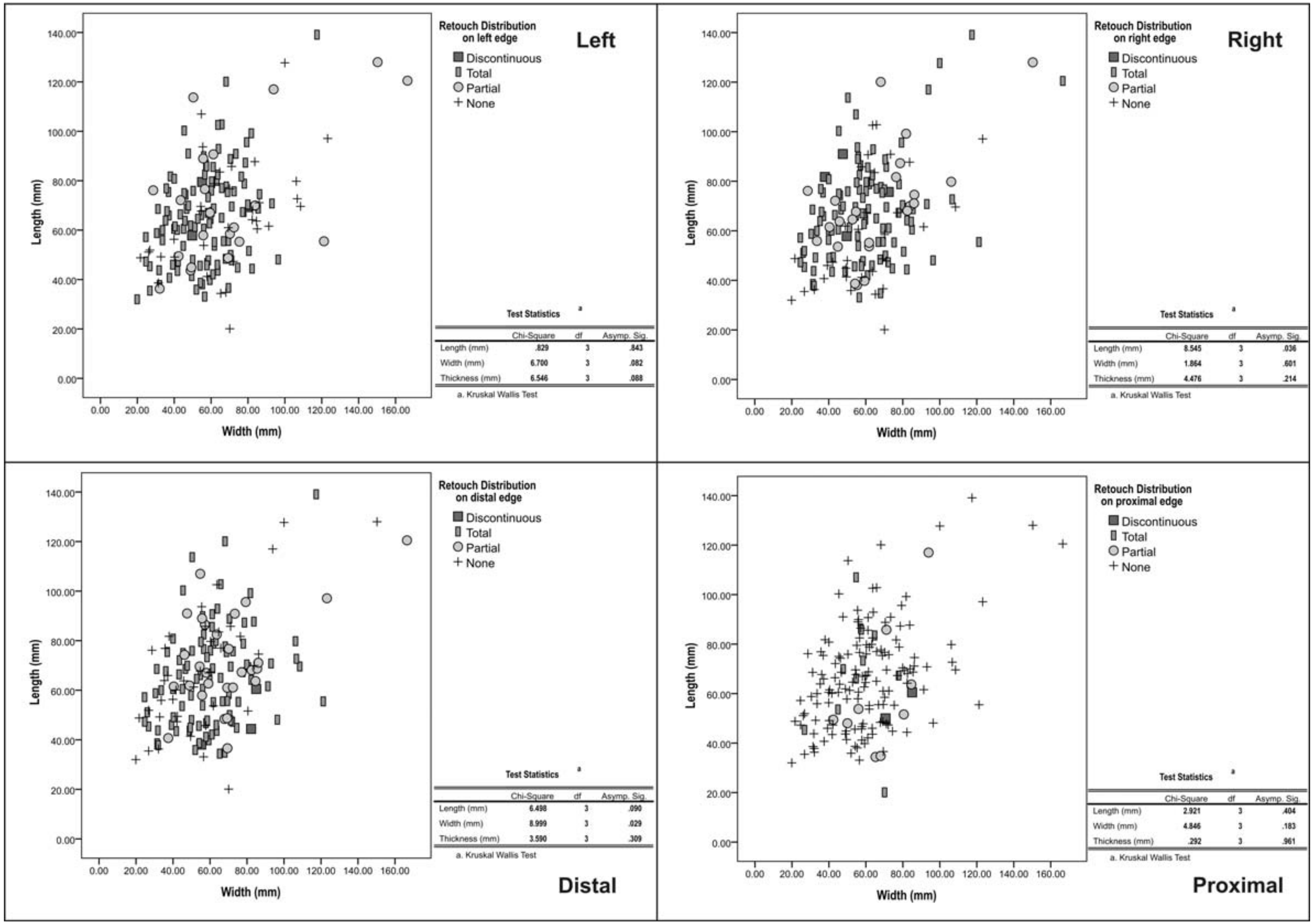


Figure A2.16: Showing the relationship between flake proportion and retouch distribution for the Hoxne Upper Industry.

Retouch Position

Figure A2.17 (below) shows the relationship between flake proportion and retouch position There would appear to be a range of retouch positions present within the Hoxne Upper Industry flake tools, although the most dominant form is alternating for the left, right and distal edges, whilst being direct for the proximal edge. Kruskal Wallis H Tests (Ebdon 1977:68) indicate that (to a 0.05 significance level) there is no statistically significant relationship between retouch position and flake length, width or thickness (figure A2.17). The presence of alternating retouch implies a fairly complicated form of retouch where along an edge the knapper is putting retouch on the dorsal and ventral sides of the flake in an alternating fashion. When considered that the majority of retouch delineation is irregular (although there is a wide range of retouch delineations present), and the majority of retouch distribution is total, the alternating position of the retouch implies that the hominins are imposing a very specific style of retouch on their flake tools even if no specific flake tool type (figure A2.15; table A2.37) is being produced. This in turn may hint at some form of culturally significant style of retouch imposition even if the tool types being produced would not appear to be culturally significant.

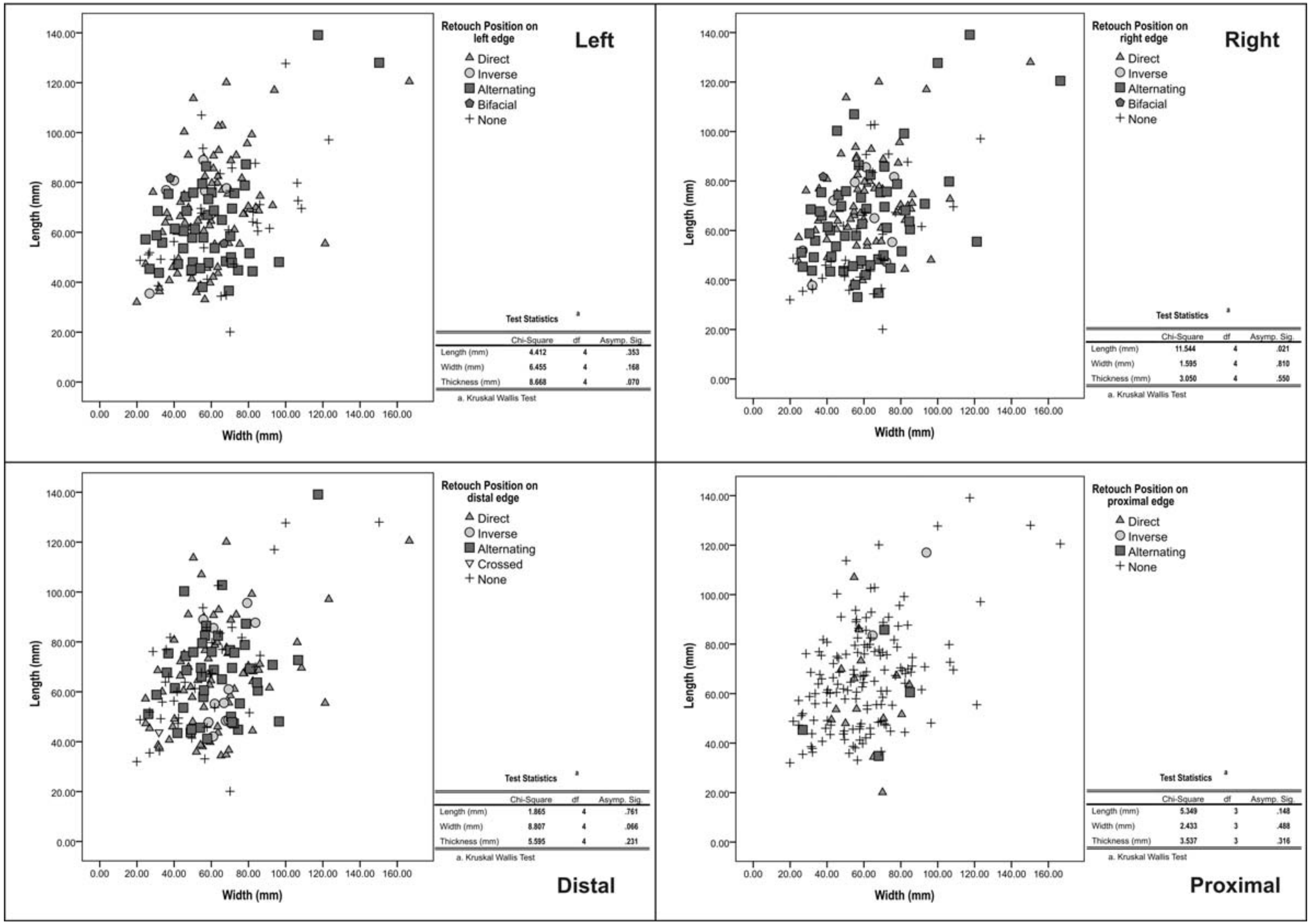


Figure A2.17: Showing the relationship between flake proportion and retouch position for the Hoxne Upper Industry.

Retouch Extent

Figure A2.18 (below) shows the relationship between flake proportion and retouch extent, where there is a range of retouch extents present on all flake edges with short retouch being the overall dominant form. The Kruskal Wallis H Tests (Ebdon 1977:68) would indicate that to a 0.05 significance level, there is a statistically significant relationship between retouch extent and flake length on the right edge (x^2 = 13.885; df = 3; p = 0.003) and flake width on the distal edge (x^2 = 14.053; df = 3; p = 0.003). Figure A2.18 would seem to suggest that there is no clear relationship between retouch extent and flake proportion so it is unclear as to what the statistically significant correlation described above may be. However, what is a significant point to pull out of figure A2.18 is the fact that the predominant form of retouch extent present within the High Lodge assemblage is short. Short retouch is not invasive across the surface of the flake (either direct or inverse) and therefore is limited to edge manipulation only. Given that the consistent pattern of retouch distribution on flake edges has matched the distribution of flake edges with no retouch present (figures A2.15 – A2.18), I would propose that there is no evidence for deliberate form imposition in terms of artefact aesthetic present within the Hoxne Upper Industry assemblage, although there may be a stylistic element to retouch imposition that may be considered significant. When figures A2.15 – A2.18 are considered together the retouch would appear to be functional in character and limited to edge modification that mirrors the shape of the original edge (personal observation), rather than deliberately changing it to a different preconceived form.

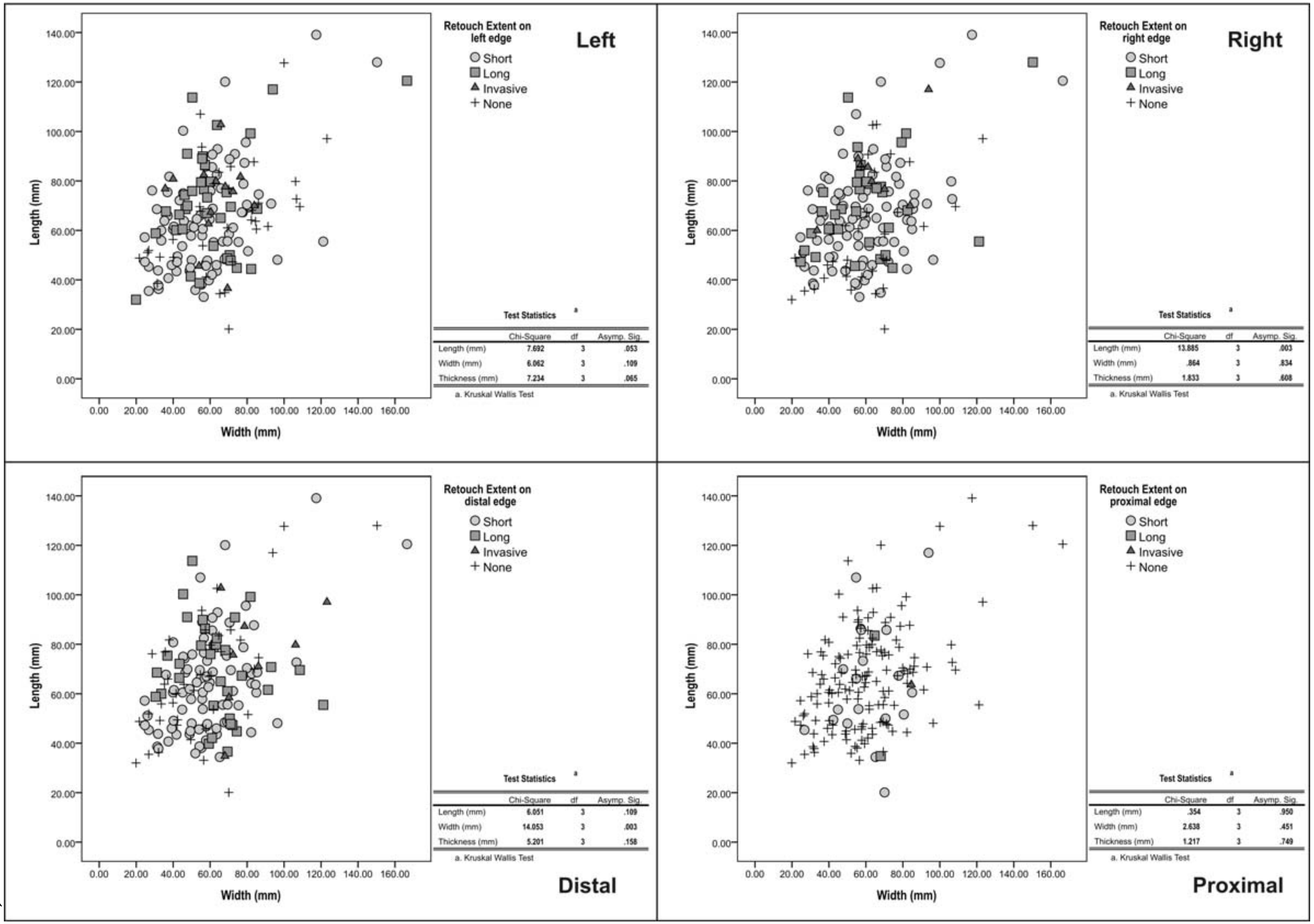


Figure A2.18: Showing the relationship between flake proportion and retouch extent for the Hoxne Upper Industry.

Conclusion

Given that the only raw material present within this assemblage was flint, a raw material renowned for it knapping versatility coupled with the fact that a range of artefact sizes has been produced from small debitage pieces to large flakes and flake tools it is deemed that raw material did not adversely affect artefact proportion or form imposition. From examining the detached pieces where retouch was present, it would appear that there are no patterns reflecting a specific retouched tool form, although there may be a presence of a particular retouch style (alternating) which may be cautiously considered as being culturally significant, although I would stress the subjective nature of this evidence. Rather, the patterns of retouch application on artefacts would seem to reflect a series of opportunistic knapping instances where the shape and form of the original edge has been followed through the retouch application. The comparatively small component of retouched tools verses unretouched flakes would also indicate that either hominins curated retouched tools and transported them around the landscape or that retouched tools were produced as and when a need arose, with the majority of needs being met by unretouched flakes. There would appear to be no degree of standardisation in terms of flake proportion for both retouched and unretouched flakes.

Cores

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. As expected for an MIS 11 dated site, the Hoxne Upper Industry does not contain any evidence for PCT (table A2.40).

		Artefact Type		
		Core	Core tool	**Total**
Non-PCT Core - Generic Type	A1 - Alternate	2	2	**4**
	A2 - Alternate and Parallel	5	3	**8**
	A3 - Parallel single platform	0	0	**0**
	A4 - Parallel multiple platform	0	1	**1**
	A5 - Single	0	0	**0**
	A6 - Mixture of A1 - A5	5	2	**7**
	A7 - Other non-PCT	3	4	**7**
	Total	**15**	**12**	**27**
Completeness	Broken	1	0	**1**
	Total	**16**	**0**	**28**

Table A2.40: Showing the relationship between Core Type and Artefact Type for the Hoxne Upper Industry.

Table A2.40 shows that there are 27 unbroken cores (that shall be used for the rest of the core analysis) and one broken core. The cores and core tools would not appear to be restricted to a particular type of reduction sequence, rather from the small number of cores present it would appear that the knappers were manipulating the flint nodules in a haphazard fashion, indicating that they were just extracting flakes as they were needed with no predetermined core reduction / flake extraction strategy in mind. Furthermore, figure A2.19 (below) suggests that there is a similar distribution pattern in terms of artefact proportion between the cores and the core tools which would suggest that hominins were adaptable enough in their knapping strategies to produce flakes from surfaces of varying sizes.

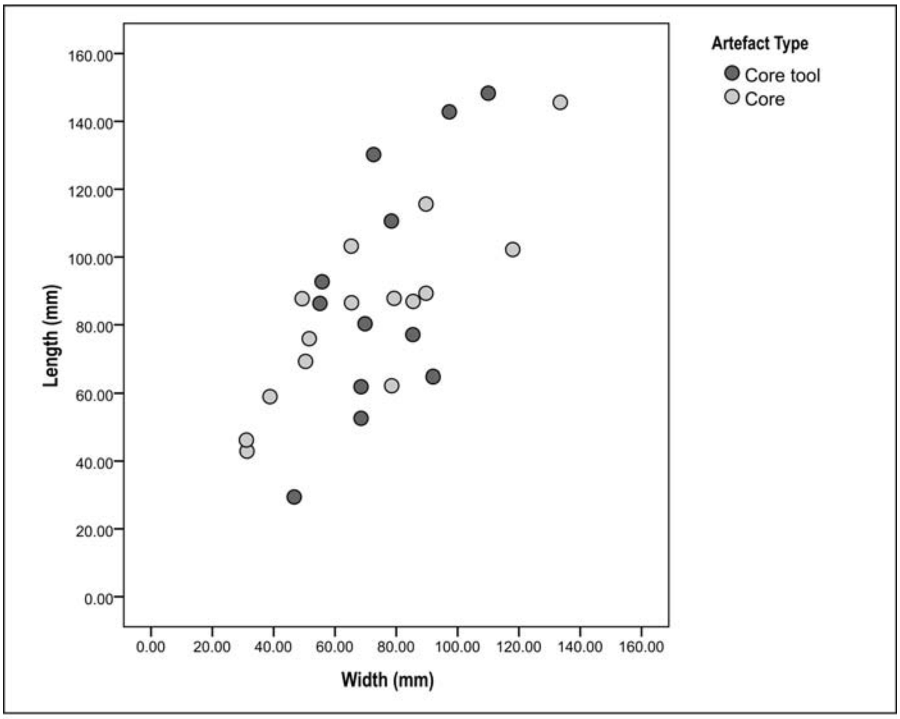


Figure A2.19: Showing the relationship between artefact proportion, cores and core tools for the Hoxne Upper Industry.

In terms of examining the cores of the Hoxne Upper Industry for any form of standardisation in artefact proportion, figure A2.20 below shows the relationship between length, width and the non-PCT generic cores.

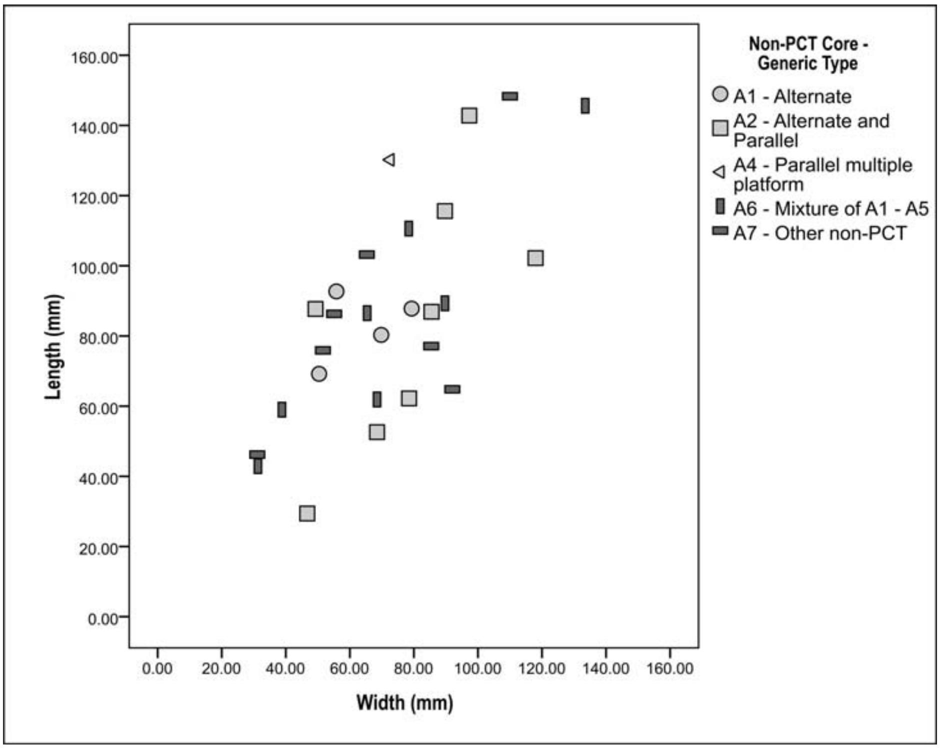


Figure A2.20: showing the relationship between artefact proportion and non-PCT generic cores for the Hoxne Upper Industry.

From figure A2.20 it would seem that all cores and core tools are being reduced and discarded through a whole range artefact proportions. This in turn would indicate that there is no predetermined or socially significant standard to which cores are being worked. Rather the core pattern would seem to support the conclusions from the flake analysis where flakes and cores are worked through opportunistic knapping to fulfil a specific need at a specific time, and then being discarded.

Furthermore, given that there is only one raw material present within the Hoxne Upper Industry assemblage, and the large range of artefact type and proportions, it would suggest that raw material was not adversely affecting core reduction.

Conclusion

In conclusion, the three artefact categories under study in the Hoxne Upper Industry (LCTs, detached pieces and cores) all seem to display a lack of extensive form imposition and standardisation with raw material not aversely affecting artefact production.

Broom Pits

The site history and details for Broom Pits can be found in Chapter 6. Table A2.41 below shows the relationship between LCT and completeness from Broom Pits.

		Completeness					
		Unbroken		Broken		**Total**	
LCT Type	Handaxe	894	*91.7%*	63	*6.5%*	**957**	***98.2%***
	Cleaver	18	*1.8%*	0	*.0%*	**18**	***1.8%***
	Total	**912**	***93.5%***	**63**	***6.5%***	**975**	***100.0%***

Table A2.41: Showing the relationship between LCT type and artefact completeness for Broom Pits.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of LCTs analysed 912 (93.5% of the LCTs recorded for this thesis). The majority of the LCTs under study are handaxes with cleavers being in a distinct minority of the assemblage. However, whether this is a genuine artifice of the assemblage make up or a result of collector's bias is difficult to ascertain. Table A2.42 shows the relationship between LCT type, raw material and artefact condition.

			Artefact Condition					
			Abraded		Lightly Abraded		**Total**	
LCT Type	Handaxe	Flint	9	*1.0%*	44	*4.8%*	**53**	***5.8%***
		Quartz	0	*.0%*	1	*.1%*	**1**	***.1%***
		Chert	51	*5.6%*	786	*86.2%*	**837**	***91.8%***
		Black fiine-grained chert	0	*.0%*	3	*.3%*	**3**	***.3%***
		Total	**60**	***6.6%***	**834**	***91.4%***	**894**	***98.0%***
	Cleaver	Chert	2	*.2%*	16	*1.8%*	**18**	***2.0%***
		Total	**2**	***.2%***	**16**	***1.8%***	**18**	***2.0%***
	Total	Flint	9	*1.0%*	44	*4.8%*	**53**	***5.8%***
		Quartz	0	*.0%*	1	*.1%*	**1**	***.1%***
		Chert	53	*5.8%*	802	*87.9%*	**855**	***93.8%***
		Black fiine-grained chert	0	*.0%*	3	*.3%*	**3**	***.3%***
		Total	**62**	***6.8%***	**850**	***93.2%***	**912**	***100.0%***

Table A2.42: Showing the relationship between LCT type, Raw Material and Artefact Condition for Broom Pits.

As can be seen from table A2.42, the majority of artefacts from Broom Pits were knapped from chert, a common raw material found within the Axe valley (Wessex Archaeology 1993: 160-161). There are a few flint artefacts and intriguingly one handaxe would was knapped from Quartz which were possibly brought into the Axe Valley from elsewhere, displaying a behavioural trait of curation and a degree of forward planning. The break down between lightly abraded and abraded artefacts from Broom Pits clearly favours the lightly abraded category, whilst the number of abraded artefacts are relatively low indicating marginal amounts of post depositional movement beyond the initial flood plain deposit. Therefore I would concur with Hosfield and Chambers (2009) that the LCTs from Broom Pits should be treated as a single occupation assemblage from MIS 9 and I shall proceed accordingly.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. In order to assess imposition of form and symmetry upon the LCTs of Broom Pits, table A2.43 shows the relationship between tip shape and symmetry by eye.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	2.3%	2.9%	3.0%	.8%	.5%	5.3%	.2%	.3%	**15.2%**
	Convergent with a Square Tip	.4%	.3%	.5%	.7%	.7%	3.9%	.4%	.1%	**7.1%**
	Convergent with an Oblique Tip	.0%	.0%	.1%	.8%	.7%	7.0%	.4%	.0%	**9.0%**
	Convergent with a Generalised Tip	1.2%	2.2%	5.0%	4.2%	3.4%	33.9%	1.1%	1.6%	**52.6%**
	Wide or Divergent	.0%	.4%	.3%	.5%	.0%	1.6%	.1%	.0%	**3.1%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.1%	.0%	1.0%	.2%	.0%	**1.3%**
	Wide with Convex Tip	.3%	.4%	1.2%	.7%	.3%	6.5%	.5%	.2%	**10.2%**
	Profoundly Asymmetrical	.0%	.0%	.0%	.3%	.1%	1.0%	.0%	.0%	**1.4%**
	Total	**4.3%**	**6.3%**	**10.2%**	**8.0%**	**5.7%**	**60.2%**	**3.1%**	**2.3%**	**100.0%**

Total N = 912

Table A2.43: Showing the relationship between Tip Shape and Symmetry by Eye for Broom Pits.

From table A2.43 it is clear that the hominins from Broom Pits did not place a high significance on absolute LCT symmetry (only 4.3% of the assemblage described as symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 23.1% of the LCTs in table A2.43 display evidence for tip symmetry. However, as 19.9% of LCTs with a symmetrical element to their tip form also have a convergent element, the degree of symmetry present within tip form is probably a result of producing a convergent tip, rather than a genuine and conscious imposition of symmetry. So even though the hominins of the Broom Pits are clearly capable of producing fully symmetrical LCTs on a variety of tip shapes, the overwhelming component of non-symmetrical (60.2%), and non-symmetrical tip shape (16.8%) would reinforce the initial observation that symmetry did not play a significant role in LCT production. However, in regards to tip shape there would appear to be an overall tendency for convergent tips over other types possibly hinting at a deliberate preference for a particular form.

Figure A2.21 below examines the relationship between symmetry and artefact proportion.

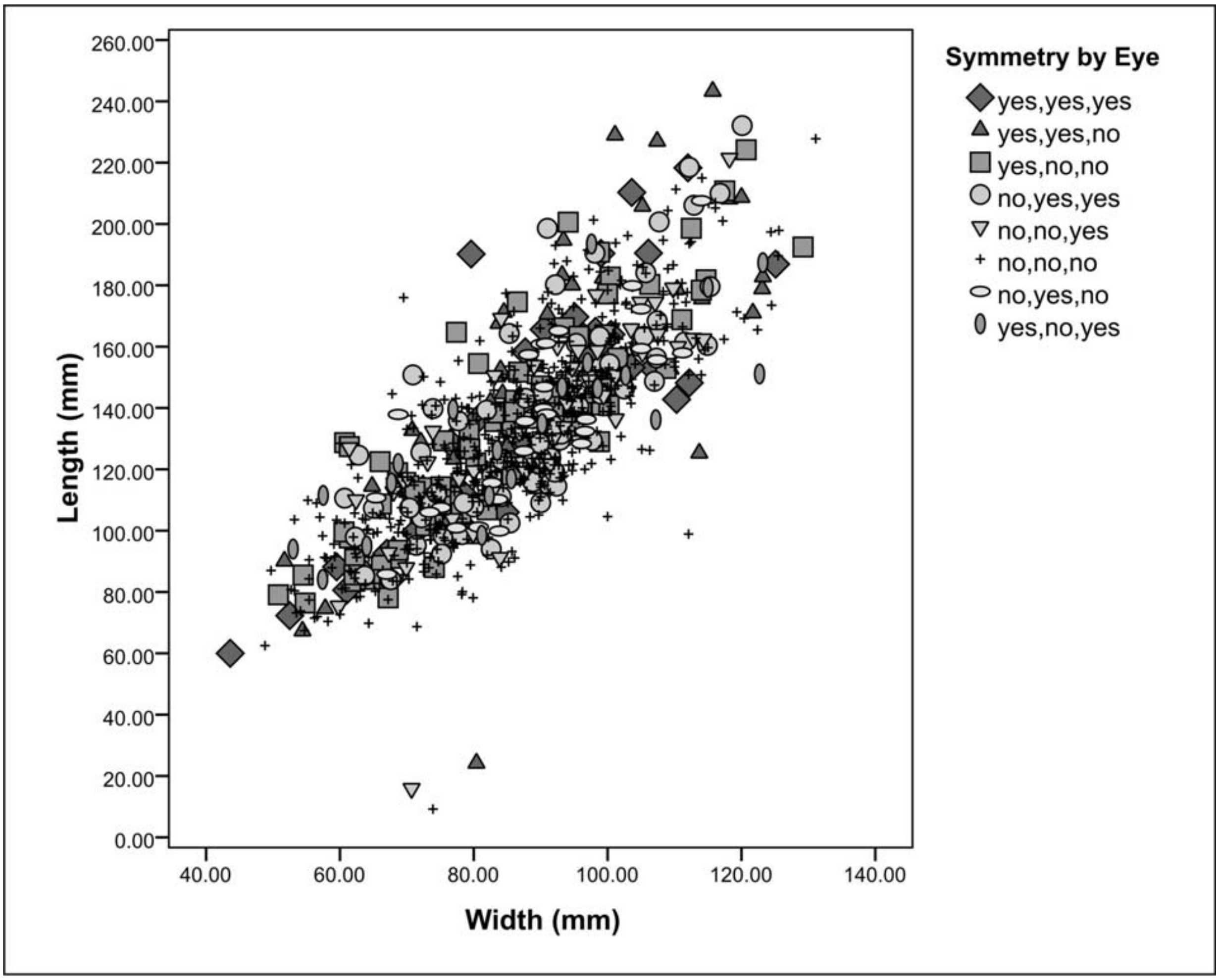


Figure A2.21: Showing the relationship between LCT proportion and symmetry for Broom Pits.

Figure A2.21 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. Furthermore, figure A2.21 shows that symmetry categories are not clustered in particular proportions as all symmetry categories are found throughout the range of artefact proportions. This would suggest that symmetry and LCT proportion have no significant relationship at Broom Pits. A Kruskal Wallis H Test (Ebdon 1977:68) shows that there is no statistically significant (to 0.05 significance) between observed symmetry and width (x^2 = 10.443; df = 7; p = 0.165), however there would appear to be a statistically significant relationship between symmetry, length (x^2 = 17.004; df = 7; p = 0.017) and thickness (x^2 = 17.815; df = 7; p = 0.013). Looking at figure A2.21 it is not clear as to what the statistically significant relationship may be given the spread of symmetry categories through artefact proportion. Therefore, even if the relationship between artefact proportion and symmetry may be statistically significant, there may not be an archaeological significance.

Figure A2.22 shows the relationship between tip shape and artefact proportion.

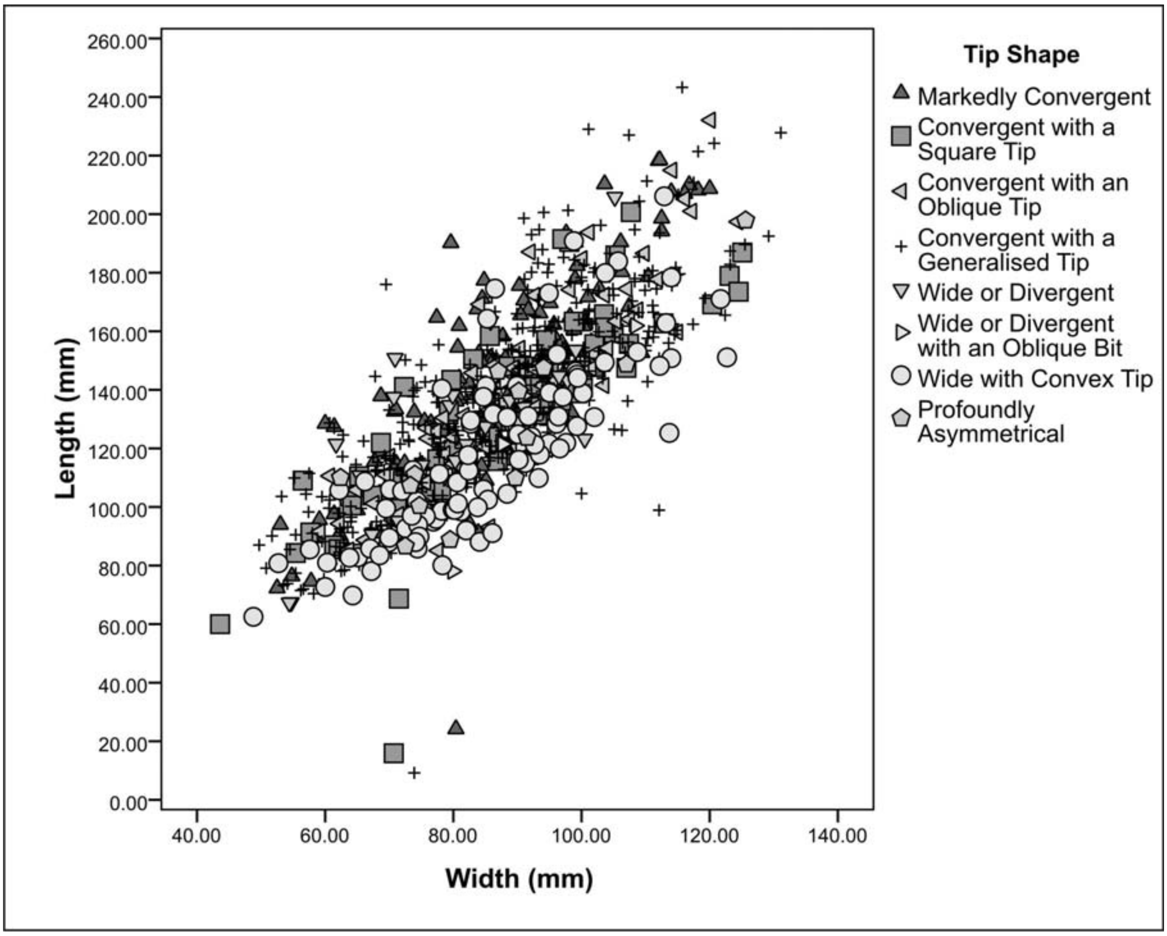


Figure A2.22: Showing the relationship between LCT proportion and tip shape for Broom Pits.

Figure A2.22 shows that there would appear to be no definitive relationships between artefact proportion and tips shape. However, a Kruskal Wallis H Test (Ebdon 1977:68) suggests that there is no statistically significant relationship (to 0.05 significance) between observed tip shape and width (x^2 = 5.922; df = 7; p = 0.549) but there is a significant relationship between symmetry and length (x^2 = 37.786; df = 7; p = 0.000) and thickness (x^2 = 15.408; df = 7; p = 0.031). Looking at figure A2.22 it is not clear as to what the statistically significant relationship may be given the spread of tip shape categories through artefact proportion. Therefore, even if the relationship between artefact proportion and symmetry may be statistically significant, there may not be an archaeological significance.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of Broom Pits (table A2.44).

		Flaking Extent Second Face						
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	None	**Total**
Flaking Extent First Face	Complete	28.3%	4.2%	2.2%	1.9%	7.1%	.0%	**43.6%**
	Complete Marginal	3.9%	1.3%	.8%	.0%	1.3%	.0%	**7.3%**
	Partial Marginal	3.4%	1.8%	10.4%	1.2%	3.0%	.0%	**19.7%**
	Partial	1.5%	.7%	.9%	2.7%	1.4%	.0%	**7.2%**
	Substantial	4.6%	1.1%	1.5%	1.4%	13.3%	.1%	**22.0%**
	None	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Total	**41.8%**	**9.0%**	**15.8%**	**7.2%**	**26.1%**	**.1%**	**100.0%**

Total N = 912

Table A2.44: Showing the relationship between Flaking Extent of the first and second LCT face for Broom Pits.

From table A2.44 it can be seen that the hominins seemed to have preferred a complete flaking initial thinning and shaping strategy. Furthermore, table A2.44 suggests that the first and second faces have been worked in similar fashions, possibly hinting at a potential form of standardisation in initial LCT shaping. However, whether this is an artifice for culturally significant form imposition or rather a result of original blank condition is difficult to establish without looking at the degree of edge working involved.

A relative index of edge working extent was described in Chapter 5 and applied to symmetry and tip shape in table A2.45 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	.1%	1.3%	2.3%	.5%	**4.3%**
	yes,yes,no	.7%	3.7%	1.4%	.4%	**6.3%**
	yes,no,no	1.8%	6.7%	1.6%	.1%	**10.2%**
	no,yes,yes	.5%	4.3%	2.9%	.3%	**8.0%**
	no,no,yes	.7%	3.2%	1.6%	.2%	**5.7%**
	no,no,no	16.8%	37.2%	6.3%	.0%	**60.2%**
	no,yes,no	.2%	1.8%	1.0%	.1%	**3.1%**
	yes,no,yes	.2%	1.4%	.7%	.0%	**2.3%**
	Total	**20.9%**	**59.5%**	**17.8%**	**1.8%**	**100.0%**

Total N = 912

Table A2.45: Showing the relationship between Symmetry and Edge Working for Broom Pits.

From table A2.45 it can be seen that the majority of LCTs have an overall low amount of edge working (20.9% at 12 - 24, 59.5% at 25 -36). This is possibly due to the fact that edge working does not seem to be a significant factor in LCT production for this assemblage. This in turn could suggest in conjunction with the data from table A2.46 that standardised working in LCT production through primary flaking and edge working, although minimally present, were not culturally significant. However, a total of 19.6% of the assemblage has a medium – high or high index of edge working all of which are associated with a symmetrical element to the LCT. This pattern suggests that where symmetry is present on small minority of artefacts, edge working is increased; implying that for some artefacts symmetrical form would appear to be deliberately imposed. However the relatively low amounts would suggest that symmetrical imposition through edge working was not the result of culturally significance.

Table A2.46 shows the relationship between tip shape and edge working.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Tip Shape	Markedly Convergent	1.9%	8.7%	3.8%	.9%	**15.2%**
	Convergent with a Square Tip	2.0%	3.8%	1.1%	.2%	**7.1%**
	Convergent with an Oblique Tip	2.5%	5.0%	1.4%	.0%	**9.0%**
	Convergent with a Generalised Tip	10.7%	32.5%	8.9%	.5%	**52.6%**
	Wide or Divergent	.5%	2.0%	.5%	.0%	**3.1%**
	Wide or Divergent with an Oblique Bit	.0%	.9%	.4%	.0%	**1.3%**
	Wide with Convex Tip	2.9%	5.9%	1.3%	.1%	**10.2%**
	Profoundly Asymmetrical	.4%	.8%	.2%	.0%	**1.4%**
	Total	**20.9%**	**59.5%**	**17.8%**	**1.8%**	**100.0%**

Total N = 912

Table A2.46: Showing the relationship between Tip Shape and Edge Working for the fresh assemblage for Broom Pits.

Table A2.46 shows that the degree of edge working is not dependent on particular tip shape, although a generally convergent tip would appear to dominate the assemblage. This would seem to support the general conclusion that there does not appear to be any standardised pattern of working being imposed on the LCTs at Broom Pits beyond LCTs with a convergent element. However, as the majority of edge working falls in the medium – low and low categories it is unlikely that the convergent form is culturally significant, but may be linked to function or original blank form.

In order to assess whether raw material has influenced artefact proportion and form imposition, figure A2.23 shows the relationship between artefact proportion and raw material and table A2.47 shows the relationship between symmetry, tip shape and raw material.

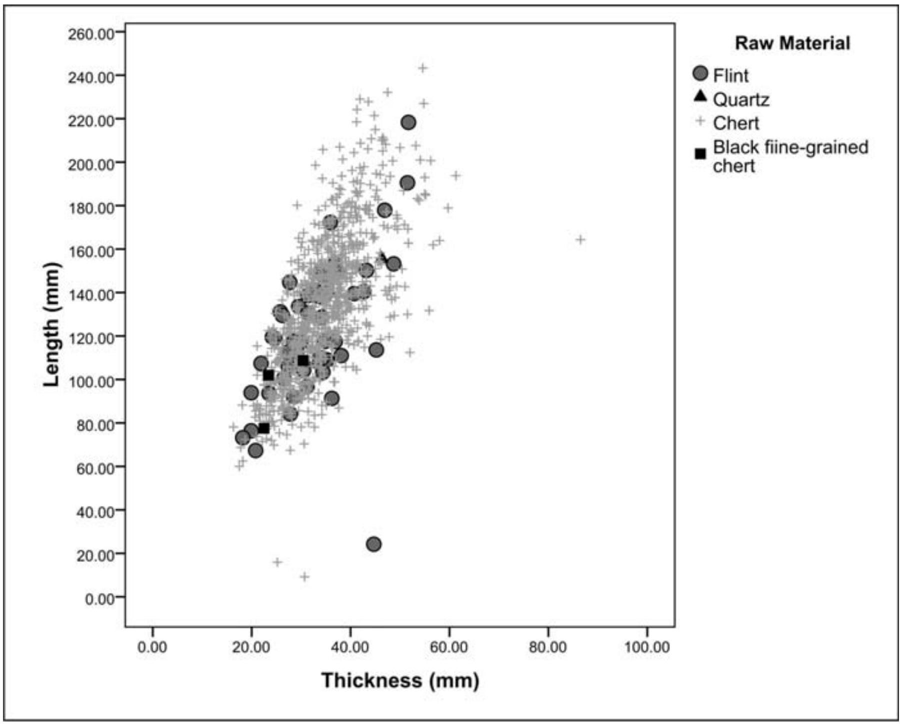


Figure A2.23: Showing the relationship between Artefact Proportion and Raw Material for Broom Pits.

		Raw Material				
		Flint	Quartz	Chert	Black fiine-grained chert	**Total**
Symmetry by Eye	yes,yes,yes	.4%	.1%	3.7%	.0%	4.3%
	yes,yes,no	.8%	.0%	5.5%	.0%	6.3%
	yes,no,no	.8%	.0%	9.3%	.1%	10.2%
	no,yes,yes	.5%	.0%	7.5%	.0%	8.0%
	no,no,yes	.2%	.0%	5.5%	.0%	5.7%
	no,no,no	2.6%	.0%	57.3%	.2%	60.2%
	no,yes,no	.2%	.0%	2.9%	.0%	3.1%
	yes,no,yes	.2%	.0%	2.1%	.0%	2.3%
	Total	**5.8%**	**.1%**	**93.8%**	**.3%**	**100.0%**
Tip Shape	Markedly Convergent	1.8%	.0%	13.5%	.0%	15.2%
	Convergent with a Square Tip	.3%	.1%	6.7%	.0%	7.1%
	Convergent with an Oblique Tip	.4%	.0%	8.6%	.0%	9.0%
	Convergent with a Generalised Tip	2.7%	.0%	49.8%	.1%	52.6%
	Wide or Divergent	.1%	.0%	3.0%	.0%	3.1%
	Wide or Divergent with an Oblique Bit	.0%	.0%	1.3%	.0%	1.3%
	Wide with Convex Tip	.4%	.0%	9.5%	.2%	10.2%
	Profoundly Asymmetrical	.0%	.0%	1.4%	.0%	1.4%
	Total	**5.8%**	**.1%**	**93.8%**	**.3%**	**100.0%**

Total N = 912

Table A2.47: Showing the relationship between Symmetry by Eye, Tip Shape and Raw Material for Broom Pits.

Figure A2.23 shows that there is a wide spread of raw material and artefact proportion indicating that raw material did not adversely affect artefact proportion. Table A2.47 shows that given the range of symmetrical categories and tip shapes present within the flint and chert raw materials, raw material would not seem to bias the imposition of symmetry or tip shape. The fully symmetrical category and the convergent with a square tip shape for the quartz handaxe may indicate specific intent on form imposition for this artefact, but the fact that there is only one quartz artefact within the assemblage makes it unclear how significant this relationship truly is.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no culturally significant imposition of symmetry or form through tip shape, flaking extent or edge working on the LCTs present within the Broom Pits assemblage. Although the majority of tip shapes for Broom Pits have a convergent element, given the low degree of edge working in relation to convergent tip shape and symmetry it is unlikely that this can be seen as culturally / socially significant in nature. This form imposition is probably linked to tool use and / or original blank form. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form for this Acheulean site, rather given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Chert is the predominant raw material type present in the Broom Pits assemblage. Chert is well a known raw material for its knapping versatility and therefore is unlikely to adversely limit artefact symmetry or form imposition beyond original blank size. Similarly the flint present within the assemblage does not seem to have limited artefact size, symmetry or tip shape imposition. The single quartz artefact produced a fully symmetrical form on a convergent with a square tip shape, yet whether this represents a culturally significant imposition of form is difficult to ascertain on such a limited sample.

Creffield Road: Acton – The Sturge / Brown Collection

The site history and details for Creffield Road can be found in Chapter 6. All the artefacts examined from Creffield Road were knapped from flint. As mentioned above, a total of 209 artefacts were examined from Creffield Road spanning the Green Lane and Pit 3 excavations but they shall be treated as a single assemblage belonging to MIS 7 (White *et al* 2006; McNabb 2007: 198; Scott 2010) (table A2.48).

		Site Subdivision								
		Green Lane			Pit 3			Total		
		Completeness			Completeness			Completeness		
		Unbroken	Broken	**Total**	Unbroken	Broken	**Total**	Unbroken	Broken	**Total**
Artefact Type	Flake	32	38	**70**	49	70	**119**	81	108	**189**
	Flake tool	7	1	**8**	3	1	**4**	10	2	**12**
	Core	1	0	**1**	7	0	**7**	8	0	**8**
	Total	**40**	**39**	**79**	**59**	**71**	**130**	**99**	**110**	**209**

Table A2.48: Showing the relationship between artefact type, completeness and provenance for Creffield Road.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed below 99. Table A2.49 shows the relationship between artefact type, site subdivision and condition.

			Artefact Type			
			Flake	Flake tool	Core	**Total**
Site Subdivision	Green Lane	Fresh	16	3	1	**20**
			16.2%	*3.0%*	*1.0%*	***20.2%***
		Lightly Abraded	16	4	0	**20**
			16.2%	*4.0%*	*.0%*	***20.2%***
		Total	**32**	**7**	**1**	**40**
			32.3%	***7.1%***	***1.0%***	***40.4%***
	Pit 3	Fresh	4	1	3	**8**
			4.0%	*1.0%*	*3.0%*	***8.1%***
		Lightly Abraded	45	2	4	**51**
			45.5%	*2.0%*	*4.0%*	***51.5%***
		Total	**49**	**3**	**7**	**59**
			49.5%	***3.0%***	***7.1%***	***59.6%***
	Total	Fresh	20	4	4	**28**
			20.2%	*4.0%*	*4.0%*	***28.3%***
		Lightly Abraded	61	6	4	**71**
			61.6%	*6.1%*	*4.0%*	***71.7%***
		Total	**81**	**10**	**8**	**99**
			81.8%	***10.1%***	***8.1%***	***100.0%***

Table A2.49: Showing the relationship between Artefact Type, Context and Condition for Creffield Road.

Table A2.49 shows that the majority of unbroken artefacts from Creffield Road are classified as lightly abraded (71.7%) or fresh (28.3%). This pattern of condition would suggest that the majority of the Creffield Road assemblage was subjected to a degree of post depositional movement and abrasion, the lightly braded artefacts display slight rounding of the flake scars, although this can be caused through minimal post depositional movement. The presence of fresh artefacts would indicate that post-depositional movement was minimal and therefore artefact condition does not count against the analysis of the Creffield Road artefacts as a single assemblage.

I shall now examine the more specific elements to the Creffield Road assemblage by looking at the Flakes, Flake Tools and Cores in greater depth.

Flake and Flake Tool Analysis

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. In order to get an understanding on the detached pieces recorded from Creffield Road, table A2.50 shows the breakdown of unbroken flakes and flake tools in relation to the flake types described in Chapter 5.

		Site Subdivision											
		Green Lane						Pit 3					
		Artefact Type						Artefact Type					
		Flake		Flake tool		**Total**		Flake		Flake tool		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R2 - Denticulated scraper	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R3 - Side scraper	0	*.0%*	1	*1.1%*	**1**	***1.1%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R4 - End / Traverse scraper	0	*.0%*	1	*1.1%*	**1**	***1.1%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R5 - Flake with scraper retouch	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R6 - Scraper used as wedge	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R7 - Retouched point (awl)	0	*.0%*	1	*1.1%*	**1**	***1.1%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R8 - Retouched point (projectile)	0	*.0%*	1	*1.1%*	**1**	***1.1%***	0	*.0%*	2	*2.2%*	**2**	***2.2%***
	R9 - Retouched notch	0	*.0%*	1	*1.1%*	**1**	***1.1%***	0	*.0%*	1	*1.1%*	**1**	***1.1%***
	R10 - Retouch non diagnostic	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R12 - Multiple tool	0	*.0%*	2	*2.2%*	**2**	***2.2%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R14 - Utilised flake with no retouch	0	*.0%*	0	*.0%*	**0**	***.0%***	0	*.0%*	0	*.0%*	**0**	***.0%***
	R16 - Flake with no retouch	1	*1.1%*	0	*.0%*	**1**	***1.1%***	2	*2.2%*	0	*.0%*	**2**	***2.2%***
	R15 - Flake with edge damage	31	*34.1%*	0	*.0%*	**31**	***34.1%***	47	*51.6%*	0	*.0%*	**47**	***51.6%***
	Total	**32**	***35.2%***	**7**	***7.7%***	**39**	***42.9%***	**49**	***53.8%***	**3**	***3.3%***	**52**	***57.1%***

Total N = 91

Table A2.50: Showing the breakdown between flakes and flake tools in relation to flake type for Creffield Road.

As can be seen there are far more flakes than flake tools present within the unbroken detached artefacts (91 in total) studied from Creffield Road which may suggest two possible explanations, firstly that the hominins did not need to adapt the flakes (through retouch) they were producing for specific tasks on a regular basis, rather preferring to use the unmodified edge of flakes. Or secondly, retouch tools were favoured for curation and removed from the site and transported elsewhere whilst unretouched flakes were left at the site of production. A possible third option is that the high degree of edge damage present on the flakes in table A2.50 could potentially mask the presence of retouch on the flakes. A personal observation on the data was that the majority of the broken flakes were broken at the tip, with retouch present on a minority of flakes. This would seem to support the original site interpretation of a tooling site where broken artefacts are repaired (White *et al* 2006; McNabb 2007: 198; Scott 2010). In terms of tool type being produced, table A2.50 illustrates that there would not appear to be any dominant retouch form or type preferred by the knappers – although this shall be discussed further below in relation to PCT flaking.

Table A2.51 shows the relationship between flake type and Toth type (Toth 1985) illustrating that Toth types 2, 3, 5 and 6 are present within the Creffield Road unbroken flake assemblage. Of particular dominance is Toth type 6 (completely non cortical) at 52.2% and Toth type 5 (40.0%) of the flakes and flake tools. This would suggest that the majority of the detached pieces from Creffield Road come from flint nodules and cores that were toward the end of the reduction sequence where most of the cortex has been knapped off the core through earlier reductions. The importance of this would suggest that there a preference for flakes with little to no cortex. This in turn suggests that the hominins of Creffield Road were producing flakes and flake tools from curated cores as they moved across the landscape.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R2 - Denticulated scraper	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R3 - Side scraper	.0%	.0%	.0%	.0%	.0%	1.1%	**1.1%**
	R4 - End / Traverse scraper	.0%	.0%	.0%	.0%	.0%	1.1%	**1.1%**
	R5 - Flake with scraper retouch	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	.0%	.0%	.0%	.0%	.0%	1.1%	**1.1%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	.0%	.0%	3.3%	**3.3%**
	R9 - Retouched notch	.0%	.0%	.0%	.0%	.0%	1.1%	**1.1%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	.0%	.0%	.0%	.0%	2.2%	**2.2%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R15 - Flake with edge damage	.0%	2.2%	5.6%	.0%	37.8%	41.1%	**86.7%**
	R16 - Flake with no retouch	.0%	.0%	.0%	.0%	2.2%	1.1%	**3.3%**
	Total	**.0%**	**2.2%**	**5.6%**	**.0%**	**40.0%**	**52.2%**	**100.0%**

Total N = 91

Table A2.51: Showing the relationship between Flake Type and Toth type for Creffield Road.

In terms of the technological make up of the Creffield Road detached pieces, table A2.52 shows that 30.8% of the detached pieces for Creffield Road are PCT in character whilst 69.2% are not.

		Flake Technology Type		
		Non-PCT	PCT	Total
Flake Type	R1 - Denticulated edge	.0%	.0%	**.0%**
	R2 - Denticulated scraper	.0%	.0%	**.0%**
	R3 - Side scraper	1.1%	.0%	**1.1%**
	R4 - End / Traverse scraper	1.1%	.0%	**1.1%**
	R5 - Flake with scraper retouch	.0%	.0%	**.0%**
	R6 - Scraper used as wedge	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	1.1%	.0%	**1.1%**
	R8 - Retouched point (projectile)	.0%	3.3%	**3.3%**
	R9 - Retouched notch	1.1%	1.1%	**2.2%**
	R10 - Retouch non diagnostic	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	2.2%	**2.2%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	**.0%**
	R15 - Flake with edge damage	61.5%	24.2%	**85.7%**
	R16 - Flake with no retouch	3.3%	.0%	**3.3%**
	Total	**69.2%**	**30.8%**	**100.0%**

Total N = 91

Table A2.52: Showing the relationship between flake type and flake technology type for Creffield Road.

Of the 30.8% (28 flakes in total) PCT flakes table A2.53 shows that the majority are convergent or convergent / laminar in character.

		PCT Flake Type							
		Radial		Convergent		Convergent / Laminar		Total	
Flake Type	R8 - Retouched point (projectile)	0	*.0%*	1	*3.6%*	2	*7.1%*	**3**	***10.7%***
	R9 - Retouched notch	0	*.0%*	0	*.0%*	1	*3.6%*	**1**	***3.6%***
	R12 - Multiple tool	1	*3.6%*	1	*3.6%*	0	*.0%*	**2**	***7.1%***
	R15 - Flake with edge damage	9	*32.1%*	5	*17.9%*	8	*28.6%*	**22**	***78.6%***
	Total	**10**	***35.7%***	**7**	***25.0%***	**11**	***39.3%***	**28**	***100.0%***

Table A2.53: Showing the relationship between flake type and PCT type for Creffield Road.

Convergent or convergent / laminar flakes are flakes produced to be Levallois points – points used as projectile heads. The lack of retouch present on the PCT flakes of Creffield Road is probably due to the fact that the knappers could extract a flake of a particular shape (such as a point) through the PCT technique of knapping. The hominins of Creffield Road may therefore have had little need to adapt the PCT flake edges through retouch. Table A2.54 (below) shows that of the ten flake tools with retouch present 6 of them are PCT or Levallois flakes.

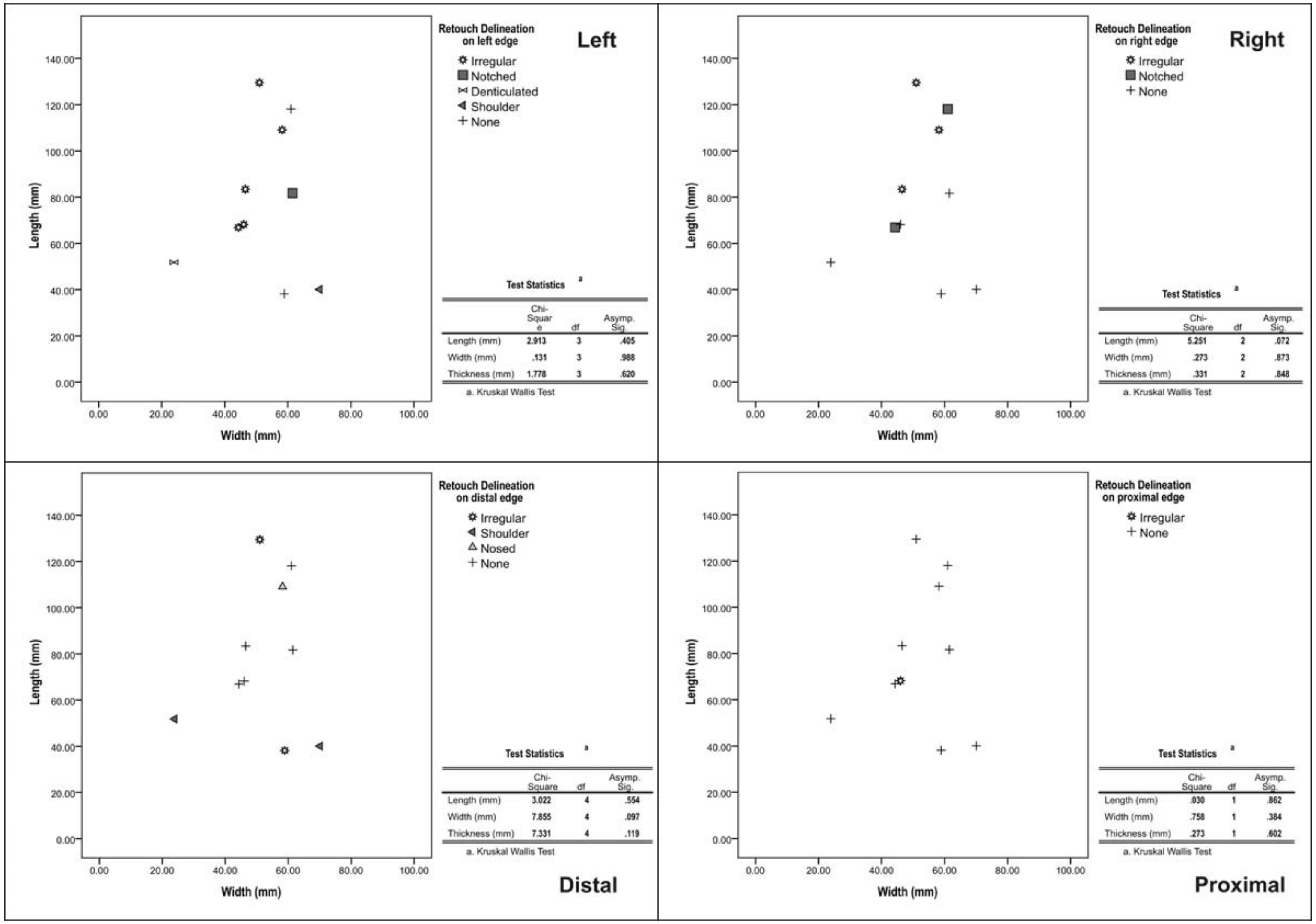
		Flake Technology Type					
		Non-PCT		PCT		**Total**	
Retouch present on left edge	Yes	3	*30.0%*	5	*50.0%*	**8**	***80.0%***
	No	1	*10.0%*	1	*10.0%*	**2**	***20.0%***
	Total	**4**	***40.0%***	**6**	***60.0%***	**10**	***100.0%***
Retouch present on distal edge	Yes	3	*30.0%*	2	*20.0%*	**5**	***50.0%***
	No	1	*10.0%*	4	*40.0%*	**5**	***50.0%***
	Total	**4**	***40.0%***	**6**	***60.0%***	**10**	***100.0%***
Retouch present on right edge	Yes	0	*.0%*	5	*50.0%*	**5**	***50.0%***
	No	4	*40.0%*	1	*10.0%*	**5**	***50.0%***
	Total	**4**	***40.0%***	**6**	***60.0%***	**10**	***100.0%***
Retouch present on proximal edge	Yes	0	*.0%*	1	*10.0%*	**1**	***10.0%***
	No	4	*40.0%*	5	*50.0%*	**9**	***90.0%***
	Total	**4**	***40.0%***	**6**	***60.0%***	**10**	***100.0%***

Table A2.54: Showing the relationship between retouch presence and artefact type for Creffield Road.

The tests below regarding retouch and flake proportion are only conducted on the 10 unbroken detached pieces that have retouch present on at least one of their edges. Although I should stress that from such a small sample any patterns relating to retouch and form imposition must be treated with a degree of caution. Furthermore, the whole idea of PCT technology is to extract a flake of a particular form through the preparation of the core. The question to answer here is whether the standardised preparation of a PCT core to extract a flake of a particular form (for example a point) can be considered as culturally significant in regards to social signalling, or whether this form of standardisation is related to a more efficient method of core reduction and flake extraction. According to the predictions in table 4.3 (Chapter 4) the form imposition through PCT would be functional in character, however if there was an extensive amount of secondary working on the flake after detachment (i.e. through retouch) then the artefacts may display some tendency toward being culturally significant.

Retouch Delineation

Figure A2.24 (below) shows the relationship between retouch delineation and flake proportion where within the limited sample there would appear to be a range of retouch delineation types present within the Creffield Road retouched flake tools. Three of the four flake tool edges display a variety of retouch delineations with no preference for a particular type. This relationship is confirmed through a Kruskal Wallis H Test (Ebdon 1977:68) for each edge showing there is no statistically significant relationship (to 0.05 significance) between flake length, width, or thickness and retouch delineation (figure A2.24). Figure A2.24 would also seem to suggest that where retouch is present, it is unlikely to be deliberately planned in terms of overall flake shape (given the varying types of retouch delineation for each edge), but rather a result of opportunistic manipulation of the flake edge. The lack of 'standardisation' in secondary form imposition (through retouch) suggests that the retouch was for a functional purpose rather than cultural significance.



Test Statistics [a] (Left)

	Chi-Square	df	Asymp. Sig.
Length (mm)	2.913	3	.405
Width (mm)	.131	3	.988
Thickness (mm)	1.778	3	.620

a. Kruskal Wallis Test

Test Statistics [a] (Right)

	Chi-Square	df	Asymp. Sig.
Length (mm)	5.251	2	.072
Width (mm)	.273	2	.873
Thickness (mm)	.331	2	.848

a. Kruskal Wallis Test

Test Statistics [a] (Distal)

	Chi-Square	df	Asymp. Sig.
Length (mm)	3.022	4	.554
Width (mm)	7.855	4	.097
Thickness (mm)	7.331	4	.119

a. Kruskal Wallis Test

Test Statistics [a] (Proximal)

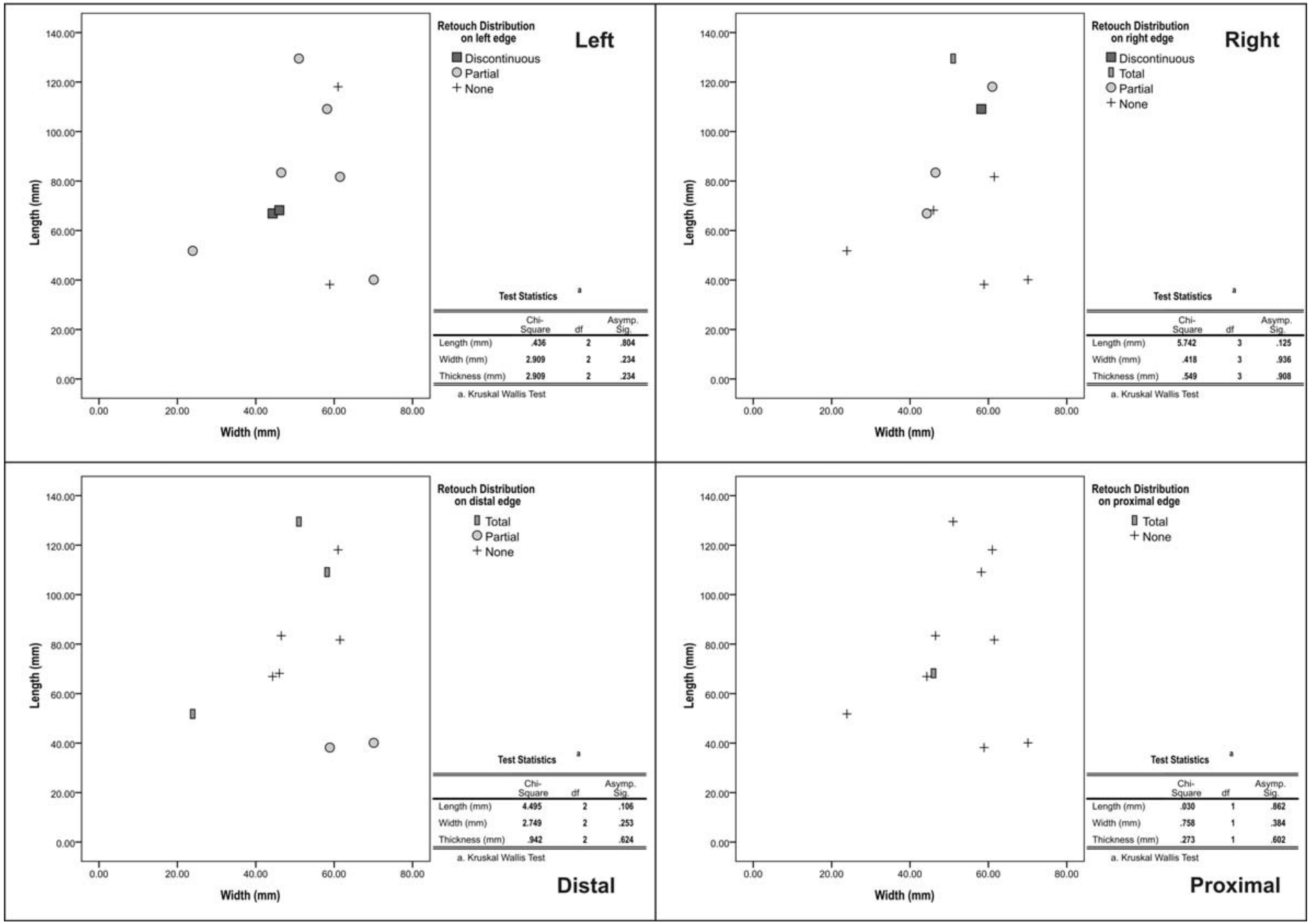
	Chi-Square	df	Asymp. Sig.
Length (mm)	.030	1	.862
Width (mm)	.758	1	.384
Thickness (mm)	.273	1	.602

a. Kruskal Wallis Test

Figure A2.24: Showing the relationship between flake proportion and retouch delineation for Creffield Road.

Retouch distribution

Figure A2.25 (below) shows the relationship between flake proportion and retouch distribution. There appears to be clear preference for a partial style of retouch distribution although total and discontinuous retouch distributions are present. Partial retouch implies that the only segments of the flake edge have been retouched and may indicate that particular form is not being imposed by the knapper. A Kruskal Wallis H Test (Ebdon 1977:68) would indicate that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch distribution (figure A2.25). Figure A2.25 would also seem to suggest that where retouch is present, it is unlikely to be deliberately planned in terms of overall flake shape (given the varying types of preference for partial retouch distribution for each edge), but rather a result of opportunistic manipulation of the flake edge. Therefore, the lack of retouched edge coverage adds support to the idea that secondary form imposition (through retouch) was for a functional purpose rather than cultural significance.



Left — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.436	2	.804
Width (mm)	2.909	2	.234
Thickness (mm)	2.909	2	.234

a. Kruskal Wallis Test

Right — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	5.742	3	.125
Width (mm)	.418	3	.936
Thickness (mm)	.549	3	.908

a. Kruskal Wallis Test

Distal — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	4.495	2	.106
Width (mm)	2.749	2	.253
Thickness (mm)	.942	2	.624

a. Kruskal Wallis Test

Proximal — Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.030	1	.862
Width (mm)	.758	1	.384
Thickness (mm)	.273	1	.602

a. Kruskal Wallis Test

Figure A2.25: Showing the relationship between flake proportion and retouch distribution for Creffield Road.

Retouch Position

Figure A2.26 (below) shows the relationship between flake proportion and retouch position There would appear to be a range of retouch positions present within the Creffield Road retouched flake tools, although the most dominant forms would appear to be direct and inverse on all flake edges. Kruskal Wallis H Tests (Ebdon 1977:68) indicate that (to a 0.05 significance level); there is no statistically significant relationship between retouch position and flake length, width or thickness (figure A2.26). When considered in conjunction with the lack of standardisation in retouch delineation (figure A2.24) and a majority of partial retouch distribution (figure A2.25) the fairly even split between inverse and direct retouch (figure A2.26) present adds another layer of support to the idea that there is a lack of a culturally significant form imposition at Creffield Road. Rather the two types of retouch position would seem to suggest that retouch is imposed opportunistically in the way best suited to the edge being modified.

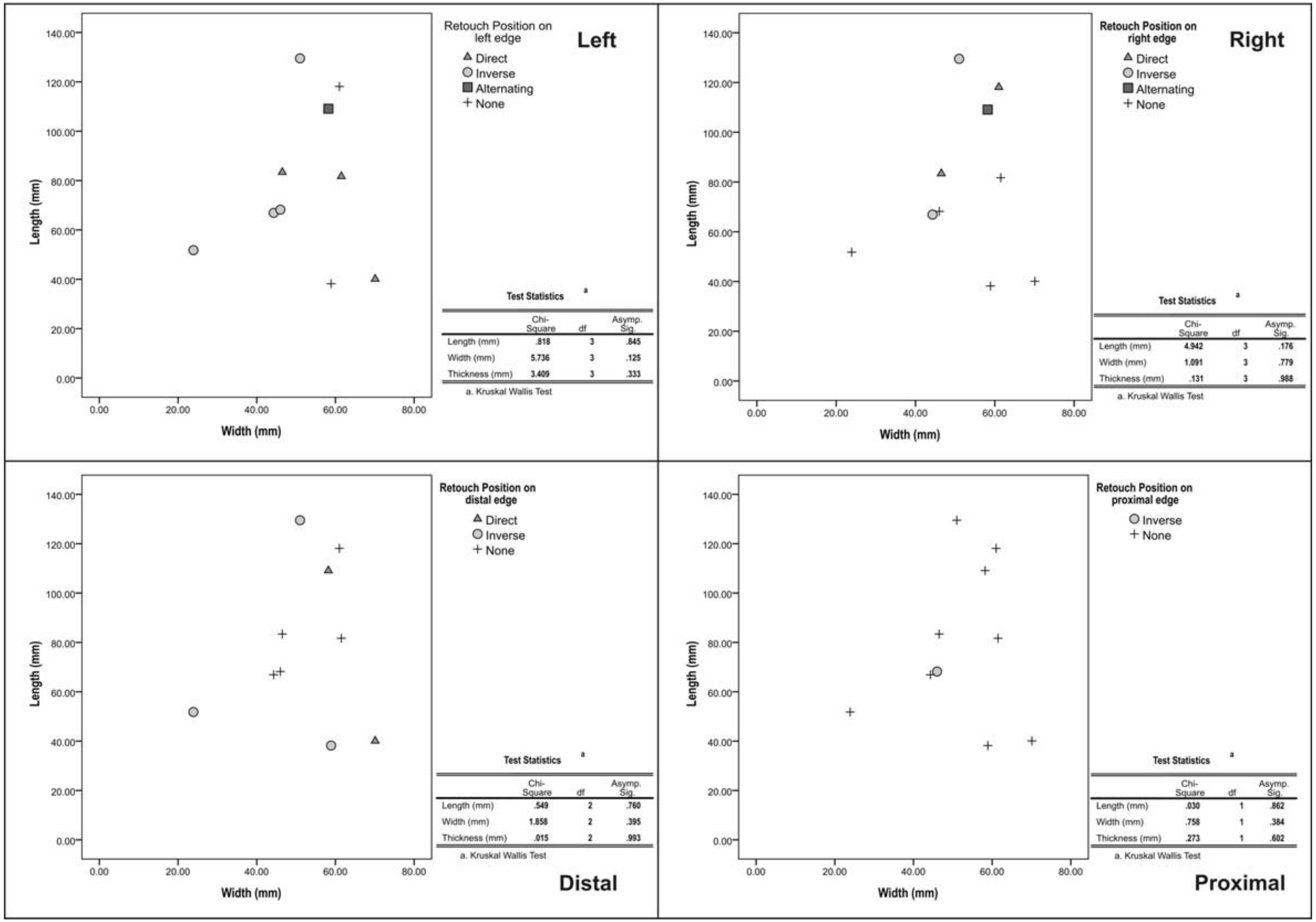
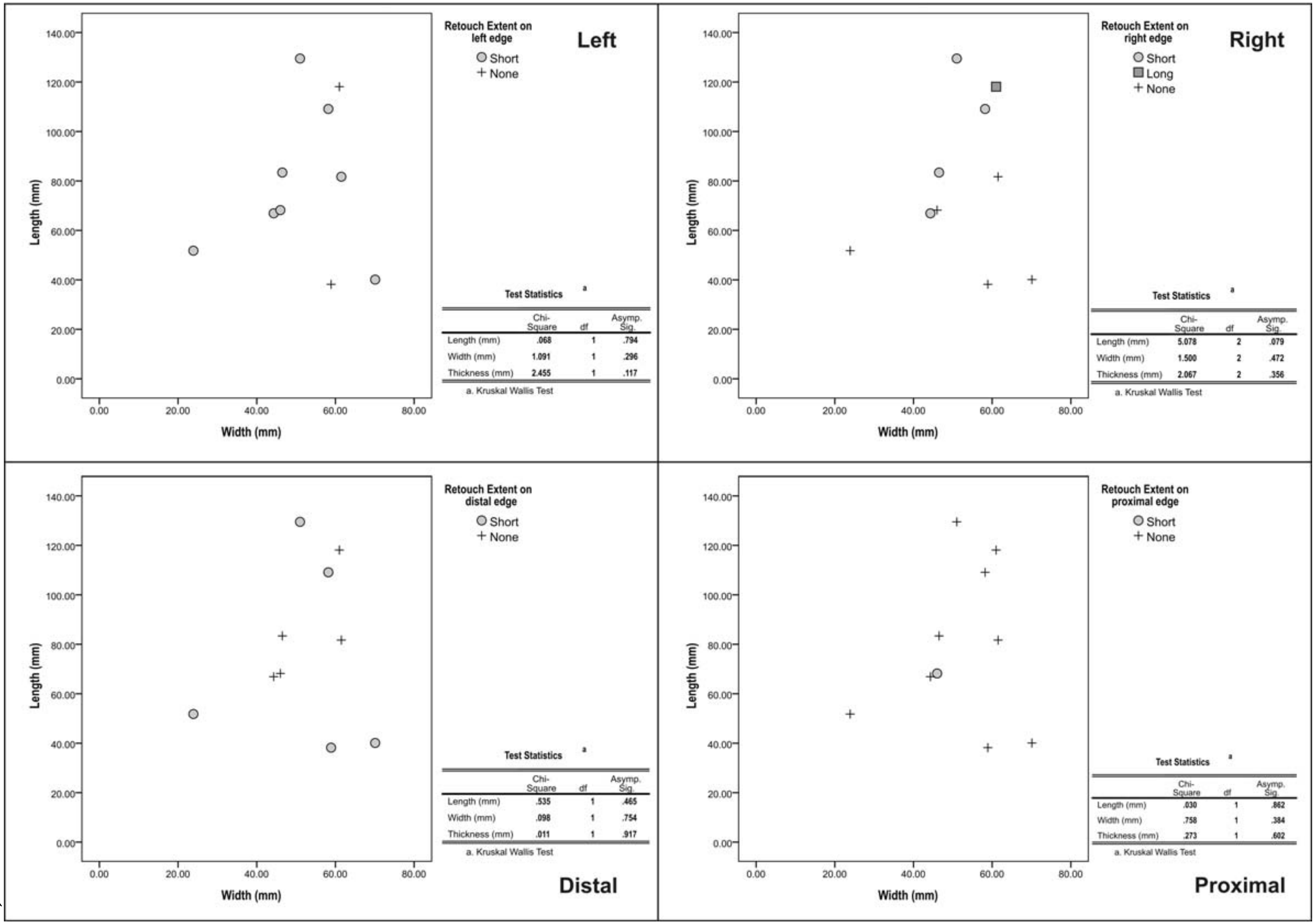


Figure A2.26: Showing the relationship between flake proportion and retouch position for Creffield Road.

Retouch Extent

Figure A2.27 (below) shows the relationship between flake proportion and retouch extent, where the dominant form retouch extent being short. The Kruskal Wallis H Tests (Ebdon 1977:68) would indicate that to a 0.05 significance level, there is no statistically significant relationship between retouch extent and flake length, width and thickness. Short retouch is not invasive across the surface of the flake (either direct or inverse) and therefore is limited to edge manipulation only. Therefore I would propose that the pattern of retouch extent seen in figure A2.27 supports the idea that deliberate form imposition through secondary working and in terms of artefact aesthetic is not present within the Creffield Road assemblage. The retouch would appear to be functional in character and limited to edge modification that mirrors the shape of the original edge (personal observation), rather than deliberately changing it to a different preconceived form.



Test Statistics[a] (Left)

	Chi-Square	df	Asymp. Sig.
Length (mm)	.068	1	.794
Width (mm)	1.091	1	.296
Thickness (mm)	2.455	1	.117

a. Kruskal Wallis Test

Test Statistics[a] (Right)

	Chi-Square	df	Asymp. Sig.
Length (mm)	5.078	2	.079
Width (mm)	1.500	2	.472
Thickness (mm)	2.067	2	.356

a. Kruskal Wallis Test

Test Statistics[a] (Distal)

	Chi-Square	df	Asymp. Sig.
Length (mm)	.535	1	.465
Width (mm)	.098	1	.754
Thickness (mm)	.011	1	.917

a. Kruskal Wallis Test

Test Statistics[a] (Proximal)

	Chi-Square	df	Asymp. Sig.
Length (mm)	.030	1	.862
Width (mm)	.758	1	.384
Thickness (mm)	.273	1	.602

a. Kruskal Wallis Test

Figure A2.27: Showing the relationship between flake proportion and retouch extent for Creffield Road.

Conclusion

Given that the only raw material present within this assemblage was flint, a raw material renowned for it knapping versatility coupled with the fact that a range of artefact sizes has been produced from small debitage pieces to large flakes and flake tools it is deemed that raw material did not adversely affect artefact proportion or form imposition. From examining the detached pieces where retouch was present (a very limited sample), it would appear that there are no patterns reflecting a specific retouched tool form, however I stress that given the extremely limited sample size, it is difficult to ascertain whether these patterns are genuine reflections of Levallois tool making in general. The comparatively small component of retouched tools verses unretouched flakes would also indicate that either hominins curated retouched tools and transported them around the landscape, retouched tools were produced as and when a need arose, or as is more likely, the predetermined form of the flake extracted through PCT produced enough detached pieces to suit purpose without the need to alter edges through secondary working. This standardisation of tool form through PCT is not necessarily culturally significant standardisation, but it could simply be a result of manufacturing technique. There would appear to be no degree of standardisation in terms of flake proportion for both retouched and unretouched flakes.

Cores

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. As expected for an MIS 7 dated site, the Creffield Road assemblage displays evidence for PCT, in fact the only cores recovered from Pit 3 and Green Lane were PCT in nature (table A2.55).

		Artefact Type	
		Core	
PCT Core Type	C1- Radial	6	75.0%
	C2 - Convergent	1	12.5%
	C3 - Parallel / laminar	1	12.5%
	C3a - Simple prepared cores	0	.0%
	C4 - Other	0	.0%
	Total	**8**	**100.0%**

Table A2.55: Showing the relationship between Core Type and Artefact Type for Creffield Road.

Table A2.55 shows that there are 8 unbroken cores. The cores would not appear to be restricted to a particular type of reduction sequence, although there would seem to be a preference for radial preferential removals. In terms of examining the cores from Creffield Road for any form of standardisation in artefact proportion, figure A2.28 below shows the relationship between length, width and the PCT cores.

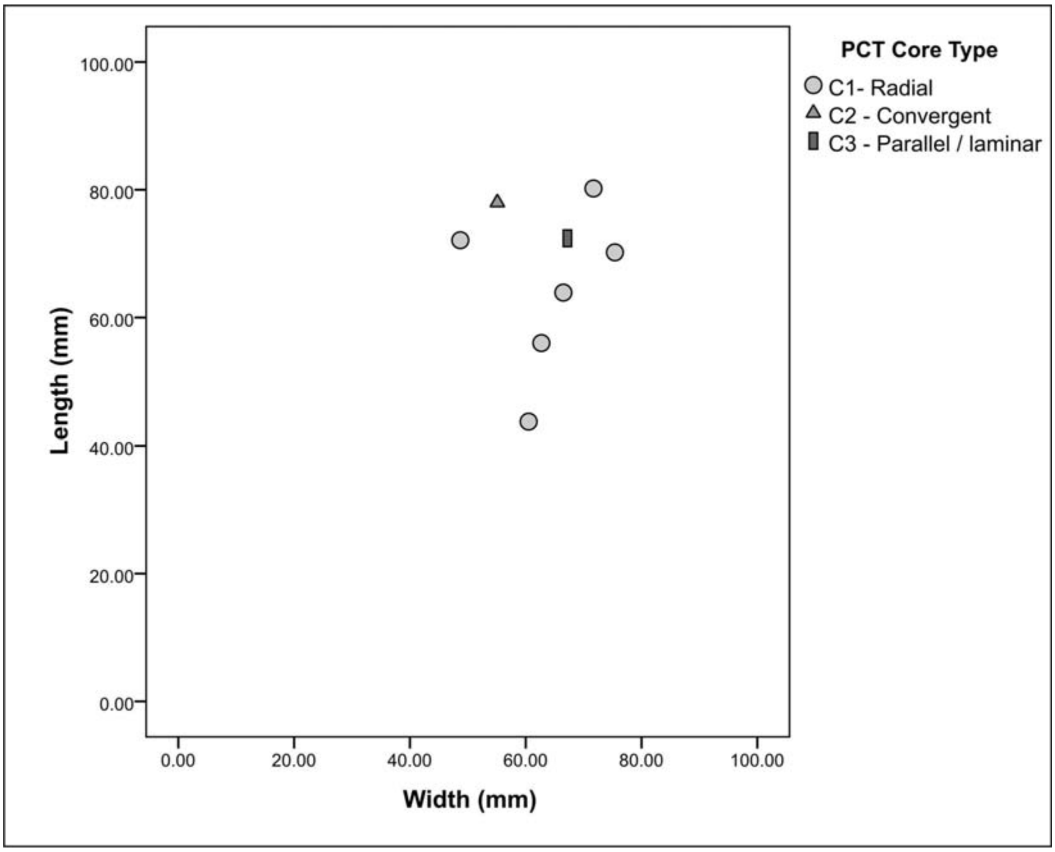


Figure A2.28: showing the relationship between artefact proportion and non-PCT generic cores for Creffield Road.

From figure A2.28 it would seem that the cores are being reduced and discarded through a whole range of artefact proportions. This in turn would indicate that there is no predetermined or socially significant standard to which cores are being worked. Rather the core pattern would seem to support the conclusions from the flake analysis where flakes and cores are worked through opportunistic knapping to fulfil a specific need at a specific time, and then being discarded.

Furthermore, given that there is only one raw material present within the Creffield Road assemblage, and the large range of artefact type and proportions, it would suggest that raw material was not adversely affecting core reduction.

Conclusion

In conclusion, the three artefact categories under study in the Creffield Road assemblage (detached pieces and cores) all seem to display a lack of extensive form imposition and standardisation beyond that afforded through the nature of PCT manufacture. Furthermore, given the large number of broken PCT flakes (specifically around the tip – personal observation) and the relatively small number of unbroken flakes, the site analysis seen here would seem to support the original interpretation of the site (White *et al* 2006) as a hunting stand / repair station where broken flakes are left behind and whole flakes are curated and taken away.

Pontnewydd Cave

The site history and details for Pontnewydd Cave can be found in Chapter 6. As mentioned above, a total of 619 artefacts were examined from Pontnewydd spanning seven areas of excavation and dated to MIS 7 (Aldhouse-Green 1995; McNabb 2007: 210). As stated in Chapter 6, given the palmipsestual nature of the Pontnewydd archaeological deposits it is impossible to tease out separate occupation phases at Pontnewydd with any degree of certainty, therefore all the artefacts shall be analysed and treated as a general sample from MIS 7, even though the assemblage probably represents several phases of occupation at Pontnewydd. Table A2.56 shows the make up of the Pontnewydd assemblage in relation to the seven areas of excavation.

		Site Sub-dividsion							
		Site A	Site B	Site C	Site D	Site F	Site G	Site H	**Total**
Artefact Type	LCT	22	6	6	25	13	0	10	**82**
	Flake	57	25	14	77	78	2	118	**371**
	Flake tool	10	11	4	28	6	0	12	**71**
	Core	18	9	6	25	10	0	21	**89**
	Unclear	0	0	0	3	1	0	0	**4**
	Hammer Stone	0	0	0	0	2	0	0	**2**
	Total	**107**	**51**	**30**	**158**	**110**	**2**	**161**	**619**

Table A2.56: Showing the relationship between artefact type and site sub-division for Pontnewydd Cave.

Table A2.57 shows the relationship between artefact type, site sub-division and completeness.

				Artefact Type						
				LCT	Flake	Flake tool	Core	Unclear	Hammer Stone	**Total**
Site Sub-dividsion	Site A	Completeness	Unbroken	18	43	8	16	0	0	**85**
			Broken	4	14	2	2	0	0	**22**
			Total	**22**	**57**	**10**	**18**	**0**	**0**	**107**
	Site B	Completeness	Unbroken	5	15	8	8	0	0	**36**
			Broken	1	10	3	1	0	0	**15**
			Total	**6**	**25**	**11**	**9**	**0**	**0**	**51**
	Site C	Completeness	Unbroken	5	7	1	5	0	0	**18**
			Broken	1	7	3	1	0	0	**12**
			Total	**6**	**14**	**4**	**6**	**0**	**0**	**30**
	Site D	Completeness	Unbroken	17	69	24	23	3	0	**136**
			Broken	8	8	4	2	0	0	**22**
			Total	**25**	**77**	**28**	**25**	**3**	**0**	**158**
	Site F	Completeness	Unbroken	8	55	5	8	1	2	**79**
			Broken	5	23	1	2	0	0	**31**
			Total	**13**	**78**	**6**	**10**	**1**	**2**	**110**
	Site G	Completeness	Unbroken	0	2	0	0	0	0	**2**
			Total	**0**	**2**	**0**	**0**	**0**	**0**	**2**
	Site H	Completeness	Unbroken	5	54	9	16	0	0	**84**
			Broken	5	64	3	5	0	0	**77**
			Total	**10**	**118**	**12**	**21**	**0**	**0**	**161**
	Total	Completeness	Unbroken	58	245	55	76	4	2	**440**
			Broken	24	126	16	13	0	0	**179**
			Total	**82**	**371**	**71**	**89**	**4**	**2**	**619**

Table A2.57: Showing the relationship between artefact type, site sub-division and completeness for Pontnewydd Cave.

In order to remain consistent throughout my data collection, all broken and unclear artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed from Pontnewydd Cave 436. Table A2.58 shows the relationship between artefact type, site sub-division and condition.

			Artefact Type											
			LCT		Flake		Flake tool		Core		Hammer Stone		**Total**	
Site Sub-dividsion	Site A	Abraded	16	*3.7%*	36	*8.3%*	4	*.9%*	11	*2.5%*	0	*.0%*	**67**	***15.4%***
		Fresh	0	*.0%*	0	*.0%*	1	*.2%*	0	*.0%*	0	*.0%*	**1**	***.2%***
		Lightly Abraded	2	*.5%*	7	*1.6%*	3	*.7%*	5	*1.1%*	0	*.0%*	**17**	***3.9%***
		Total	**18**	***4.1%***	**43**	***9.9%***	**8**	***1.8%***	**16**	***3.7%***	**0**	***.0%***	**85**	***19.5%***
	Site B	Abraded	3	*.7%*	11	*2.5%*	5	*1.1%*	6	*1.4%*	0	*.0%*	**25**	***5.7%***
		Fresh	0	*.0%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	**1**	***.2%***
		Lightly Abraded	2	*.5%*	3	*.7%*	3	*.7%*	2	*.5%*	0	*.0%*	**10**	***2.3%***
		Total	**5**	***1.1%***	**15**	***3.4%***	**8**	***1.8%***	**8**	***1.8%***	**0**	***.0%***	**36**	***8.3%***
	Site C	Abraded	2	*.5%*	6	*1.4%*	1	*.2%*	2	*.5%*	0	*.0%*	**11**	***2.5%***
		Fresh	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
		Lightly Abraded	3	*.7%*	1	*.2%*	0	*.0%*	3	*.7%*	0	*.0%*	**7**	***1.6%***
		Total	**5**	***1.1%***	**7**	***1.6%***	**1**	***.2%***	**5**	***1.1%***	**0**	***.0%***	**18**	***4.1%***
	Site D	Abraded	13	*3.0%*	51	*11.7%*	10	*2.3%*	21	*4.8%*	0	*.0%*	**95**	***21.8%***
		Fresh	0	*.0%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	**1**	***.2%***
		Lightly Abraded	4	*.9%*	17	*3.9%*	14	*3.2%*	2	*.5%*	0	*.0%*	**37**	***8.5%***
		Total	**17**	***3.9%***	**69**	***15.8%***	**24**	***5.5%***	**23**	***5.3%***	**0**	***.0%***	**133**	***30.5%***
	Site F	Abraded	4	*.9%*	22	*5.0%*	2	*.5%*	6	*1.4%*	0	*.0%*	**34**	***7.8%***
		Fresh	0	*.0%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	**1**	***.2%***
		Lightly Abraded	4	*.9%*	32	*7.3%*	3	*.7%*	2	*.5%*	2	*.5%*	**43**	***9.9%***
		Total	**8**	***1.8%***	**55**	***12.6%***	**5**	***1.1%***	**8**	***1.8%***	**2**	***.5%***	**78**	***17.9%***
	Site G	Abraded	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
		Fresh	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
		Lightly Abraded	0	*.0%*	2	*.5%*	0	*.0%*	0	*.0%*	0	*.0%*	**2**	***.5%***
		Total	**0**	***.0%***	**2**	***.5%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**2**	***.5%***
	Site H	Abraded	1	*.2%*	2	*.5%*	0	*.0%*	0	*.0%*	0	*.0%*	**3**	***.7%***
		Fresh	2	*.5%*	17	*3.9%*	4	*.9%*	3	*.7%*	0	*.0%*	**26**	***6.0%***
		Lightly Abraded	2	*.5%*	35	*8.0%*	5	*1.1%*	13	*3.0%*	0	*.0%*	**55**	***12.6%***
		Total	**5**	***1.1%***	**54**	***12.4%***	**9**	***2.1%***	**16**	***3.7%***	**0**	***.0%***	**84**	***19.3%***
	Total	Abraded	39	*8.9%*	128	*29.4%*	22	*5.0%*	46	*10.6%*	0	*.0%*	**235**	***53.9%***
		Fresh	2	*.5%*	20	*4.6%*	5	*1.1%*	3	*.7%*	0	*.0%*	**30**	***6.9%***
		Lightly Abraded	17	*3.9%*	97	*22.2%*	28	*6.4%*	27	*6.2%*	2	*.5%*	**171**	***39.2%***
		Total	**58**	***13.3%***	**245**	***56.2%***	**55**	***12.6%***	**76**	***17.4%***	**2**	***.5%***	**436**	***100.0%***

Table A2.58: Showing the relationship between artefact type, site sub-division and condition for Pontnewydd Cave.

Table A2.58 shows that the majority of unbroken artefacts from Pontnewydd Cave are classified as abraded (54.1%), lightly abraded (39.1%) and finally a small minority classed as fresh (6.8%). This pattern of condition would suggest that the majority of the Pontnewydd Cave assemblage has been subjected to a large degree of post depositional movement and abrasion from all areas excavated within the cave, however, specific artefact conditions are examined in greater detail in the artefact categories explored below. The overall abraded / lightly abraded pattern of artefact condition within the Pontnewydd assemblage is unsurprising given the palimpsestual nature of the assemblage, and reinforces the importance of looking at Pontnewydd as a general example of MIS 7 artefacts, rather than attempting to tease out specific occupation episodes from the artefacts.

I shall now examine the more specific elements to the Pontnewydd Cave assemblage by looking at the LCTs, Flakes, Flake Tools and Cores in greater depth.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. From table A2.57 above it can be seen that the 58 unbroken LCTs from Pontnewydd Cave come in a predominantly abraded condition (39), a few being lightly abraded (17) and 2 which are fresh. Table A2.59 below shows the relationship between raw material and LCT type.

		LCT Type			
		Handaxe	Cleaver	Blank	**Total**
Raw Material	Flint	1.7%	.0%	1.7%	**3.4%**
	Dacite	3.4%	.0%	.0%	**3.4%**
	Feldspar Phyric Lava	8.6%	.0%	3.4%	**12.1%**
	Rhyolitic Tuff	3.4%	.0%	3.4%	**6.9%**
	Tuff	5.2%	.0%	.0%	**5.2%**
	Crystal Tuff	1.7%	.0%	1.7%	**3.4%**
	Crystal Lithic Tuff	.0%	.0%	3.4%	**3.4%**
	Rhyolitic Lava	5.2%	1.7%	.0%	**6.9%**
	Ignimbrite	6.9%	.0%	6.9%	**13.8%**
	Silicic Tuff	3.4%	.0%	.0%	**3.4%**
	Siltstone	1.7%	.0%	.0%	**1.7%**
	Fine Silicic Tuff	6.9%	.0%	6.9%	**13.8%**
	Sandstone	3.4%	.0%	.0%	**3.4%**
	Rhyolite	10.3%	.0%	3.4%	**13.8%**
	Flow Banded Rhyolite	1.7%	.0%	.0%	**1.7%**
	Carboniferous Chert	1.7%	.0%	.0%	**1.7%**
	Pumice	1.7%	.0%	.0%	**1.7%**
	Total	**67.2%**	**1.7%**	**31.0%**	**100.0%**

Total N = 58

Table A2.59: Showing the relationship between Raw Material and LCT Type for Pontnewydd Cave.

From table A2.59 it can be seen that the majority of LCTs from Pontnewydd Cave are handaxes, made on a variety of raw material types. There would also appear to be a fair proportion of LCT blanks from Pontnewydd Cave which suggest that the various occupations of the cave were related to LCT production. A small cleaver sample was recorded from one type of raw material (Rhyolitic lava), however I do not think this represents a special correlation between biface type and raw material, but rather a result of sample size (1.7% of 58 = 3 artefacts). In order to assess imposition of form and symmetry upon the LCTs from Pontnewydd Cave, table A2.60 shows that from the limited sample available, there are no major symmetrical elements to LCT form.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Raw Material	Flint	.0%	.0%	1.7%	.0%	.0%	1.7%	.0%	.0%	**3.4%**
	Dacite	.0%	.0%	.0%	.0%	.0%	3.4%	.0%	.0%	**3.4%**
	Feldspar Phyric Lava	.0%	.0%	.0%	.0%	.0%	12.1%	.0%	.0%	**12.1%**
	Rhyolitic Tuff	.0%	.0%	.0%	1.7%	.0%	5.2%	.0%	.0%	**6.9%**
	Tuff	.0%	1.7%	1.7%	.0%	.0%	1.7%	.0%	.0%	**5.2%**
	Crystal Tuff	.0%	.0%	1.7%	.0%	.0%	1.7%	.0%	.0%	**3.4%**
	Crystal Lithic Tuff	.0%	.0%	1.7%	.0%	.0%	1.7%	.0%	.0%	**3.4%**
	Rhyolitic Lava	.0%	.0%	1.7%	.0%	.0%	5.2%	.0%	.0%	**6.9%**
	Ignimbrite	.0%	1.7%	.0%	.0%	.0%	12.1%	.0%	.0%	**13.8%**
	Silicic Tuff	.0%	.0%	.0%	.0%	.0%	3.4%	.0%	.0%	**3.4%**
	Siltstone	.0%	.0%	1.7%	.0%	.0%	.0%	.0%	.0%	**1.7%**
	Fine Silicic Tuff	.0%	.0%	5.2%	1.7%	.0%	6.9%	.0%	.0%	**13.8%**
	Sandstone	.0%	.0%	.0%	.0%	.0%	3.4%	.0%	.0%	**3.4%**
	Rhyolite	1.7%	.0%	1.7%	.0%	.0%	10.3%	.0%	.0%	**13.8%**
	Flow Banded Rhyolite	.0%	.0%	.0%	.0%	.0%	1.7%	.0%	.0%	**1.7%**
	Carboniferous Chert	.0%	.0%	1.7%	.0%	.0%	.0%	.0%	.0%	**1.7%**
	Pumice	.0%	.0%	.0%	.0%	.0%	1.7%	.0%	.0%	**1.7%**
	Total	**1.7%**	**3.4%**	**19.0%**	**3.4%**	**.0%**	**72.4%**	**.0%**	**.0%**	**100.0%**

Total N = 58

Table A2.60: Showing the relationship between Raw Material and Symmetry by Eye for Pontnewydd Cave.

From table A2.60 it is clear that the hominins from Pontnewydd Cave did not place a high importance on symmetry within LCT form. Whether this is related to raw material constraints over behavioural preference is difficult to ascertain. However, where symmetry is present within LCT form, it is present on a number of different raw material types (albeit in very low numbers) which would suggest that raw material is not constraining symmetry imposition. I believe that given that there is no consistent raw material that seems to have been favoured in producing symmetry in LCT form, that the hominins from Pontnewydd Cave did not value symmetry within LCT production on a culturally significant level and raw material constraints did not play a primary role in determining symmetry in LCT manufacture. Table A2.61 shows the relationship between raw material and tip shape.

		Tip Shape								
		Markedly Convergent	Convergent with a Square Tip	Convergent with an Oblique Tip	Convergent with a Generalised Tip	Wide or Divergent	Wide or Divergent with an Oblique Bit	Wide with Convex Tip	Profoundly Asymmetrical	**Total**
Raw Material	Flint	.0%	.0%	.0%	.0%	1.7%	.0%	1.7%	.0%	**3.4%**
	Dacite	.0%	.0%	.0%	3.4%	.0%	.0%	.0%	.0%	**3.4%**
	Feldspar Phyric Lava	.0%	1.7%	1.7%	8.6%	.0%	.0%	.0%	.0%	**12.1%**
	Rhyolitic Tuff	.0%	.0%	.0%	6.9%	.0%	.0%	.0%	.0%	**6.9%**
	Tuff	1.7%	.0%	.0%	3.4%	.0%	.0%	.0%	.0%	**5.2%**
	Crystal Tuff	1.7%	.0%	.0%	1.7%	.0%	.0%	.0%	.0%	**3.4%**
	Crystal Lithic Tuff	.0%	.0%	.0%	1.7%	.0%	.0%	.0%	1.7%	**3.4%**
	Rhyolitic Lava	.0%	.0%	.0%	5.2%	1.7%	.0%	.0%	.0%	**6.9%**
	Ignimbrite	1.7%	.0%	.0%	10.3%	.0%	.0%	1.7%	.0%	**13.8%**
	Silicic Tuff	.0%	.0%	.0%	1.7%	1.7%	.0%	.0%	.0%	**3.4%**
	Siltstone	.0%	1.7%	.0%	.0%	.0%	.0%	.0%	.0%	**1.7%**
	Fine Silicic Tuff	1.7%	.0%	.0%	10.3%	1.7%	.0%	.0%	.0%	**13.8%**
	Sandstone	.0%	.0%	.0%	3.4%	.0%	.0%	.0%	.0%	**3.4%**
	Rhyolite	3.4%	3.4%	1.7%	5.2%	.0%	.0%	.0%	.0%	**13.8%**
	Flow Banded Rhyolite	.0%	.0%	.0%	1.7%	.0%	.0%	.0%	.0%	**1.7%**
	Carboniferous Chert	1.7%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**1.7%**
	Pumice	.0%	1.7%	.0%	.0%	.0%	.0%	.0%	.0%	**1.7%**
	Total	**12.1%**	**8.6%**	**3.4%**	**63.8%**	**6.9%**	**.0%**	**3.4%**	**1.7%**	**100.0%**

Total N = 58

Table A2.61: Showing the relationship between Raw Material and Tip Shape for Pontnewydd Cave.

Table A2.61 shows that there is a general preference for tip shapes with a convergent element to them. Convergent tips would seem to be related to symmetry with a general correspondence between tips with a symmetrical element and tips with a convergent element (tables 6.10 and 6.11). This would seem to confirm that imposed symmetry on LCTs was not a culturally important component of artefact manufacture but rather a result of convergent tip shape. Given the range of tip shapes seen in table A2.61, it would appear that raw material was not a constraining factor in form imposition for LCTs with a convergent element, although it may play a role in producing LCTs with a wide, divergent or convex tip given the low percentage of artefacts displaying those features. Figure A2.29 below examines the relationship between artefact proportion and raw material.

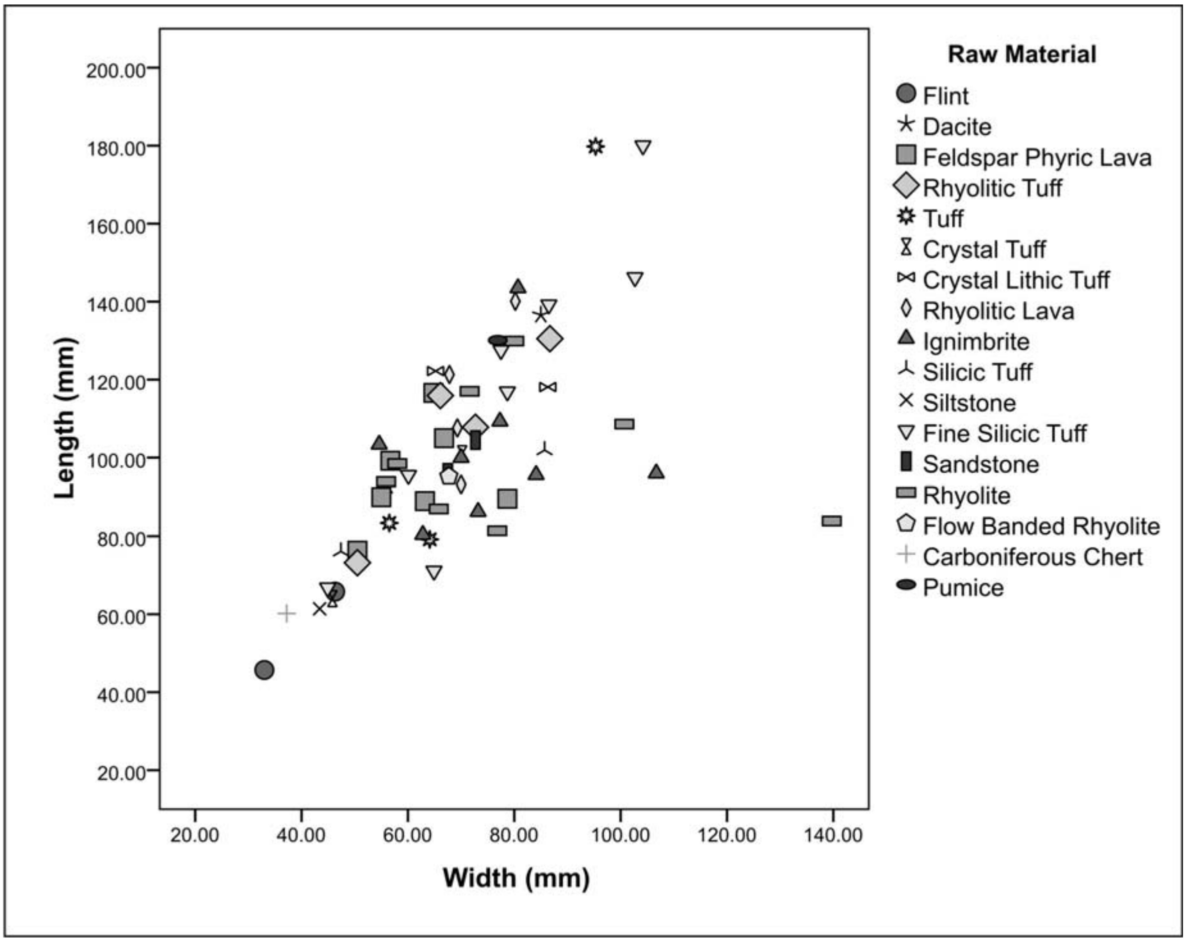


Figure A2.29: Showing the relationship between LCT proportion and Raw Material for Pontnewydd Cave.

Figure A2.29 shows that beyond a broad correlation between length and width (the longer the LCT, the wider it is) raw material does not seem to affect LCT proportion. A Kruskal Wallis H Test (Ebdon 1977:68) confirms that there is no statistically significant relationship (to 0.05 significance) between raw material and LCT length (x^2 = 19.316; df = 16; p = 0.253), width (x^2 = 16.817; df = 16; p = 0.398) or thickness (x^2 = 15.734; df = 16; p = 0.472). The only exception to this is that the flint artefacts seem to be fairly small in size which may suggest that in relation to other raw material types, the flint artefacts were curated, reused and reduced until they were too small to handle. Figure A2.30 shows the relationship between symmetry and LCT proportion.

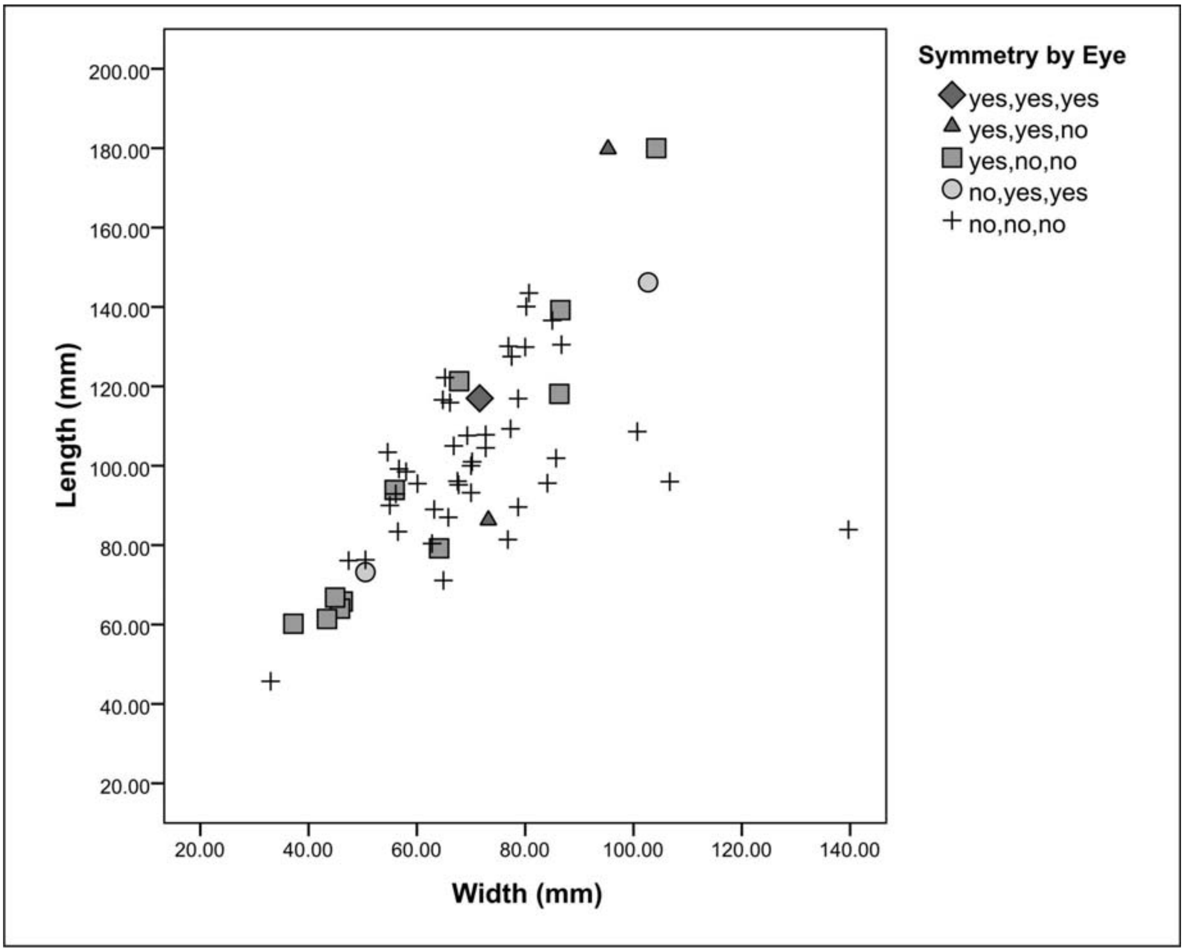


Figure A2.30: Showing the relationship between LCT proportion and Symmetry by Eye for Pontnewydd Cave.

Figure A2.30 suggests that symmetry and LCT proportion have no significant relationship from the Pontnewydd Cave assemblage. A Kruskal Wallis H Test (Ebdon 1977:68) confirms that there is no statistically significant relationship (to 0.05 significance) between observed symmetry and LCT length (x^2 = 2.723; df = 4; p = 0.605), width (x^2 = 4.358; df = 4; p = 0.360) or thickness (x^2 = 2.335; df = 4; p = 0.674).

Similarly, figure A2.31 shows the relationship between tip shape and artefact proportion and suggests that there is no significant relationship between tip shape and LCT proportion.

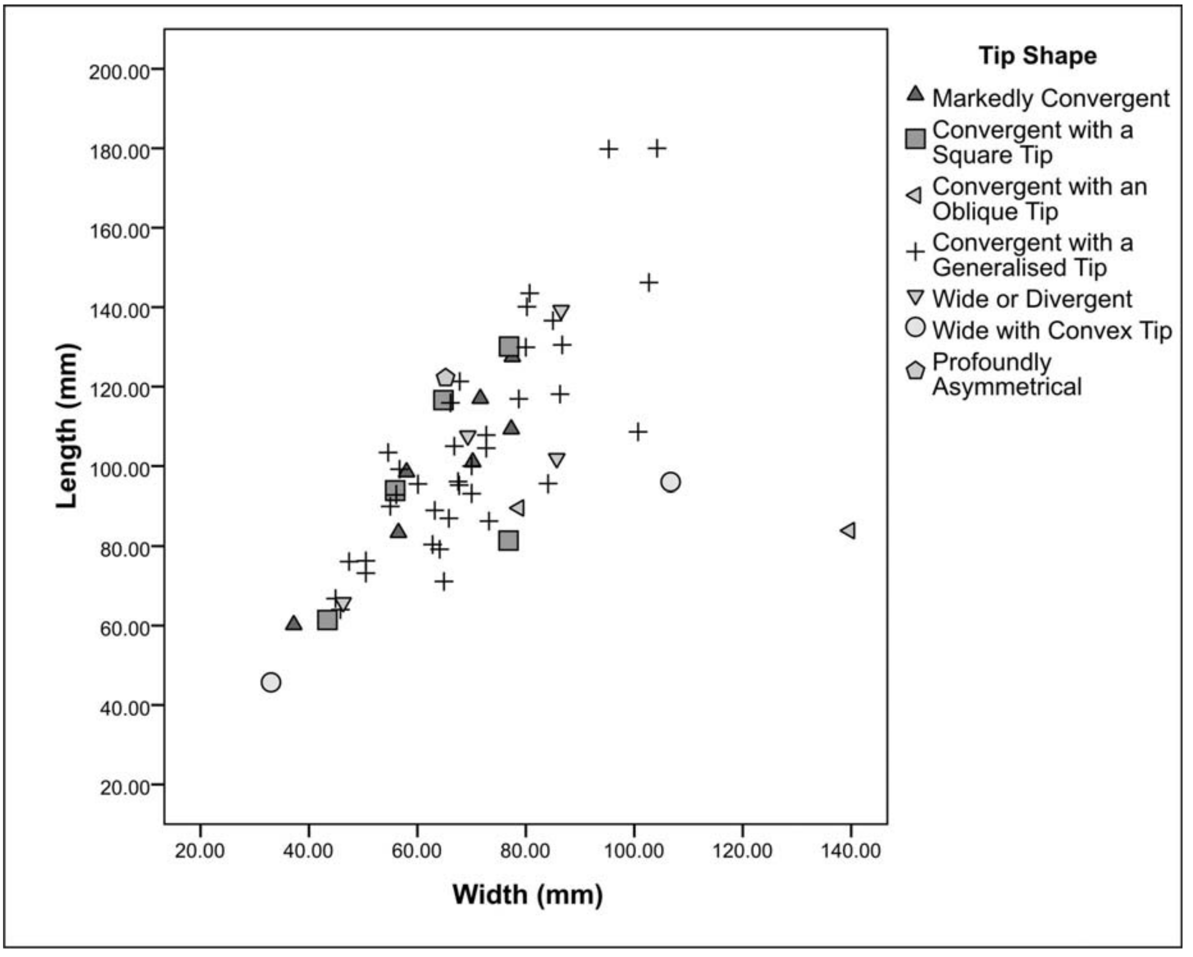


Figure A2.31: Showing the relationship between LCT proportion and tip shape for Pontnewydd Cave.

A Kruskal Wallis H Test (Ebdon 1977:68) confirms that there is no statistically significant relationship (to 0.05 significance) between observed tip shape and LCT length (x^2 = 4.308; df = 6; p = 0.635), width (x^2 = 4.649; df = 6; p = 0.590) or thickness (x^2 = 6.057; df = 6; p = 0.417). Therefore, from figures A2.29 – A2.31 it would seem that there are no standardised LCT proportions to which LCTs are produced / reduced independent of raw material, symmetry imposition and tip shape.

The next criteria for assessing form imposition shall be through the flaking patterns relating to the LCTs of the Pontnewydd Cave assemblage (table A2.62).

		Flaking Extent Second Face					
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	5.2%	.0%	3.4%	5.2%	3.4%	**17.2%**
	Complete Marginal	1.7%	.0%	1.7%	1.7%	.0%	**5.2%**
	Partial Marginal	6.9%	1.7%	46.6%	5.2%	3.4%	**63.8%**
	Partial	.0%	.0%	3.4%	.0%	1.7%	**5.2%**
	Substantial	.0%	.0%	1.7%	1.7%	5.2%	**8.6%**
	Total	**13.8%**	**1.7%**	**56.9%**	**13.8%**	**13.8%**	**100.0%**

Total N = 58

Table A2.62: Showing the relationship between Flaking Extents of the first and second LCT faces for Pontnewydd Cave.

From the small sample of LCTs from the Pontnewydd Cave assemblage there would appear to be a preference for partial marginal preparation in regards to LCT shaping and thinning. It should be noted here that this type of shaping and thinning requires the least amount of work and does not contribute hugely to form imposition on the LCTs. Furthermore, the two sides of the LCTs seem to be often knapped in a semi-comparable fashion, however there is not enough similarity to suggest a standardisation in shaping and thinning of the LCTs.

Another way to ascertain whether there is any standardisation in LCT manufacture is through the amount of edge working seen on the LCT. A relative index of edge working extent was described in Chapter 5 and applied to raw material and tip shape in tables A2.63 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Raw Material	Flint	.0%	3.4%	.0%	.0%	**3.4%**
	Dacite	3.4%	.0%	.0%	.0%	**3.4%**
	Feldspar Phyric Lava	8.6%	3.4%	.0%	.0%	**12.1%**
	Rhyolitic Tuff	6.9%	.0%	.0%	.0%	**6.9%**
	Tuff	.0%	3.4%	1.7%	.0%	**5.2%**
	Crystal Tuff	1.7%	1.7%	.0%	.0%	**3.4%**
	Crystal Lithic Tuff	3.4%	.0%	.0%	.0%	**3.4%**
	Rhyolitic Lava	3.4%	3.4%	.0%	.0%	**6.9%**
	Ignimbrite	10.3%	3.4%	.0%	.0%	**13.8%**
	Silicic Tuff	1.7%	1.7%	.0%	.0%	**3.4%**
	Siltstone	1.7%	.0%	.0%	.0%	**1.7%**
	Fine Silicic Tuff	10.3%	3.4%	.0%	.0%	**13.8%**
	Sandstone	3.4%	.0%	.0%	.0%	**3.4%**
	Rhyolite	10.3%	3.4%	.0%	.0%	**13.8%**
	Flow Banded Rhyolite	1.7%	.0%	.0%	.0%	**1.7%**
	Carboniferous Chert	1.7%	.0%	.0%	.0%	**1.7%**
	Pumice	.0%	1.7%	.0%	.0%	**1.7%**
	Total	**69.0%**	**29.3%**	**1.7%**	**.0%**	**100.0%**

Total N = 58

Table A2.63: Showing the relationship between Raw Material and Edge Working for Pontnewydd Cave.

From table A2.63 it can be seen that the majority of LCTs have an overall low amount of edge working (69.0% at 12-24) across the majority of raw material types. However, given the overall lack of symmetry, and the fact that raw material does not seem to have affected LCT proportion, it is likely that the lack of edge working within the Pontnewydd Cave assemblage is not a result of raw material constraints, but rather an indication of hominin behaviour. Table A2.64 shows the relation between symmetry and edge working.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Symmetry by Eye	yes,yes,yes	.0%	1.7%	.0%	.0%	**1.7%**
	yes,yes,no	1.7%	1.7%	.0%	.0%	**3.4%**
	yes,no,no	12.1%	5.2%	1.7%	.0%	**19.0%**
	no,yes,yes	1.7%	1.7%	.0%	.0%	**3.4%**
	no,no,yes	.0%	.0%	.0%	.0%	**.0%**
	no,no,no	53.4%	19.0%	.0%	.0%	**72.4%**
	no,yes,no	.0%	.0%	.0%	.0%	**.0%**
	yes,no,yes	.0%	.0%	.0%	.0%	**.0%**
	Total	**69.0%**	**29.3%**	**1.7%**	**.0%**	**100.0%**

Total N = 58

Table A2.64: Showing the relationship between Symmetry by Eye and Edge Working for Pontnewydd Cave.

Table A2.64 shows that there would appear to be no relationship between symmetry imposition and edge working extent. Where symmetry is present, the majority of edge working falls within the lowest index, this would seem to support the idea that form imposition was not an important factor of artefact production, independent of any raw material constraints. Table A2.65 shows the relationship between tip shape and edge working

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Tip Shape	Markedly Convergent	6.9%	5.2%	.0%	.0%	**12.1%**
	Convergent with a Square Tip	6.9%	1.7%	.0%	.0%	**8.6%**
	Convergent with an Oblique Tip	1.7%	1.7%	.0%	.0%	**3.4%**
	Convergent with a Generalised Tip	46.6%	15.5%	1.7%	.0%	**63.8%**
	Wide or Divergent	3.4%	3.4%	.0%	.0%	**6.9%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	1.7%	1.7%	.0%	.0%	**3.4%**
	Profoundly Asymmetrical	1.7%	.0%	.0%	.0%	**1.7%**
	Total	**69.0%**	**29.3%**	**1.7%**	**.0%**	**100.0%**

Total N = 58

Table A2.65: Showing the relationship between Tip Shape and Edge Working for Pontnewydd Cave.

Table A2.65 shows that tip shapes with a convergent element have an overall low degree of associated edge working seeming to confirm the observation that specific form imposition was not an important function in artefact production. Rather the hominins of Pontnewydd seem to have adopted a strategy of least resistance, producing artefacts on a variety of raw materials involving the least amount of effort to do so.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry or form from initial flaking extents. Rather hominins are generally working the LCTs to the minimum extent on a variety of raw materials. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip shape for this site. Rather, given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. There is a wide variety of raw material seen within the Pontnewydd assemblage. And the site was probably seen as a convenient point within the landscape for retooling and hunting on numerous occasions. Given the lack of symmetry and form imposition on all raw material types, it is unlikely that raw material was a constraining factor for form imposition / standardisation of LCT working at Pontnewydd Cave. The only possible exception to this rule is that the flint artefacts seem to be greatly reduced in proportion, which may suggest that they were curated and extensively reworked. However, the amount of edge working seen on the flint LCT still lies within the medium to low index of edge working which could argue against this.

Flake and Flake Tool Analysis

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. In order to get an understanding on the number of detached pieces recorded from the Pontnewydd Cave assemblage, table A2.66 shows the breakdown of unbroken flakes and flake tools in relation to the flake types described in Chapter 5.

		Artefact Type					
		Flake		Flake tool		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	2	*.7%*	**2**	***.7%***
	R2 - Denticulated scraper	0	*.0%*	4	*1.3%*	**4**	***1.3%***
	R3 - Side scraper	0	*.0%*	15	*5.0%*	**15**	***5.0%***
	R4 - End / Traverse scraper	0	*.0%*	6	*2.0%*	**6**	***2.0%***
	R5 - Flake with scraper retouch	0	*.0%*	8	*2.7%*	**8**	***2.7%***
	R6 - Scraper used as wedge	0	*.0%*	2	*.7%*	**2**	***.7%***
	R7 - Retouched point (awl)	0	*.0%*	0	*.0%*	**0**	***.0%***
	R8 - Retouched point (projectile)	0	*.0%*	2	*.7%*	**2**	***.7%***
	R9 - Retouched notch	0	*.0%*	5	*1.7%*	**5**	***1.7%***
	R10 - Retouch non diagnostic	0	*.0%*	0	*.0%*	**0**	***.0%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	0	*.0%*	**0**	***.0%***
	R12 - Multiple tool	0	*.0%*	7	*2.3%*	**7**	***2.3%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R14 - Utilised flake with no retouch	2	*.7%*	0	*.0%*	**2**	***.7%***
	R15 - Flake with edge damage	240	*80.0%*	4	*1.3%*	**244**	***81.3%***
	R16 - Flake with no retouch	3	*1.0%*	0	*.0%*	**3**	***1.0%***
	Total	**245**	***81.7%***	**55**	***18.3%***	**300**	***100.0%***

Table A2.66: Showing the breakdown between flakes and flake tools in relation to flake type for Pontnewydd Cave.

As can be seen in table A2.66 there are far more flakes than flake tools present within the unbroken detached artefacts studied from Pontnewydd Cave which may suggest three possible explanations. Firstly, that the hominins did not need to adapt the flakes (through retouch) they were producing for specific tasks on a regular basis, rather preferring to use the unmodified edge of flakes. Secondly, retouch tools were favoured for curation and removed from the site and transported elsewhere whilst unretouched flakes were left at the site of production. A possible third option is that the high degree of edge damage present on the flakes in table A2.66 could potentially mask the presence of retouch on the flakes. In terms of tool type being produced, table A2.66 illustrates that there would not appear to be any dominant retouch form or type preferred by the knappers – although this shall be discussed further below in relation to PCT flaking.

Table A2.67 shows the relationship between flake type and Toth type (Toth 1985) illustrating that Toth types 2, 3, 4, 5 and 6 are present within the Pontnewydd Cave unbroken flake assemblage. Of particular dominance is Toth type 6 (completely non cortical) at 56.7% and Toth type 5 (some cortex on the dorsal) at 33.3% of the flakes and flake tools. This would suggest that the majority of the detached pieces from Pontnewydd Cave come from cores that were toward the end of the reduction sequence where most of the cortex has been knapped off the core through earlier reductions.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	.0%	.0%	.3%	.3%	.0%	**.7%**
	R2 - Denticulated scraper	.0%	.0%	.0%	.0%	1.0%	.3%	**1.3%**
	R3 - Side scraper	.0%	.3%	.3%	.0%	3.0%	1.3%	**5.0%**
	R4 - End / Traverse scraper	.0%	.0%	.0%	.0%	1.0%	1.0%	**2.0%**
	R5 - Flake with scraper retouch	.0%	.0%	.0%	.0%	.3%	2.3%	**2.7%**
	R6 - Scraper used as wedge	.0%	.0%	.3%	.0%	.3%	.0%	**.7%**
	R7 - Retouched point (awl)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	.0%	.0%	.7%	**.7%**
	R9 - Retouched notch	.0%	.0%	.0%	.0%	.3%	1.3%	**1.7%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	.0%	.3%	.0%	.0%	2.0%	**2.3%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	.0%	.0%	.3%	.3%	**.7%**
	R15 - Flake with edge damage	.0%	2.3%	3.0%	3.0%	26.3%	46.7%	**81.3%**
	R16 - Flake with no retouch	.0%	.0%	.0%	.0%	.3%	.7%	**1.0%**
	Total	**.0%**	**2.7%**	**4.0%**	**3.3%**	**33.3%**	**56.7%**	**100.0%**

Total N = 300

Table A2.67: Showing the relationship between Flake Type and Toth type for Pontnewydd Cave.

In terms of the technological make up of the Pontnewydd Cave detached pieces, table A2.68 shows that 16.0% of the unbroken detached pieces for Pontnewydd Cave are PCT in character, 4.3% (PCT?) display PCT characteristics but are not definitively PCT in nature, whilst 79.7% are Non-PCT.

		Flake Technology Type			
		Non-PCT	PCT	PCT?	**Total**
Flake Type	R1 - Denticulated edge	.7%	.0%	.0%	**.7%**
	R2 - Denticulated scraper	.7%	.7%	.0%	**1.3%**
	R3 - Side scraper	3.7%	1.0%	.3%	**5.0%**
	R4 - End / Traverse scraper	2.0%	.0%	.0%	**2.0%**
	R5 - Flake with scraper retouch	1.7%	1.0%	.0%	**2.7%**
	R6 - Scraper used as wedge	.7%	.0%	.0%	**.7%**
	R7 - Retouched point (awl)	.0%	.0%	.0%	**.0%**
	R8 - Retouched point (projectile)	.0%	.7%	.0%	**.7%**
	R9 - Retouched notch	1.3%	.3%	.0%	**1.7%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.7%	1.3%	.3%	**2.3%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.7%	.0%	.0%	**.7%**
	R15 - Flake with edge damage	66.7%	11.0%	3.7%	**81.3%**
	R16 - Flake with no retouch	1.0%	.0%	.0%	**1.0%**
	Total	**79.7%**	**16.0%**	**4.3%**	**100.0%**

Total N = 300

Table A2.68: Showing the relationship between flake type and flake technology type for Pontnewydd Cave.

Table A2.68 further illustrates that there does not seem to be a particular preference for a specific tool type from any of the flake technology type categories, which may suggest that the hominins were not producing tools to specific form templates, but rather as opportunistic responses to required tasks. A closer look at the PCT flakes in table A2.69 shows that the majority of PCT flakes (48 in total) are radial in character and not confined to a specific tool type adding further support to the previous point.

		PCT Flake Type							
		Radial		Convergent		Convergent / Laminar		**Total**	
Flake Type	R2 - Denticulated scraper	2	*4.2%*	0	*.0%*	0	*.0%*	**2**	***4.2%***
	R3 - Side scraper	3	*6.3%*	0	*.0%*	0	*.0%*	**3**	***6.3%***
	R5 - Flake with scraper retouch	3	*6.3%*	0	*.0%*	0	*.0%*	**3**	***6.3%***
	R8 - Retouched point (projectile)	2	*4.2%*	0	*.0%*	0	*.0%*	**2**	***4.2%***
	R9 - Retouched notch	1	*2.1%*	0	*.0%*	0	*.0%*	**1**	***2.1%***
	R12 - Multiple tool	3	*6.3%*	0	*.0%*	1	*2.1%*	**4**	***8.3%***
	R15 - Flake with edge damage	29	*60.4%*	2	*4.2%*	2	*4.2%*	**33**	***68.8%***
	Total	**43**	***89.6%***	**2**	***4.2%***	**3**	***6.3%***	**48**	***100.0%***

Table A2.69: Showing the relationship between Flake type and PCT type for Pontnewydd Cave.

Convergent or convergent / laminar flakes are flakes produced to be Levallois points – points used as projectile heads, yet table A2.69 shows that there is an overall lack of Levallois points found within unbroken PCT flakes from Pontnewydd. There would also appear to be a marked lack of retouch visible on the PCT flakes (table A2.69) although genuine retouch may be masked by the overwhelming presence of edge damage within the PCT assemblage. If the presence of retouch was not masked by edge damage, then due to the fact that the knappers could extract a flake of a particular shape (such as a point) through the PCT technique of knapping, the hominins of Pontnewydd Cave may therefore have had little need to adapt the flake edges through retouch. Table A2.70 (below) shows that the hominins of Pontnewydd Cave were able to extract PCT flakes over a variety of raw materials, which in turn, suggests that raw material type did not play a limiting factor in flake and flake tool production.

		PCT Flake Type			
		Radial	Convergent	Convergent / Laminar	**Total**
Raw Material	Flint	4.2%	.0%	.0%	**4.2%**
	Dacite	4.2%	.0%	.0%	**4.2%**
	Feldspar Phyric Lava	10.4%	2.1%	.0%	**12.5%**
	Rhyolitic Tuff	2.1%	.0%	.0%	**2.1%**
	Tuff	4.2%	.0%	.0%	**4.2%**
	Crystal Tuff	6.3%	.0%	2.1%	**8.3%**
	Crystal Lithic Tuff	2.1%	2.1%	.0%	**4.2%**
	Microdiorite	8.3%	.0%	.0%	**8.3%**
	Rhyolitic Lava	4.2%	.0%	2.1%	**6.3%**
	Ignimbrite	8.3%	.0%	.0%	**8.3%**
	Silicic Tuff	6.3%	.0%	.0%	**6.3%**
	Fine Silicic Tuff	12.5%	.0%	.0%	**12.5%**
	Sandstone	2.1%	.0%	.0%	**2.1%**
	Rhyolite	12.5%	.0%	.0%	**12.5%**
	Crystal Pumice Tuff	2.1%	.0%	.0%	**2.1%**
	Limestone	.0%	.0%	2.1%	**2.1%**
	Total	**89.6%**	**4.2%**	**6.3%**	**100.0%**

Total N = 48

Table A2.70: Showing the relationship between Raw Material and PCT Type for Pontnewydd Cave.

Figure A2.32 shows the relationship between raw material and flake / flake tool size, and as can be seen, raw material would not appear to play a limiting factor in flake / flake tool production.

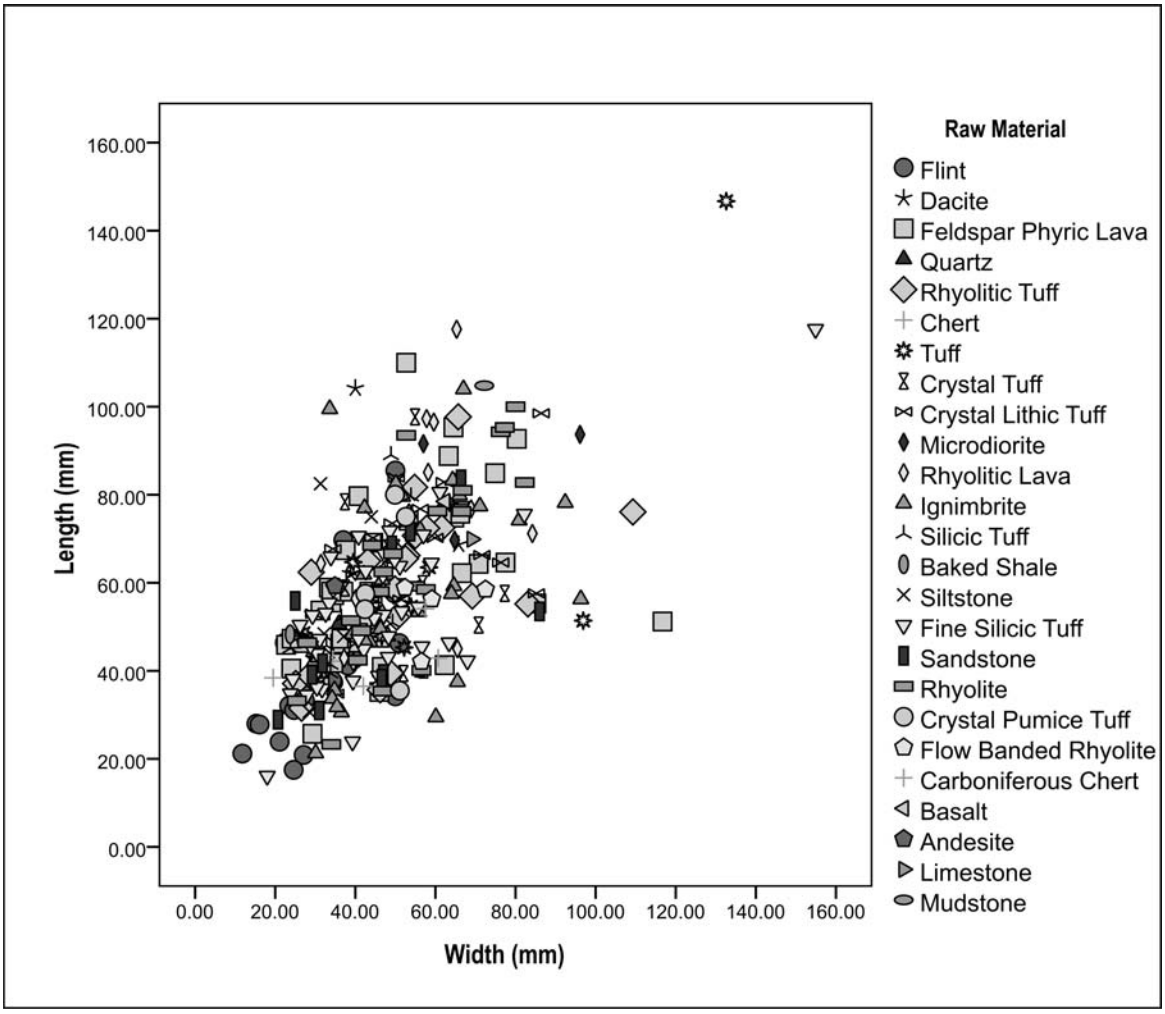


Figure A2.32: Showing the relationship between flake and flake tool proportion and raw material for Pontnewydd Cave.

Figure A2.33 illustrates the relationship between flake technology type and flake proportion.

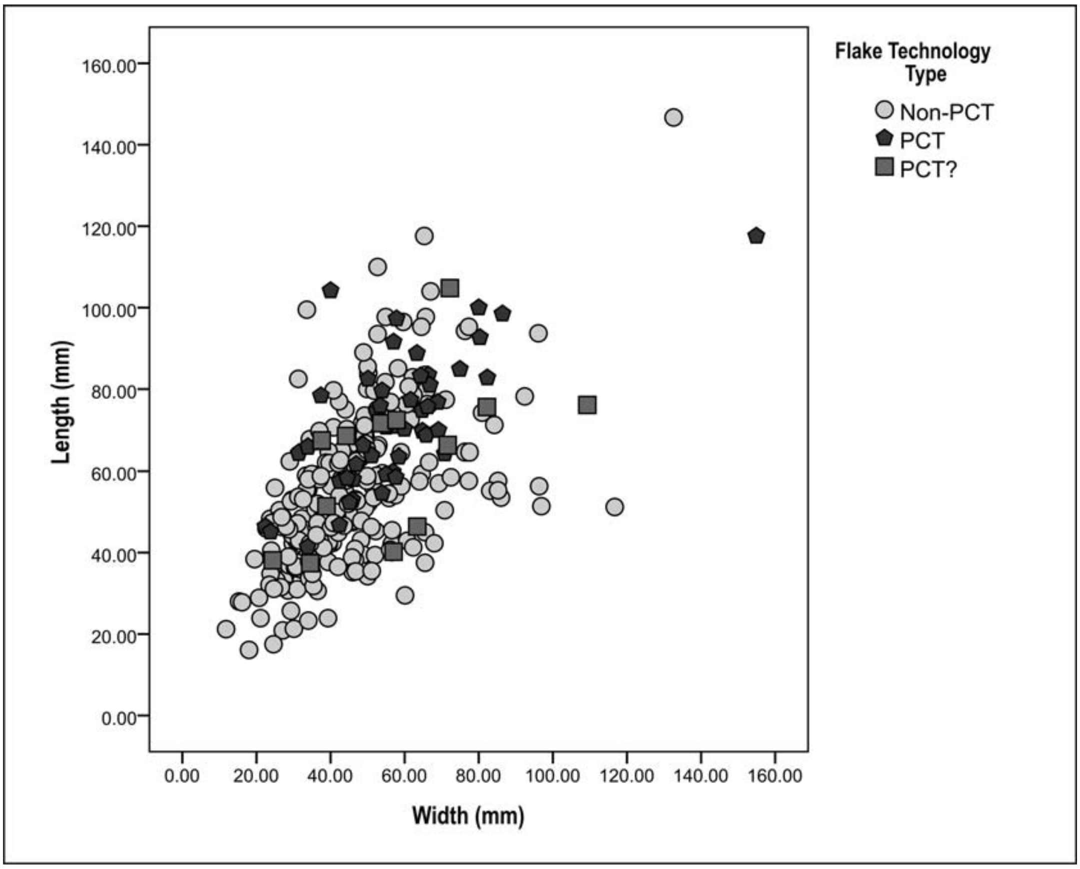


Figure A2.33: Showing the relationship between flake proportion and flake technology type for Pontnewydd Cave.

Once again there would not seem to be a relationship between flake proportion and technology type. A Kruskal Wallis H Test (Ebdon 1977:68) shows that there is no statistically significant relationship between flake technology type and raw material to a 0.05 significance level (x^2 = 35.832; df = 24; p = 0.057). Therefore it can be surmised that despite the vast amount of raw material use at Pontnewydd Cave, it would not appear to be adversely affecting flake or flake tool production. Table A2.71 illustrates the relationship between retouch and flake technology.

		Flake Technology Type							
		Non-PCT		PCT		PCT?		**Total**	
Retouch present on left edge	Yes	14	*27.5%*	10	*19.6%*	1	*2.0%*	**25**	***49.0%***
	No	20	*39.2%*	5	*9.8%*	1	*2.0%*	**26**	***51.0%***
	Total	**34**	***66.7%***	**15**	***29.4%***	**2**	***3.9%***	**51**	***100.0%***
Retouch present on distal edge	Yes	13	*25.5%*	9	*17.6%*	2	*3.9%*	**24**	***47.1%***
	No	21	*41.2%*	6	*11.8%*	0	*.0%*	**27**	***52.9%***
	Total	**34**	***66.7%***	**15**	***29.4%***	**2**	***3.9%***	**51**	***100.0%***
Retouch present on right edge	Yes	16	*31.4%*	12	*23.5%*	1	*2.0%*	**29**	***56.9%***
	No	18	*35.3%*	3	*5.9%*	1	*2.0%*	**22**	***43.1%***
	Total	**34**	***66.7%***	**15**	***29.4%***	**2**	***3.9%***	**51**	***100.0%***
Retouch present on proximal edge	Yes	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	No	34	*66.7%*	15	*29.4%*	2	*3.9%*	**51**	***100.0%***
	Total	**34**	***66.7%***	**15**	***29.4%***	**2**	***3.9%***	**51**	***100.0%***

Table A2.71: Showing the relationship between retouch presence and artefact type for Pontnewydd Cave.

Table A2.71 shows that there are 51 flake tools with retouch on at least one flake edge. Table A2.71 seems to imply that where retouch is present, it may be present on more than one edge, which may indicate that specific form and shape is being applied to the flake tools. However, given the wide range of flake tools present in table A2.66, this may not be the case, although this is explored in greater detail below during the retouch analysis. Table A2.66 shows that there are 55 flake tools, however four are edge damaged and are subsequently not included in table A2.71 or the rest of the retouch analysis below.

The following tests below regarding retouch and flake proportion are only conducted on the 51 unbroken detached pieces that have retouch present on at least one of their edges. Although I should stress that from such a small sample any patterns relating to retouch and form imposition must be treated with a degree of caution. Furthermore, the whole idea of PCT technology is to extract a flake of a particular form through the preparation of the core. The question to answer here is whether the standardised preparation of a PCT core to extract a flake of a particular form (for example a point) can be considered as culturally significant in regards to social signalling, or whether this form of standardisation is more related to an efficient method of core reduction and flake extraction. According to the predictions in table 4.3 (Chapter 4) the form imposition through PCT would be functional in character, however if there was an extensive amount of secondary working on the flake after detachment (i.e. through retouch) then the artefacts may display some tendency toward being culturally significant.

Retouch Delineation

Figure A2.34 (below) shows the relationship between retouch delineation and flake proportion where there would appear to be a large spread of retouch delineation types present within the Pontnewydd Cave flake tools. Although all flake tool edges display a variety of retouch delineations, there is a clear preference for denticulated retouch on the left edge, whilst the right and distal edge have no preference (figure A2.34). The proximal edge is characterised by a total lack of retouch presence. A Kruskal Wallis H Test (Ebdon 1977:68) shows there is no statistically significant relationship (to 0.05 significance) between flake length, width, or thickness and retouch delineation for the left, right and distal edges (figure A2.34). The proximal edge can not be tested through the Kruskal Wallis H Test due to the lack of variability in retouch delineation, that is, there is no retouch on the proximal and this shall be followed for the remaining retouch analyses for Pontnewydd Cave below (figure A2.34). As there would not appear to be a specific pattern of retouch delineation and flake proportion in figure A2.34, it is unlikely that retouch delineation is deliberately planned (in terms of overall flake shape), but rather a result of opportunistic manipulation of the flake edge.

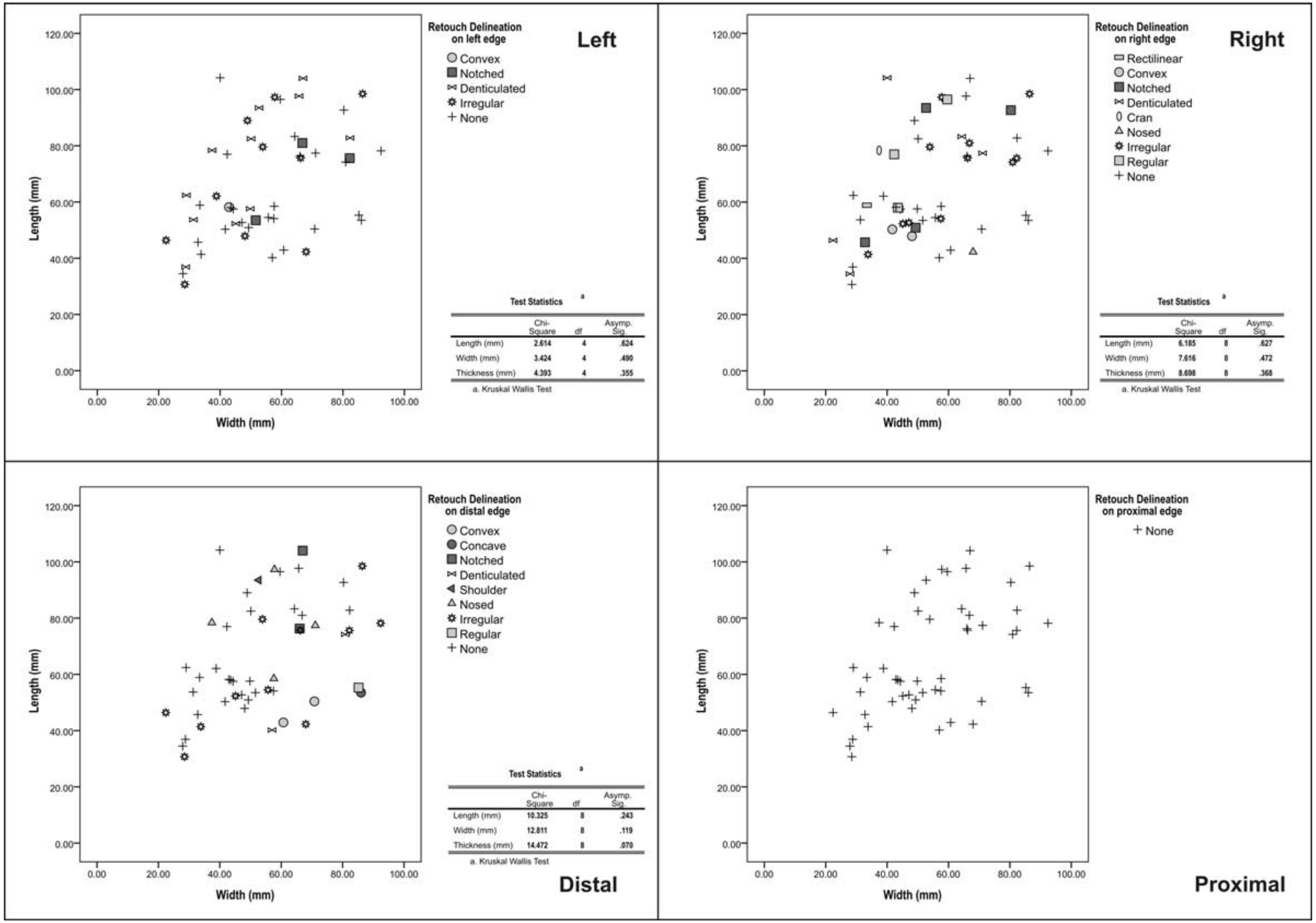


Figure A2.34: Showing the relationship between flake proportion and retouch delineation for Pontnewydd Cave.

Retouch distribution

Figure A2.35 (below) shows the relationship between flake proportion and retouch distribution. There appears to be clear preference for a total style of retouch distribution although partial and discontinuous retouch distributions are present within the sample. Total retouch implies that the whole of the flake edge had been retouched and may indicate that particular form was being imposed by the knapper through retouch. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch distribution (figure A2.35) for the left and right edges. However, on the distal edge there would appear to be a statistically significant relationship between retouch distribution and flake width (x^2 = 10.077; df = 2; p = 0.006) but not for length or thickness (figure A2.35). If there is a genuine relationship between retouch distribution on the distal and flake width (and I stress the small sample of 51 artefacts in total here), then this may not be that surprising given that the length of the distal edge is primarily governed by flake width. That is to say, the wider the flake, the greater the distal edge. Figure A2.35 suggests that where patterns of retouch are present then the hominins are utilising the full edge of the flake, possibly as a response to raw material constraints – curation of the retouched edge on a conducive raw material type for as long as possible - although the range of flake proportions and technology types would argue against this. However, figures A2.34 and A2.35 do not suggest culturally mediated form imposition on flake tools through secondary retouch.

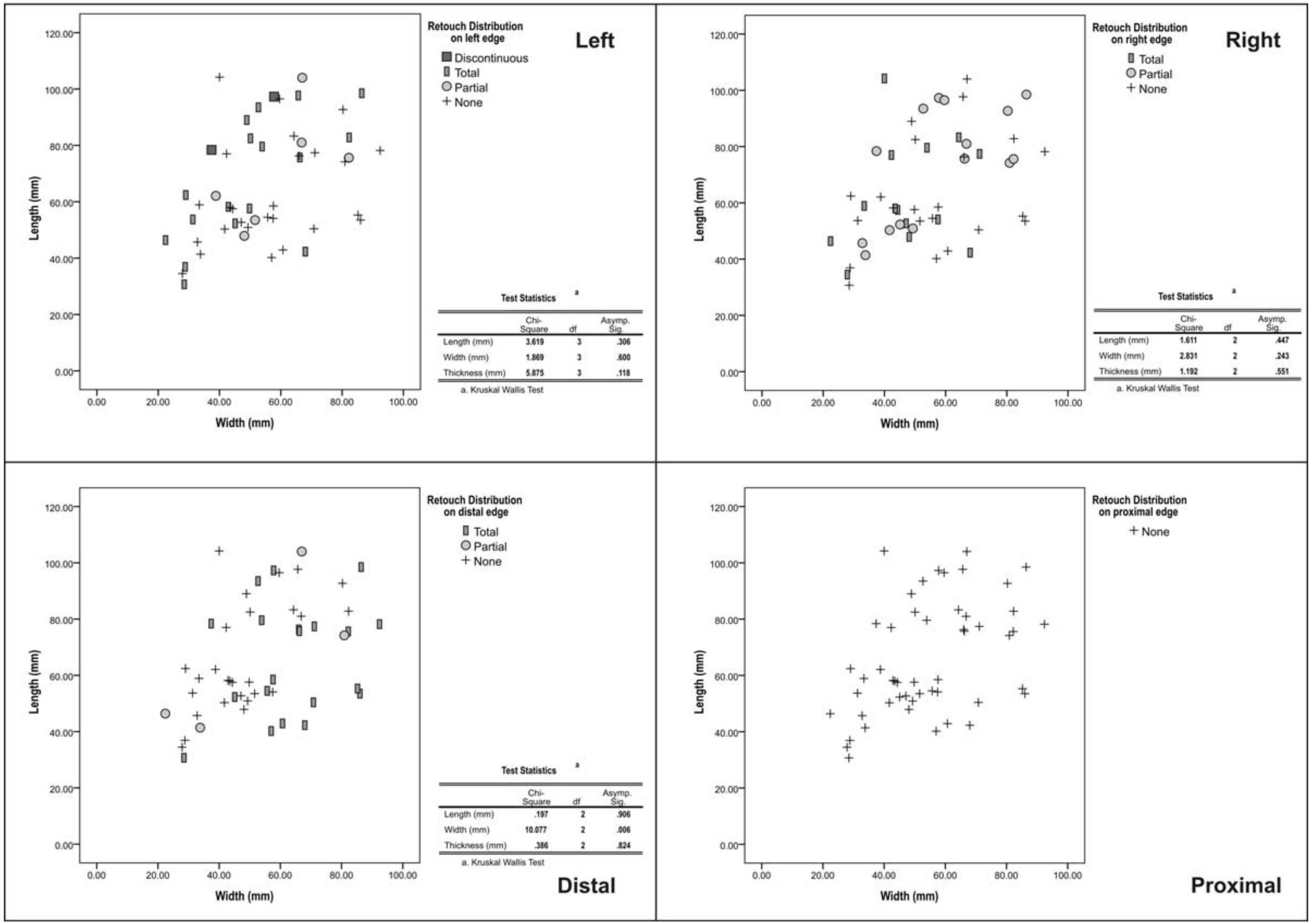


Figure A2.35: Showing the relationship between flake proportion and retouch distribution for Pontnewydd Cave.

Retouch Position

Figure A2.36 (below) shows the relationship between flake proportion and retouch position. There appears to be clear preference for a direct style of retouch position whilst inverse retouch has a limited presence within the sample. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch position (figure A2.36) for the left and right edges. However, on the distal edge there would appear to be a relationship between retouch position and flake width (x^2 = 17.580; df = 2; p = 0.000) but not for length or thickness (figure A2.36). This example of statistical significance is likely linked to the reasons given above Therefore I would suggest that figures A2.34, A2.35 and A2.36 do not suggest culturally mediated form imposition on flake tools through secondary retouch.

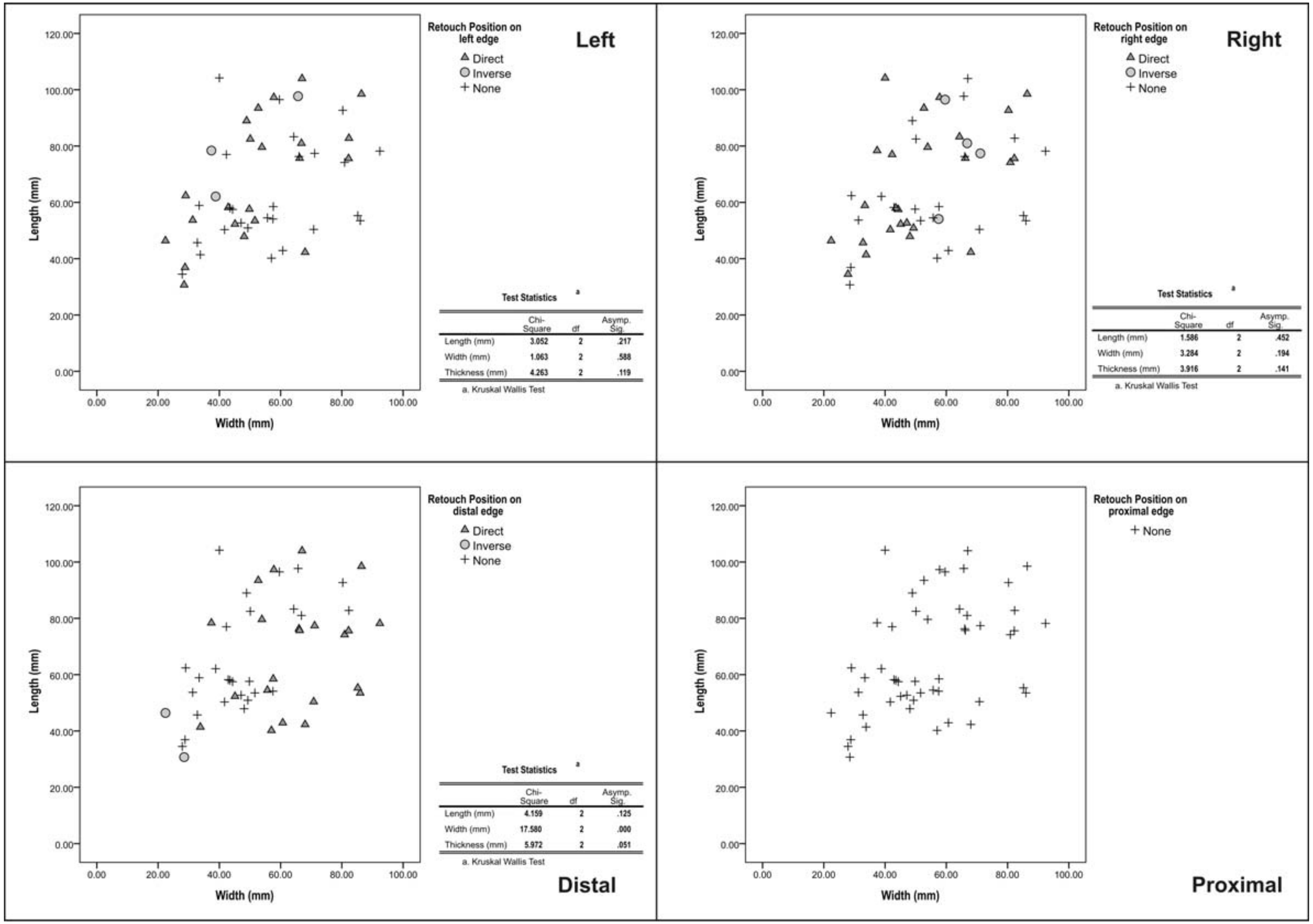


Figure A2.36: Showing the relationship between flake proportion and retouch position for Pontnewydd Cave.

Retouch Extent

Figure A2.37 (below) shows the relationship between flake proportion and retouch extent, where the dominant form retouch extent being short. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch extent (figure A2.37) for the left and right edges. However, on the distal edge there would appear to be a relationship between retouch position and flake width (x^2 = 8.446; df = 1; p = 0.004) but not for length or thickness (figure A2.37). Short retouch is not invasive across the surface of the flake and is limited to edge manipulation only. Therefore I would propose that the pattern of retouch extent seen in figure A2.37 supports the idea that deliberate form imposition through secondary working and in terms of artefact aesthetic is not present within the Pontnewydd Cave assemblage. The retouch would appear to be functional in character and limited to edge modification that mirrors the shape of the original edge (personal observation), rather than deliberately changing it to a different preconceived form.

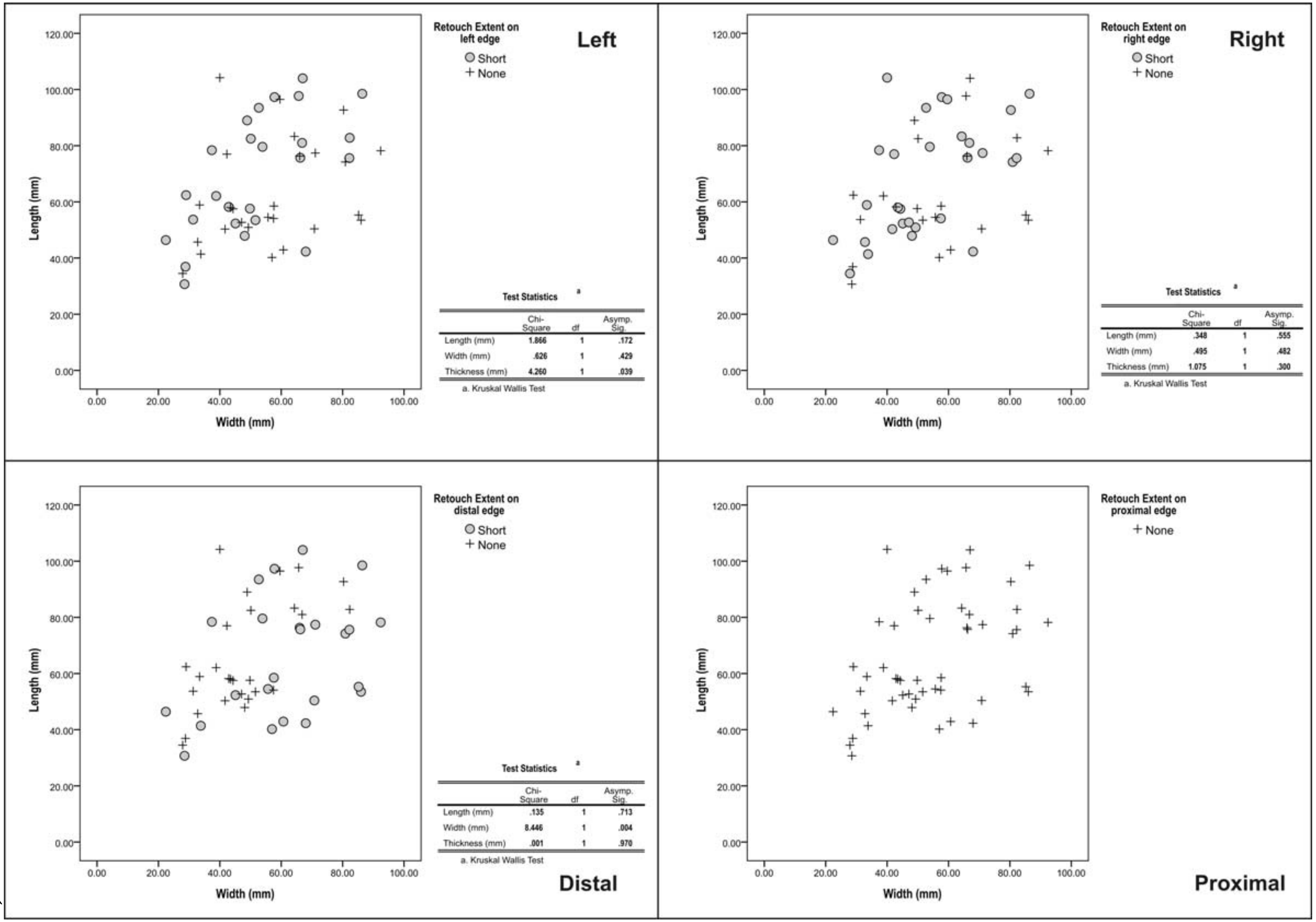


Figure A2.37: Showing the relationship between flake proportion and retouch extent for Pontnewydd Cave.

Conclusion

Given that there are many types of raw material present at Pontnewydd Cave, tests regarding artefact proportion and flaking technology would suggest that the varied range of raw material did not play an adverse role on artefact production. From examining the detached pieces where retouch was present (a very limited sample), it would appear that there are no patterns reflecting a specific retouched tool form, however I stress that given the extremely limited sample size, it is difficult to ascertain whether this is a genuine reflections of tool making (Non-PCT and PCT) in general. The comparatively small component of retouched tools verses unretouched flakes would also indicate that either hominins curated retouched tools and transported them around the landscape, or that retouched tools were produced as and when a need arose, with the majority of needs being met by unretouched flakes. The standardisation of tool form through PCT (PCT flake predominantly being radial in nature) is not necessarily culturally significant standardisation, but given the lack of specific secondary form imposition through retouch, it is more likely a result of manufacturing technique. There would appear to be no degree of standardisation in terms of flake proportion for both retouched and unretouched flakes from Non-PCT and PCT manufacturing.

Cores

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. As expected for an MIS 7 dated site, the Pontnewydd Cave assemblage displays evidence for PCT and Non- PCT cores (table A2.72).

		Artefact Type	
		Core	
Non-PCT Core - Generic Type	A1 - Alternate	1	*3.3%*
	A2 - Alternate and Parallel	3	*10.0%*
	A3 - Parallel single platform	4	*13.3%*
	A4 - Parallel multiple platform	0	*.0%*
	A5 - Single	16	*53.3%*
	A6 - Mixture of A1 - A5	4	*13.3%*
	A7 - Other non-PCT	2	*6.7%*
	Total	**30**	***100.0%***
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	1	*3.4%*
	B2 - Discoid	14	*48.3%*
	B3 - Other	14	*48.3%*
	Total	**29**	***100.0%***
PCT Core Type	C1- Radial	16	*94.1%*
	C2 - Convergent	0	*.0%*
	C3 - Parallel / laminar	0	*.0%*
	C3a - Simple prepared cores	0	*.0%*
	C4 - Other	1	*5.9%*
	Total	**17**	***100.0%***

Total N = 76

Table A2.72: Showing the relationship between Core Type and Artefact Type for Pontnewydd Cave.

Table A2.72 shows that there are 76 unbroken cores in total from Pontnewydd Cave. The cores would not appear to be restricted to a particular type of reduction sequence, although there would seem to be a preference for radial preferential removals in the PCT cores (a pattern reflected in the PCT flakes). In terms of examining the cores of the Pontnewydd Cave assemblage for any form of standardisation in artefact proportion, figures A2.38, A2.39 and A2.40 below shows the relationship between length, width and the Pontnewydd Cave cores.

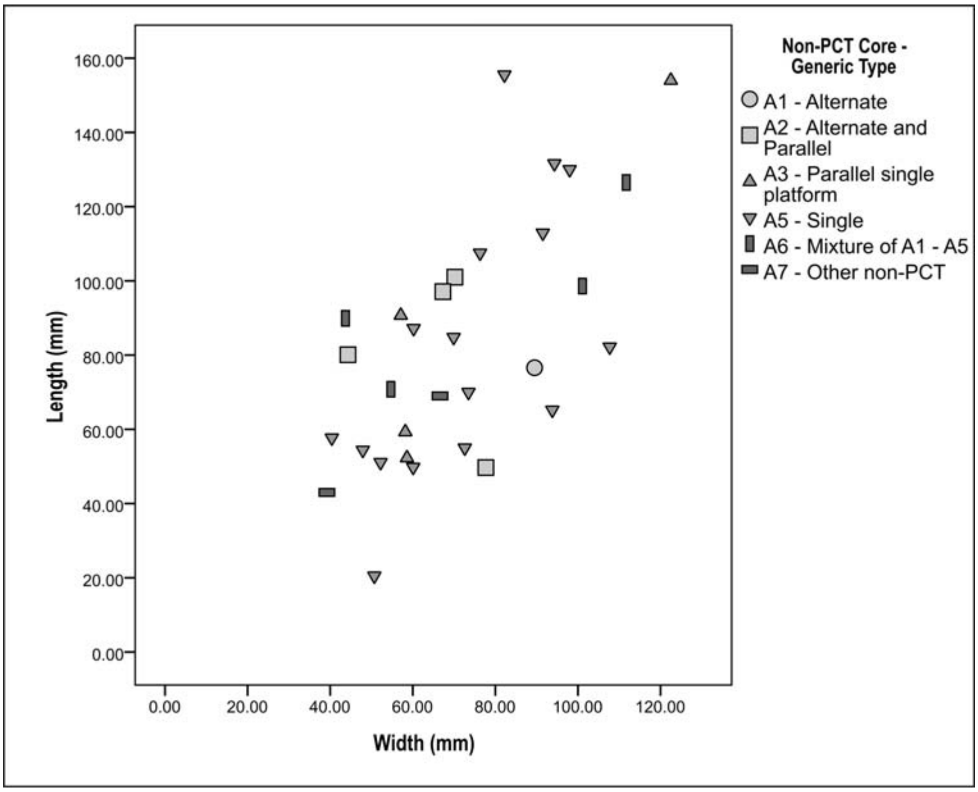


Figure A2.38: Showing the relationship between artefact proportion and Non-PCT Generic cores for Pontnewydd Cave.

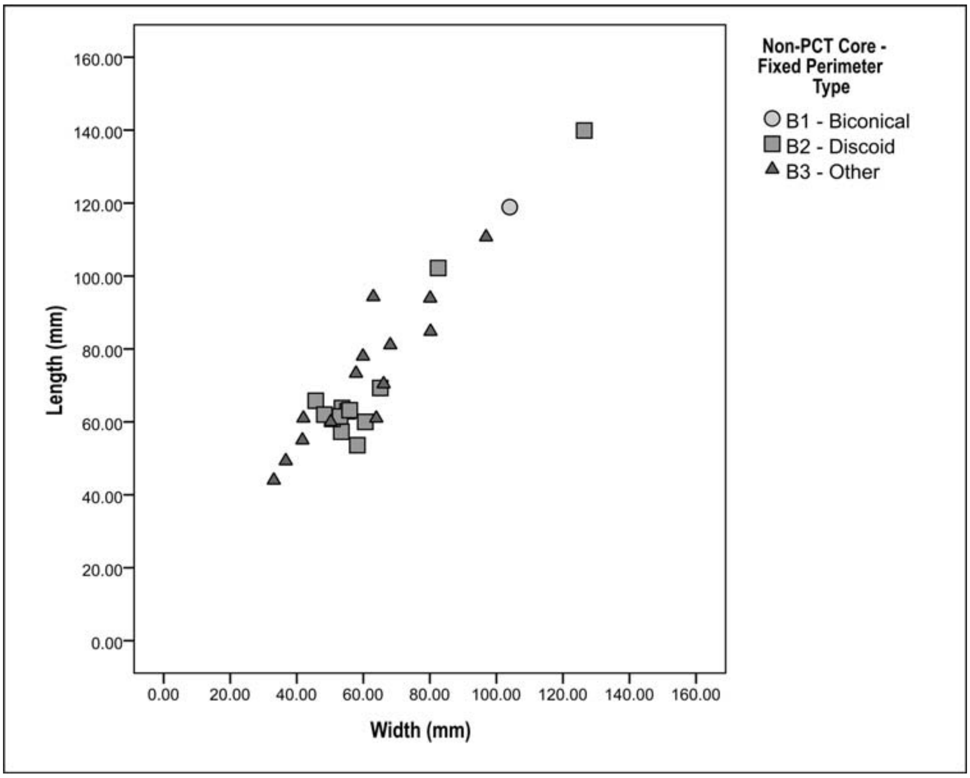


Figure A2.39: Showing the relationship between artefact proportion and Non-PCT fixed perimeter cores for Pontnewydd Cave.

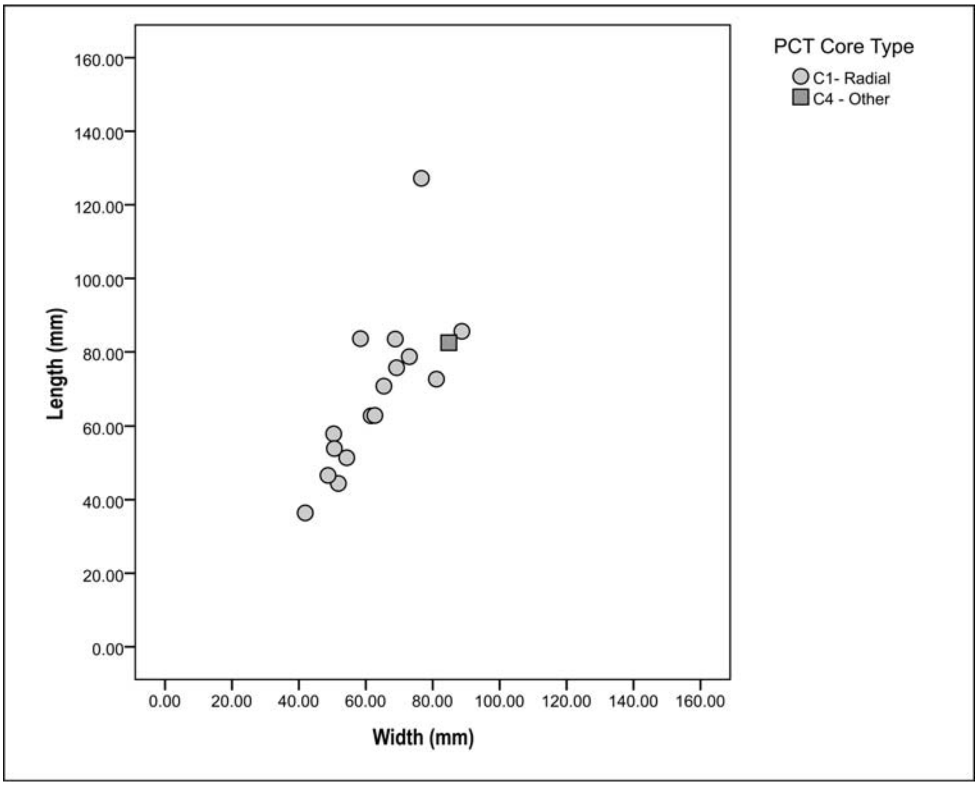


Figure A2.40: showing the relationship between artefact proportion and PCT cores for Pontnewydd Cave.

From figures A2.38 – A2.40 it would seem that all non-PCT generic cores and PCT cores are being reduced and discarded through a whole range artefact proportions. This in turn would indicate that there is no predetermined or socially significant standard to which these core types are being worked. Rather the core pattern would seem to support the conclusions from the flake analysis where flakes and cores are worked through opportunistic knapping to fulfil a specific need at a specific time, and then being discarded. However, the non-PCT fixed margin cores would suggest that the majority of discoid cores are being reduced to a very specific size irrespective of raw material type (figure A2.41), possibly hinting at a culturally imposed standard of discoid working.

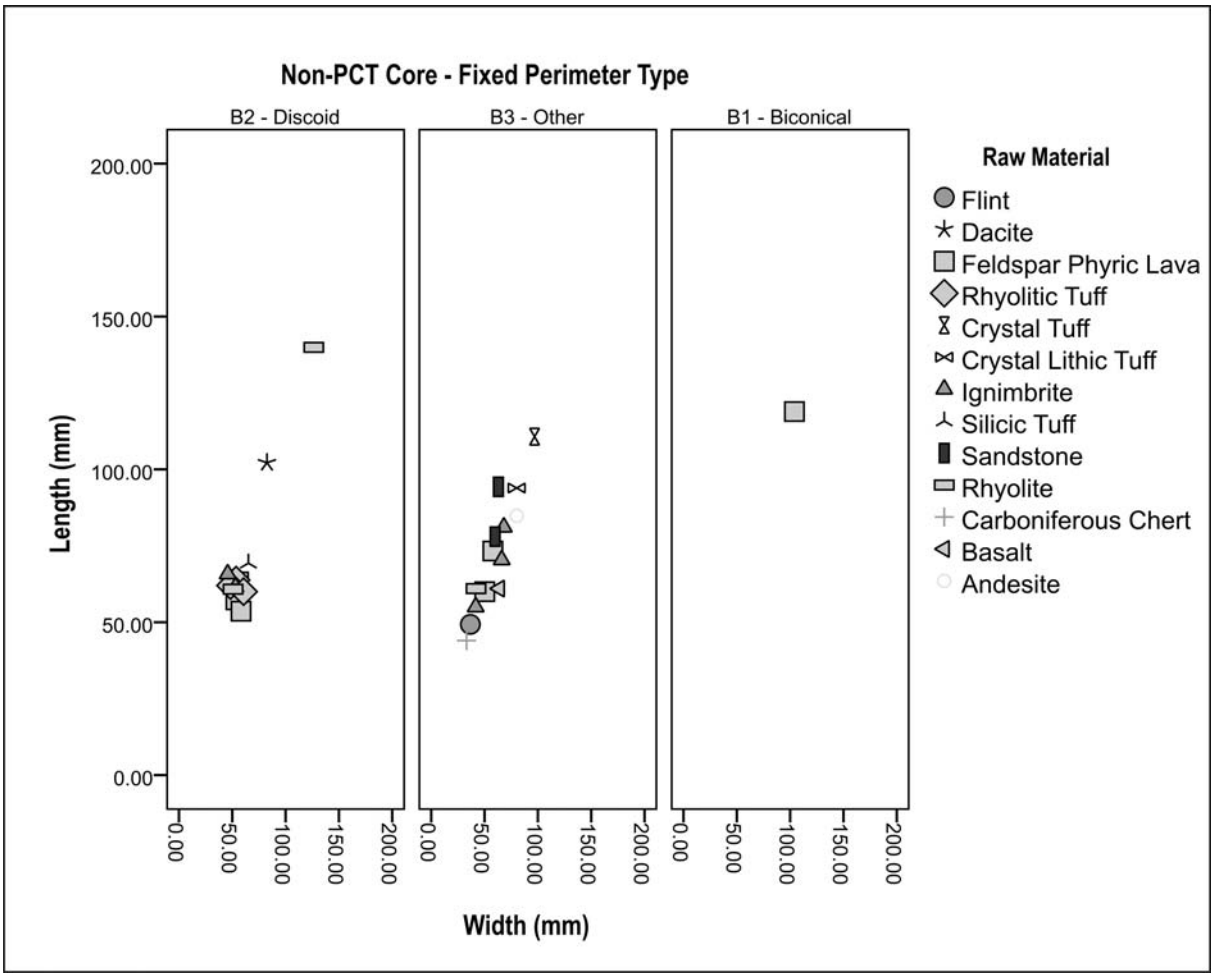


Figure A2.41: showing the relationship between artefact proportion, Non-PCT fixed Perimeter Type and Raw Material for Pontnewydd Cave.

<u>*Conclusion*</u>

The artefacts from Pontnewydd as a whole would seem to indicate a lack of standardisation in working, proportion and reduction. Furthermore, raw material does not seem to have played an adverse role in artefact production.

Cuxton – Tester Collection

The site history and details for Cuxton can be found in Chapter 6. As mentioned above, a total of 730 artefacts were examined from the Cuxton Tester excavations (Tester 1965). The artefacts were knapped from flint and shall be analysed and treated as a general sample from MIS 7, even though the artefacts were excavated from a number of test pits and trenches all seem to have originated from the same gravel layer (Tester 1965). Table A2.73 shows the breakdown of artefact type and site subdivisions for all artefacts examined from the Tester Collection.

		Site Sub-dividsion								
		Spoil Heap	T.H.	TR 1	TR 2	TR 3	TR 4	TR 5	Unknown	**Total**
Artefact Type	LCT	0	1	52	62	7	121	1	1	**245**
	Flake	1	0	32	71	23	181	4	41	**353**
	Flake tool	0	0	2	4	5	37	3	3	**54**
	Debitage	0	0	1	3	1	9	0	33	**47**
	Core	0	0	8	2	4	11	3	2	**30**
	Unclear	0	0	0	0	1	0	0	0	**1**
	Total	**1**	**1**	**95**	**142**	**41**	**359**	**11**	**80**	**730**

Table A2.73: Showing the relationship between artefact type and site sub-division for Cuxton.

As stated above, the artefacts from the Cuxton Tester Collection probably all originated from the gravels, and as such, as is appropriate in terms of the scale for this thesis, I shall examine the Cuxton Tester Collection as a general example of an MIS 7 assemblage including all unbroken artefacts from all areas of the site, even where their exact provenance is unknown. Table A2.74 shows the relationship between artefact type, site sub-division and completeness.

				Artefact Type						
				LCT	Flake	Flake tool	Debitage	Core	Unclear	**Total**
Site Sub-dividsion	Spoil Heap	Completeness	Unbroken	0	1	0	0	0	0	**1**
			Broken	0	0	0	0	0	0	**0**
			Total	**0**	**1**	**0**	**0**	**0**	**0**	**1**
	T.H.	Completeness	Unbroken	1	0	0	0	0	0	**1**
			Broken	0	0	0	0	0	0	**0**
			Total	**1**	**0**	**0**	**0**	**0**	**0**	**1**
	TR 1	Completeness	Unbroken	40	28	1	1	8	0	**78**
			Broken	12	4	1	0	0	0	**17**
			Total	**52**	**32**	**2**	**1**	**8**	**0**	**95**
	TR 2	Completeness	Unbroken	42	59	3	3	2	0	**109**
			Broken	20	12	1	0	0	0	**33**
			Total	**62**	**71**	**4**	**3**	**2**	**0**	**142**
	TR 3	Completeness	Unbroken	6	18	3	1	3	1	**32**
			Broken	1	5	2	0	1	0	**9**
			Total	**7**	**23**	**5**	**1**	**4**	**1**	**41**
	TR 4	Completeness	Unbroken	95	164	32	8	11	0	**310**
			Broken	26	17	5	1	0	0	**49**
			Total	**121**	**181**	**37**	**9**	**11**	**0**	**359**
	TR 5	Completeness	Unbroken	1	3	3	0	2	0	**9**
			Broken	0	1	0	0	1	0	**2**
			Total	**1**	**4**	**3**	**0**	**3**	**0**	**11**
	Unknown	Completeness	Unbroken	1	29	3	26	2	0	**61**
			Broken	0	12	0	7	0	0	**19**
			Total	**1**	**41**	**3**	**33**	**2**	**0**	**80**
	Total	Completeness	Unbroken	186	302	45	39	28	1	**601**
			Broken	59	51	9	8	2	0	**129**
			Total	**245**	**353**	**54**	**47**	**30**	**1**	**730**

Table A2.74: Showing the relationship between artefact type, site sub-division and completeness for Cuxton.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed from the Cuxton Tester Collection 601. Table A2.75 shows the relationship between artefact type, site sub-division and condition.

Site Sub-dividsion			Artefact Type													
			LCT		Flake		Flake tool		Debitage		Core		Unclear		**Total**	
Spoil Heap		Abraded	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
		Fresh	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
		Lightly Abraded	0	*.0%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**1**	***.2%***
		Total	**0**	***.0%***	**1**	***.2%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**1**	***.2%***
	T.H.	Abraded	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
		Fresh	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
		Lightly Abraded	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**1**	***.2%***
		Total	**1**	***.2%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**0**	***.0%***	**1**	***.2%***
	TR 1	Abraded	2	*.3%*	2	*.3%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**4**	***.7%***
		Fresh	18	*3.0%*	2	*.3%*	0	*.0%*	0	*.0%*	1	*.2%*	0	*.0%*	**21**	***3.5%***
		Lightly Abraded	20	*3.3%*	24	*4.0%*	1	*.2%*	1	*.2%*	7	*1.2%*	0	*.0%*	**53**	***8.8%***
		Total	**40**	***6.7%***	**28**	***4.7%***	**1**	***.2%***	**1**	***.2%***	**8**	***1.3%***	**0**	***.0%***	**78**	***13.0%***
	TR 2	Abraded	2	*.3%*	2	*.3%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**4**	***.7%***
		Fresh	16	*2.7%*	7	*1.2%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**23**	***3.8%***
		Lightly Abraded	24	*4.0%*	50	*8.3%*	3	*.5%*	3	*.5%*	2	*.3%*	0	*.0%*	**82**	***13.6%***
		Total	**42**	***7.0%***	**59**	***9.8%***	**3**	***.5%***	**3**	***.5%***	**2**	***.3%***	**0**	***.0%***	**109**	***18.1%***
	TR 3	Abraded	1	*.2%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**2**	***.3%***
		Fresh	0	*.0%*	2	*.3%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**2**	***.3%***
		Lightly Abraded	5	*.8%*	15	*2.5%*	3	*.5%*	1	*.2%*	3	*.5%*	1	*.2%*	**28**	***4.7%***
		Total	**6**	***1.0%***	**18**	***3.0%***	**3**	***.5%***	**1**	***.2%***	**3**	***.5%***	**1**	***.2%***	**32**	***5.3%***
	TR 4	Abraded	2	*.3%*	5	*.8%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	**8**	***1.3%***
		Fresh	35	*5.8%*	27	*4.5%*	7	*1.2%*	1	*.2%*	1	*.2%*	0	*.0%*	**71**	***11.8%***
		Lightly Abraded	58	*9.7%*	132	*22.0%*	24	*4.0%*	7	*1.2%*	10	*1.7%*	0	*.0%*	**231**	***38.4%***
		Total	**95**	***15.8%***	**164**	***27.3%***	**32**	***5.3%***	**8**	***1.3%***	**11**	***1.8%***	**0**	***.0%***	**310**	***51.6%***
	TR 5	Abraded	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
		Fresh	0	*.0%*	0	*.0%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	**1**	***.2%***
		Lightly Abraded	1	*.2%*	3	*.5%*	2	*.3%*	0	*.0%*	2	*.3%*	0	*.0%*	**8**	***1.3%***
		Total	**1**	***.2%***	**3**	***.5%***	**3**	***.5%***	**0**	***.0%***	**2**	***.3%***	**0**	***.0%***	**9**	***1.5%***
	Unknown	Abraded	0	*.0%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	0	*.0%*	**1**	***.2%***
		Fresh	0	*.0%*	4	*.7%*	1	*.2%*	3	*.5%*	0	*.0%*	0	*.0%*	**8**	***1.3%***
		Lightly Abraded	1	*.2%*	24	*4.0%*	2	*.3%*	23	*3.8%*	2	*.3%*	0	*.0%*	**52**	***8.7%***
		Total	**1**	***.2%***	**29**	***4.8%***	**3**	***.5%***	**26**	***4.3%***	**2**	***.3%***	**0**	***.0%***	**61**	***10.1%***
	Total	Abraded	7	*1.2%*	11	*1.8%*	1	*.2%*	0	*.0%*	0	*.0%*	0	*.0%*	**19**	***3.2%***
		Fresh	69	*11.5%*	42	*7.0%*	9	*1.5%*	4	*.7%*	2	*.3%*	0	*.0%*	**126**	***21.0%***
		Lightly Abraded	110	*18.3%*	249	*41.4%*	35	*5.8%*	35	*5.8%*	26	*4.3%*	1	*.2%*	**456**	***75.9%***
		Total	**186**	***30.9%***	**302**	***50.2%***	**45**	***7.5%***	**39**	***6.5%***	**28**	***4.7%***	**1**	***.2%***	**601**	***100.0%***

Table A2.75: Showing the relationship between artefact type, site sub-division and condition for Cuxton.

Table A2.75 shows that the majority of unbroken artefacts from the Cuxton Tester Collection are classified as lightly abraded (75.9%), fresh (20.9%) and finally a small minority classed as abraded (3.2%). This pattern of condition would suggest that the majority of the Cuxton artefacts were exposed to a small to limited amount of post-depositional movement, with only a very small minority that had moved significantly to become abraded. Therefore based on condition, I think it would be valid to examine the unbroken artefacts from Cuxton as a single assemblage, in the broader context of MIS 7.

I shall now examine the more specific elements to the Cuxton Tester Collection by looking at the LCTs, Flakes, Flake Tools and Cores in greater depth.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. From table A2.75 above it can be seen that there are 186 unbroken LCTs from the Cuxton Tester Collection predominantly in a lightly abraded and fresh condition with 7 which are abraded. As mentioned above, all the artefacts are knapped from flint. In order to assess the imposition of form and symmetry upon the LCTs from the Cuxton Tester Collection, table A2.76 shows the relationship between tip shape and symmetry.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	1.6%	3.2%	3.2%	.5%	.0%	8.1%	.0%	.5%	**17.2%**
	Convergent with a Square Tip	.0%	.5%	.5%	.0%	.0%	3.2%	.0%	.0%	**4.3%**
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	.0%	4.3%	.5%	.0%	**4.8%**
	Convergent with a Generalised Tip	.5%	1.1%	11.8%	.0%	1.6%	41.4%	1.1%	.5%	**58.1%**
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	2.7%	.0%	.0%	**2.7%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	1.6%	.0%	.0%	**1.6%**
	Wide with Convex Tip	.5%	.5%	1.6%	.0%	.0%	5.9%	.5%	.0%	**9.1%**
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	2.2%	.0%	.0%	**2.2%**
	Total	**2.7%**	**5.4%**	**17.2%**	**.5%**	**1.6%**	**69.4%**	**2.2%**	**1.1%**	**100.0%**

Total N = 186

Table A2.76: Showing the relationship between Tip Shape and Symmetry by Eye for Cuxton.

From table A2.76 it is clear that the hominins from Cuxton did not place a high significance on absolute LCT symmetry (only 2.7% of the assemblage described as symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 26.4% of the LCTs in table A2.76 display evidence for tip symmetry. However, as 23.4% of LCTs with a symmetrical element to their tip form also have a convergent element, the degree of symmetry present within tip form is probably a result of producing a convergent tip, rather than a genuine and conscious imposition of symmetry. The overwhelming component of non-symmetrical (69.4%), and non-symmetrical tip shape (4.3 %) would reinforce the initial observation that symmetry did not play a significant role in LCT production for in the Cuxton Tester Collection. However, in regards to tip shape there would appear to be an overall tendency for convergent tips over other types possibly hinting at a deliberate preference for a particular tip form being imposed on the LCTs.

Figures A2.42 below examines the relationship between symmetry and artefact proportion.

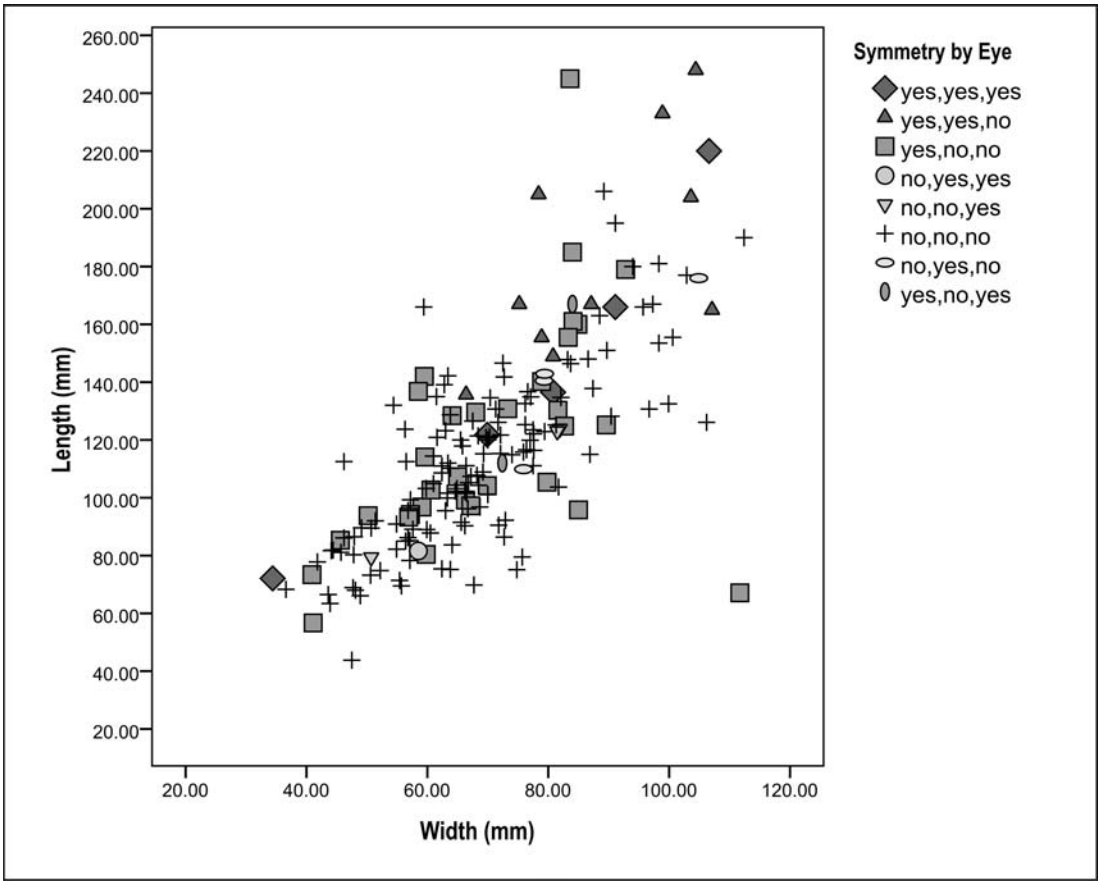


Figure A2.42: Showing the relationship between LCT proportion and symmetry for Cuxton.

Figure A2.42 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. Furthermore, figure A2.42shows that symmetry categories are not clustered in particular proportions but rather scattered through the range of artefact proportions. This would suggest that symmetry and LCT proportion have no significant relationship for the Cuxton Tester Collection. However, a Kruskal Wallis H Test (Ebdon 1977:68) suggests that there is a statistically significant relationship (to 0.05 significance) between symmetry and length (x^2 = 29.369; df = 7; p = 0.000), width (x^2 = 19.144; df = 7; p = 0.008), but not thickness (x^2 = 10.011; df = 7; p = 0.188). From figure A2.42, it can be seen that the larger the LCT (+140.00mm), the more symmetry appears to be present within LCT form. This could suggest that the larger the artefact, the easier it was for the hominins of Cuxton to impose an aspect of symmetry to the original blank.

Figure A2.43 shows the relationship between tip shape and artefact proportion.

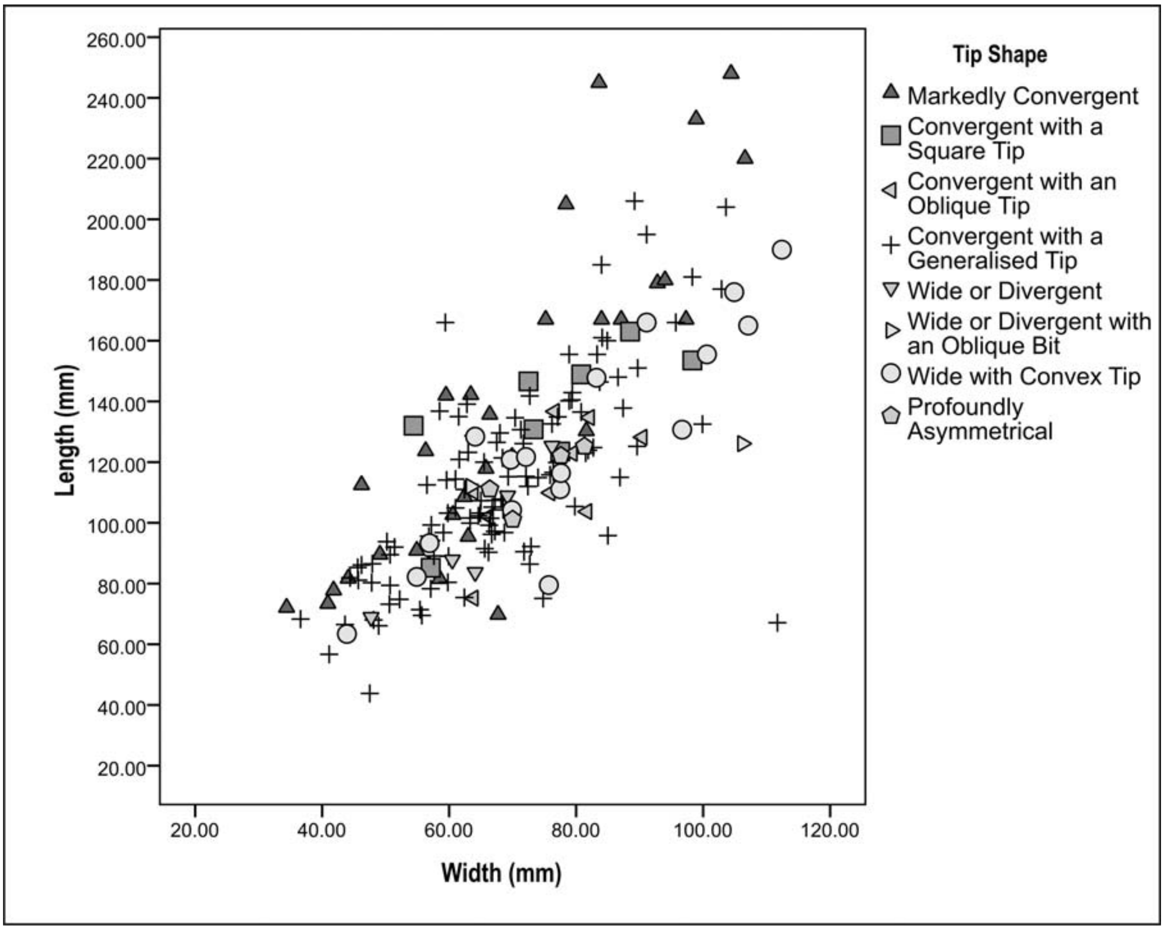


Figure A2.43: Showing the relationship between LCT proportion and tip shape for Cuxton.

Figure A2.43 shows that there would appear to be no definitive relationships between artefact proportion and tip shape. A Kruskal Wallis H Test (Ebdon 1977:68) seems to confirm that there is no statistically significant relationship (to 0.05 significance) between observed tip shape and length (x^2 = 10.821; df = 7; p = 0.147), width (x^2 = 10.581; df = 7; p = 0.158) or thickness (x^2 = 8.006; df = 7; p = 0.332). Therefore from figures A2.42 and A2.43, it would seem that there is no clear relationship between LCT proportion and tip shape, although symmetry may be linked to LCT size. In regards to standardisation of form imposition and artefact size, I would suggest that there is no obvious relationship that emerges although it is interesting to note that the larger the LCT, the more convergent the tip shape, and the more symmetry is present within the LCT form. Therefore, the patterns of symmetry may well be linked to the knapping of a convergent tip shape, rather than through deliberate design.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of the Cuxton Tester Collection (table A2.77).

		Flaking Extent Second Face					
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	5.9%	.5%	5.9%	2.7%	9.1%	**24.2%**
	Complete Marginal	.5%	.0%	.0%	.5%	1.1%	**2.2%**
	Partial Marginal	1.6%	.5%	16.1%	1.1%	3.2%	**22.6%**
	Partial	1.6%	.0%	4.8%	4.3%	3.8%	**14.5%**
	Substantial	2.7%	1.6%	6.5%	9.1%	16.7%	**36.6%**
	Total	**12.4%**	**2.7%**	**33.3%**	**17.7%**	**33.9%**	**100.0%**

Total N = 186

Table A2.77: Showing the relationship between Flaking Extent of the first and second LCT face for Cuxton.

From table A2.77 it can be seen that the hominins from Cuxton did not have a preferred initial flaking strategy. Interestingly the two sides of the LCTs often seem to be knapped in different ways, with the first face having more LCTs that are worked in a complete fashion than the second face, and less LCTs that are worked in a partial fashion. Therefore, it would seem that the patterns of secondary working support the idea that there are no clear patterns of standardisation in shaping and thinning within the LCTs from the Cuxton Tester Collection.

A relative index of edge working extent was described in Chapter 5 and applied to symmetry in table A2.78 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	.5%	.5%	1.6%	.0%	**2.7%**
	yes,yes,no	.5%	3.2%	1.6%	.0%	**5.4%**
	yes,no,no	9.1%	8.1%	.0%	.0%	**17.2%**
	no,yes,yes	.5%	.0%	.0%	.0%	**.5%**
	no,no,yes	.5%	.5%	.5%	.0%	**1.6%**
	no,no,no	47.8%	18.3%	3.2%	.0%	**69.4%**
	no,yes,no	.5%	1.6%	.0%	.0%	**2.2%**
	yes,no,yes	.5%	.5%	.0%	.0%	**1.1%**
	Total	**60.2%**	**32.8%**	**7.0%**	**.0%**	**100.0%**

Total N = 186

Table A2.78: Showing the relationship between Symmetry and Edge Working for Cuxton.

From table A2.78 it can be seen that the majority of LCTs have an overall low amount of edge working (60.2% at 12 – 24 and 32.8% at 25 -36). This is possibly due to the fact that edge working does not seem to be significant factor in LCT production for this assemblage. Tables A2.79 shows the relationship between tip shape and edge working.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Tip Shape	Markedly Convergent	9.7%	4.8%	2.7%	.0%	**17.2%**
	Convergent with a Square Tip	2.2%	2.2%	.0%	.0%	**4.3%**
	Convergent with an Oblique Tip	2.2%	2.2%	.5%	.0%	**4.8%**
	Convergent with a Generalised Tip	38.7%	16.1%	3.2%	.0%	**58.1%**
	Wide or Divergent	2.2%	.5%	.0%	.0%	**2.7%**
	Wide or Divergent with an Oblique Bit	.5%	1.1%	.0%	.0%	**1.6%**
	Wide with Convex Tip	3.8%	4.8%	.5%	.0%	**9.1%**
	Profoundly Asymmetrical	1.1%	1.1%	.0%	.0%	**2.2%**
	Total	**60.2%**	**32.8%**	**7.0%**	**.0%**	**100.0%**

Total N = 186

Table A2.79: Showing the relationship between Tip Shape and Edge Working for the fresh assemblage for Cuxton.

Table A2.79 shows that the degree of edge working is not dependent on particular tip shape other than there is a low extent of edge working regardless of tip shape and symmetry imposition (table A2.78). This would seem to support the general conclusion that there does not appear to be any standardised form of working being imposed on the LCTs at Cuxton.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry (apart from a possible correlation of symmetry and the larger LCTs from the assemblage) or form through tip shape, flaking extent or edge working on the LCTs present within the Cuxton Tester Collection. Although the majority of tip shapes are convergent, given the low degree of edge working in relation to convergent tip shape it is unlikely that this can be seen as culturally / socially significant in nature. This form imposition is probably linked to tool use and / or original blank form. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form for this Acheulean site, rather given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Flint is the only raw material type present in the Cuxton Tester Collection. Flint is well a known raw material for its knapping versatility and therefore is unlikely to adversely limit artefact symmetry or form imposition beyond original blank size.

<u>*Flake and Flake Tool Analysis*</u>

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. In order to get an understanding on the number of detached pieces recorded from the Cuxton Tester Collection, table A2.80 shows the breakdown of unbroken flakes and flake tools in relation to the flake types described in Chapter 5.

		Artefact Type							
		Flake		Flake tool		Debitage		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	3	*.8%*	0	*.0%*	**3**	***.8%***
	R2 - Denticulated scraper	0	*.0%*	4	*1.0%*	0	*.0%*	**4**	***1.0%***
	R3 - Side scraper	0	*.0%*	5	*1.3%*	0	*.0%*	**5**	***1.3%***
	R4 - End / Traverse scraper	0	*.0%*	4	*1.0%*	0	*.0%*	**4**	***1.0%***
	R5 - Flake with scraper retouch	0	*.0%*	6	*1.6%*	0	*.0%*	**6**	***1.6%***
	R6 - Scraper used as wedge	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R7 - Retouched point (awl)	0	*.0%*	3	*.8%*	0	*.0%*	**3**	***.8%***
	R8 - Retouched point (projectile)	0	*.0%*	1	*.3%*	0	*.0%*	**1**	***.3%***
	R9 - Retouched notch	0	*.0%*	2	*.5%*	0	*.0%*	**2**	***.5%***
	R10 - Retouch non diagnostic	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R12 - Multiple tool	0	*.0%*	6	*1.6%*	0	*.0%*	**6**	***1.6%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	0	*.0%*	0	*.0%*	**0**	***.0%***
	R14 - Utilised flake with no retouch	0	*.0%*	3	*.8%*	0	*.0%*	**3**	***.8%***
	R15 - Flake with edge damage	282	*73.1%*	8	*2.1%*	15	*3.9%*	**305**	***79.0%***
	R16 - Flake with no retouch	20	*5.2%*	0	*.0%*	24	*6.2%*	**44**	***11.4%***
	Total	**302**	***78.2%***	**45**	***11.7%***	**39**	***10.1%***	**386**	***100.0%***

Table A2.80: Showing the breakdown between flakes and flake tools in relation to flake type for Cuxton.

As can be seen there are far more flakes than flake tools present within the unbroken detached artefacts studied from the Cuxton Tester Collection which may suggest three possible explanations, firstly that the hominins did not need to adapt the flakes (through retouch) they were producing for specific tasks on a regular basis, rather preferring to use the unmodified edge of flakes. Secondly, retouch tools were favoured for curation and removed from the site and transported elsewhere whilst unretouched flakes were left at the site of production. A possible third option is that the high degree of edge damage present on the flakes in table A2.80 could potentially mask the presence of retouch on the flakes. In terms of tool type being produced, table A2.80 illustrates that there would not appear to be any dominant tool form or type preferred by the knappers – although this shall be discussed further below in relation to PCT flaking. The debitage pieces included in table A2.80 are those that are greater than 20 mm.

Table A2.81 shows the relationship between flake type and Toth type (Toth 1985) illustrating that Toth types 2, 3, 4, 5 and 6 are present within the Cuxton Tester

Collection unbroken flake assemblage. Of particular dominance is Toth type 5 (some cortex on the dorsal) at 71.8% of the flakes and flake tools. This would suggest that the majority of the detached pieces from Cuxton come from cores that were toward the end of the reduction sequence, but not in the final stages of reduction.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	.0%	.0%	.0%	.8%	.0%	**.8%**
	R2 - Denticulated scraper	.0%	.0%	.0%	.0%	1.0%	.0%	**1.0%**
	R3 - Side scraper	.0%	.0%	.0%	.0%	1.0%	.3%	**1.3%**
	R4 - End / Traverse scraper	.0%	.0%	.0%	.0%	1.0%	.0%	**1.0%**
	R5 - Flake with scraper retouch	.0%	.5%	.0%	.0%	1.0%	.0%	**1.6%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	.0%	.3%	.0%	.0%	.5%	.0%	**.8%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	.0%	.0%	.3%	**.3%**
	R9 - Retouched notch	.0%	.0%	.0%	.0%	.5%	.0%	**.5%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	.0%	.0%	.0%	1.3%	.3%	**1.6%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	.0%	.0%	.8%	.0%	**.8%**
	R15 - Flake with edge damage	.0%	8.5%	2.3%	5.2%	57.5%	5.4%	**79.0%**
	R16 - Flake with no retouch	.0%	.5%	.0%	2.1%	6.2%	2.6%	**11.4%**
	Total	**.0%**	**9.8%**	**2.3%**	**7.3%**	**71.8%**	**8.8%**	**100.0%**

Total N = 386

Table A2.81: Showing the relationship between Flake Type and Toth type for Cuxton.

In terms of the technological make up of the Cuxton Tester Collection detached pieces, table A2.82 shows that the assemblage is entirely Non-PCT in nature.

		Flake Technology Type	
		Non-PCT	
Flake Type	R1 - Denticulated edge	3	.8%
	R2 - Denticulated scraper	4	1.0%
	R3 - Side scraper	5	1.3%
	R4 - End / Traverse scraper	4	1.0%
	R5 - Flake with scraper retouch	6	1.6%
	R6 - Scraper used as wedge	0	.0%
	R7 - Retouched point (awl)	3	.8%
	R8 - Retouched point (projectile)	1	.3%
	R9 - Retouched notch	2	.5%
	R10 - Retouch non diagnostic	0	.0%
	R11 - Flaked flake or flaked flake spall (burin)	0	.0%
	R12 - Multiple tool	6	1.6%
	R13 - Unretouched flake used as a wedge	0	.0%
	R14 - Utilised flake with no retouch	3	.8%
	R15 - Flake with edge damage	305	79.0%
	R16 - Flake with no retouch	44	11.4%
	Total	**386**	**100.0%**

Table A2.82: Showing the relationship between flake type and flake technology type for Cuxton.

Table A2.82 further illustrates that there does not seem to be a particular preference for a specific tool type within the Cuxton Tester Collection which may suggest that the hominins were not producing tools to specific form templates, but rather as opportunistic responses to required tasks.

Of the 386 flake tools seen in table A2.82, only 45 are classed as flake tools. Of these 45, only 34 have retouch present on at least one edge (table A2.83).

		Artefact Type			
		Flake	Flake tool	Debitage	**Total**
Retouch present on left edge	Yes	0	14	0	**14**
	No	0	20	0	**20**
	Total	**0**	**34**	**0**	**34**
Retouch present on distal edge	Yes	0	19	0	**19**
	No	0	15	0	**15**
	Total	**0**	**34**	**0**	**34**
Retouch present on right edge	Yes	0	19	0	**19**
	No	0	15	0	**15**
	Total	**0**	**34**	**0**	**34**
Retouch present on proximal edge	Yes	0	1	0	**1**
	No	0	33	0	**33**
	Total	**0**	**34**	**0**	**34**

Table A2.83: Showing the relationship between retouch presence and artefact type for Cuxton.

The following tests below regarding retouch and flake proportion are only conducted on the 34 unbroken detached pieces that have retouch present on at least one of their edges. Although I should stress that from such a small sample any patterns relating to retouch and form imposition must be treated with a degree of caution.

Retouch Delineation

Figure A2.44 (below) shows the relationship between retouch delineation and flake proportion where there would appear to be a reasonable spread of retouch delineation types present within the Cuxton Tester Collection flake tools. Although all flake tool edges display a variety of retouch delineations, there is a clear preference for irregular retouch on the all edges. The proximal edge is characterised by a lack of retouch presence, bar one irregular exception. A Kruskal Wallis H Test (Ebdon 1977:68) shows there is no statistically significant relationship (to 0.05 significance) between flake length, width, or thickness and retouch delineation for the left, right and proximal edges (figure A2.44). The distal edge would seem to have a suggested statistically significant relationship between flake thickness and retouch delineation (x^2 = 14.285; df = 7; p = 0.046), but not for length or width (figure A2.44). However on a sample as small as 34 flake tools with retouch, I question whether there truly is a significant relationship between retouch delineation and flake thickness. Irregular retouch is an unstructured form of retouch and probably related to the knapper following the shape of the original flake edge rather than imposing any particular form of their own. Therefore I would suggest that there is no clear evidence for form imposition on flake tools through retouch delineation but rather retouch is a result of opportunistic manipulation of the flake edge.

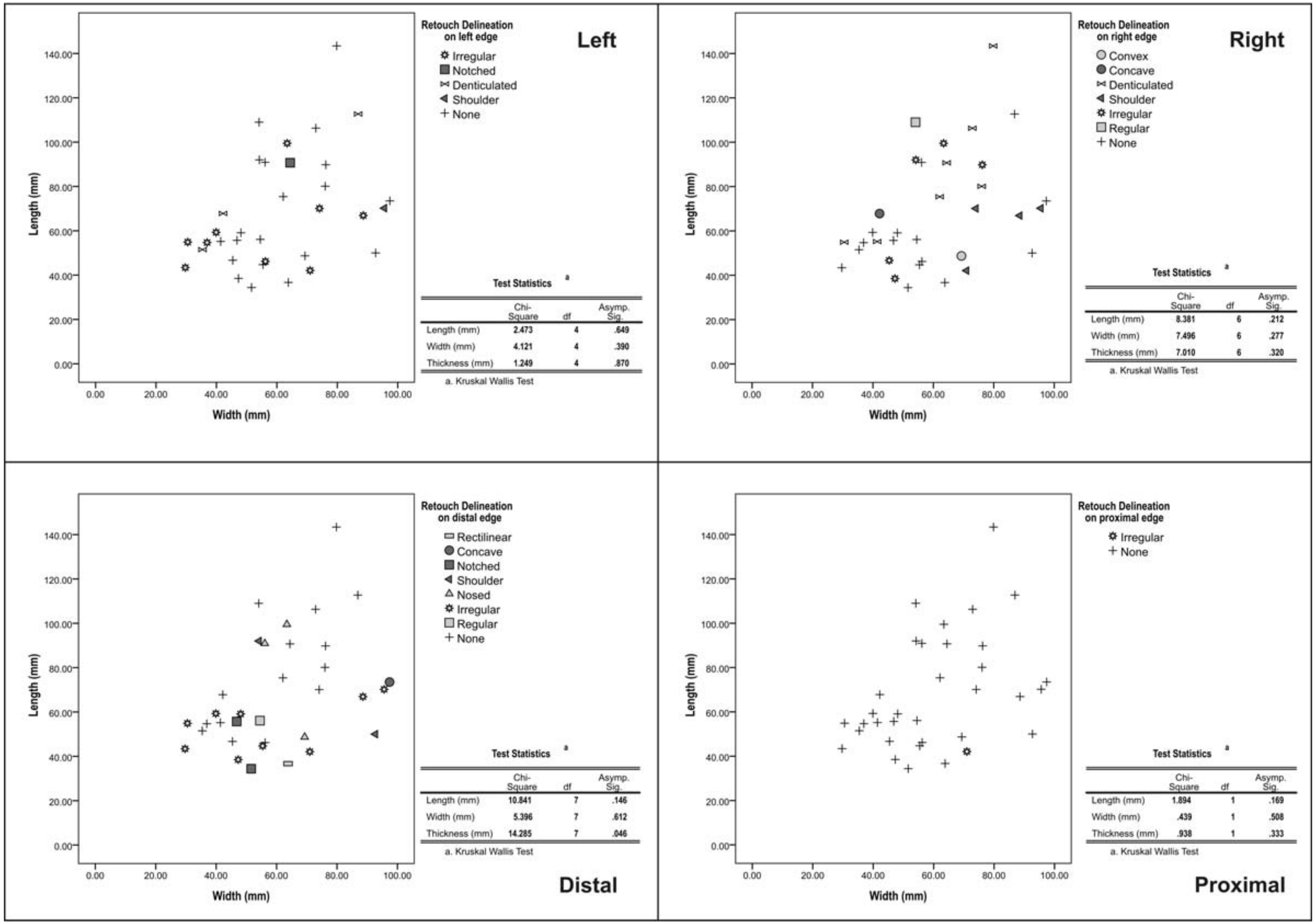


Figure A2.44: Showing the relationship between flake proportion and retouch delineation for Cuxton.

Retouch distribution

Figure A2.45 (below) shows the relationship between flake proportion and retouch distribution. There appears to be clear preference for a total style of retouch distribution on the distal edge whilst the left and right edges are more evenly balanced between partial, total and none. Total retouch implies that the whole of the flake edge had been retouched and may indicate that particular form was being imposed by the knapper through retouch, although the lack of a clearly predominant retouch delineation type in figure A2.44 would suggest that deliberate form is not being imposed on the distal edge, even when retouch is present it is total in nature (figure A2.45). A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch distribution (figure A2.45) for the left, right, distal and proximal edges. Overall, figures A2.44 and A2.45 do not suggest culturally mediated form imposition on flake tools through secondary retouch.

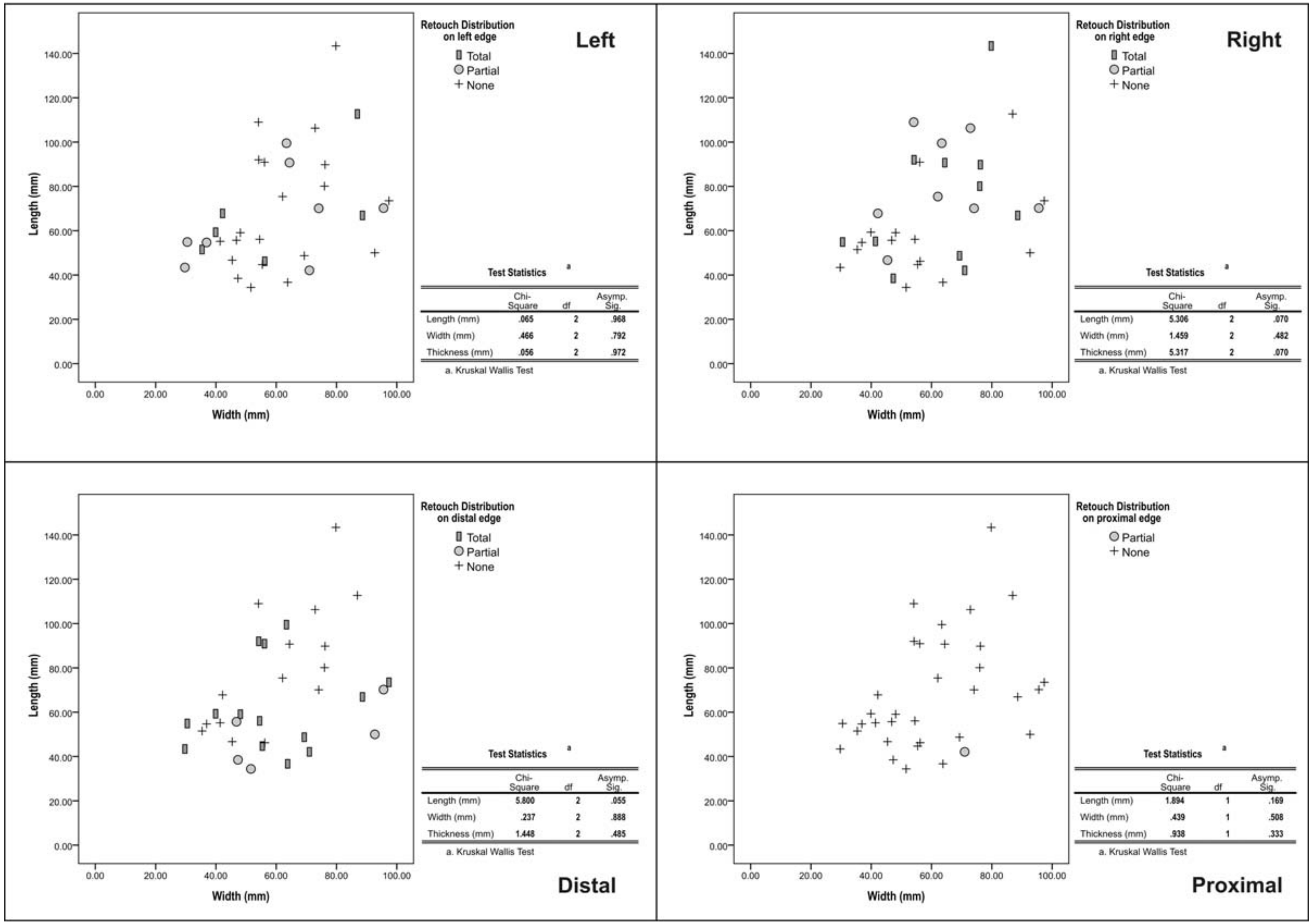


Figure A2.45: Showing the relationship between flake proportion and retouch distribution for Cuxton.

Retouch Position

Figure A2.46 (below) shows the relationship between flake proportion and retouch position. There appears to be clear preference for a direct style of retouch position on all edges whilst inverse and alternating retouch have a limited presence within the sample. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch position (figure A2.46) for the left and right edges. However, on the distal edge there would appear to be a statistically significant relationship between retouch position and flake length (x^2 = 7.054; df = 2; p = 0.029) but not for length or thickness (figure A2.46). I stress again that given the extremely limited sample of 34 artefacts that have retouch present, I wonder how statistically significant the relationship between retouch delineation and flake length may be, however from figure A2.46, it is clear that the shorter, wider flakes (i.e. the flakes with the longest distal edge) have far more examples of direct retouch. Therefore, figures A2.44 – A2.46 would seem to suggest that where retouch is present on the distal edge, there is no preference for retouch delineation, however there is a preference for total and direct retouch. Given that the patterns of retouch distribution would suggest that hominins are exploiting the longest edge of the flake tools being produced through the easiest / least work form of retouch (direct), yet varied delineation type, then I would suggest that form imposition was not culturally motivated, but rather pragmatically motivated.

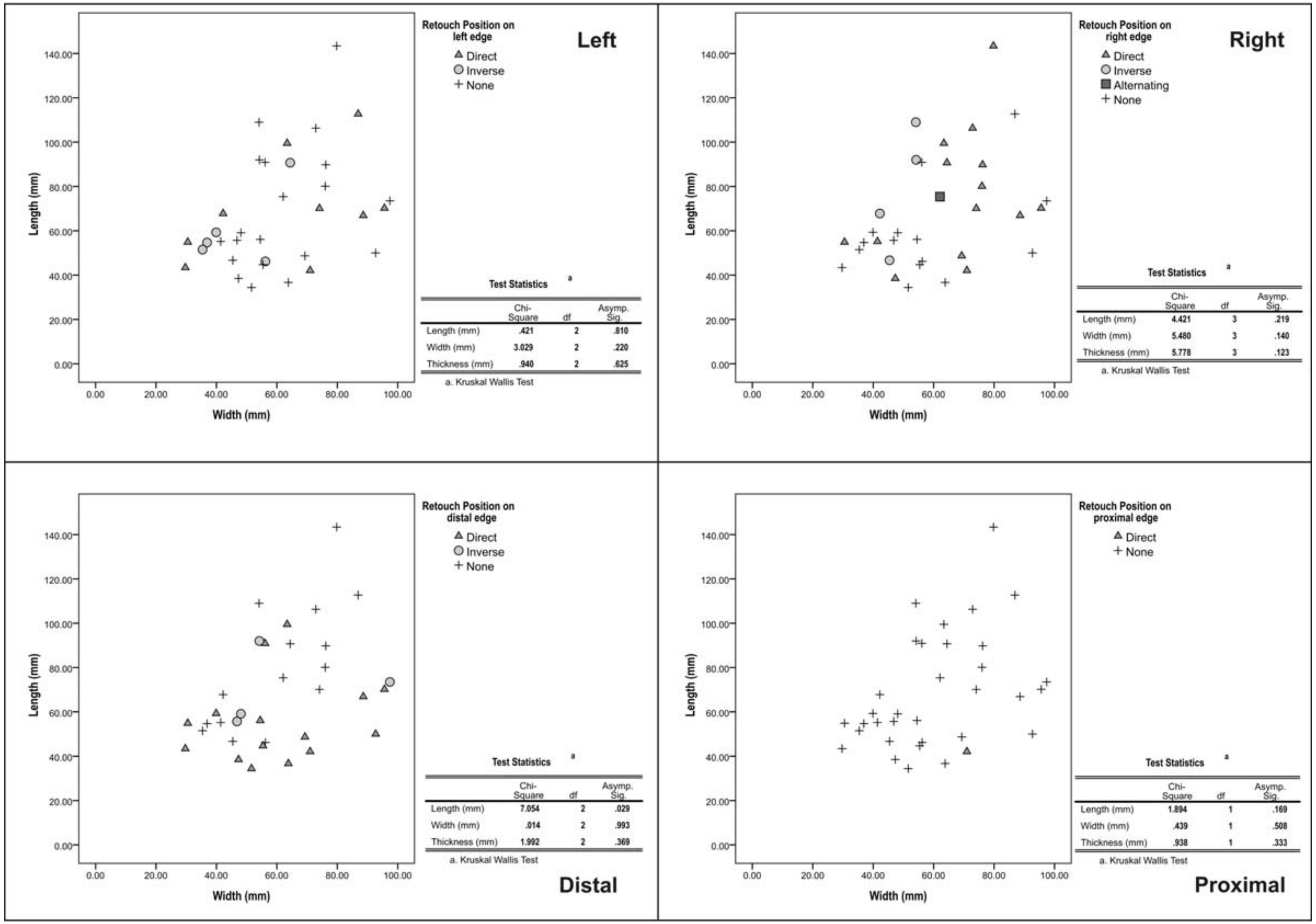


Figure A2.46: Showing the relationship between flake proportion and retouch position for Cuxton.

Retouch Extent

Figure A2.47 (below) shows the relationship between flake proportion and retouch extent, where the dominant form retouch extent being short for all flake edges. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch extent (figure A2.47) for the left, distal and proximal edges. However, on the right edge there would appear to be a statistically significant relationship suggested between retouch extent and flake length (x^2 = 8.344; df = 3; p = 0.039) but not for length or thickness (figure A2.47). However, given the small sample caution must be exercised when reading into such suggested relationships. Certainly figure A2.47 does not immediately suggest what such a relationship may be, and given that short retouch (the predominant form) is not invasive across the surface of the flake and therefore limited to edge manipulation only, I would propose that the pattern of retouch extent seen in figure A2.47 supports the idea that deliberate form imposition through secondary working is not present within the Cuxton Tester Collection. The retouch would rather appear to be functional in character and limited to edge modification that mirrors the shape of the original flake edge (personal observation), rather than deliberately changing it to a different preconceived form.

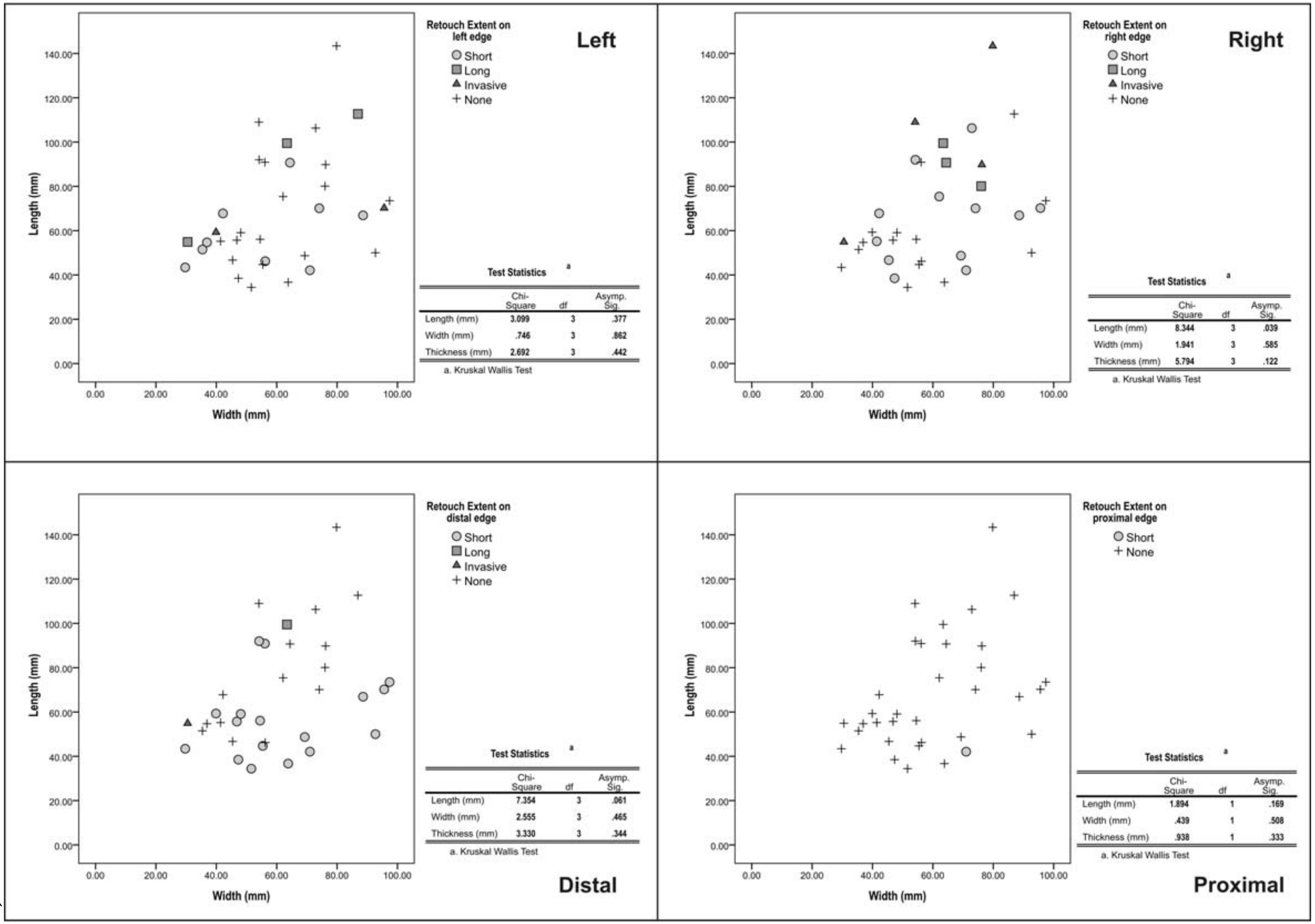


Figure A2.47: Showing the relationship between flake proportion and retouch extent for Cuxton.

Conclusion

Given that the only raw material present within this assemblage was flint, a raw material renowned for it knapping versatility coupled with the fact that a range of artefact sizes has been produced from small debitage pieces to large flakes and flake tools it is deemed that raw material did not adversely affect artefact proportion or form imposition. From examining the detached pieces where retouch was present (a very limited sample), it would appear that there are no clear patterns reflecting a specific retouched tool form, however I stress the extremely limited sample size, leading to difficulties in ascertaining whether this reflects genuinely on MIS 7 tool making in general. There would appear to be no degree of standardisation in terms of flake proportion for both retouched and unretouched flakes.

<u>*Cores*</u>

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. The Cuxton Tester Collection displays evidence for PCT and Non-PCT cores (table A2.84).

		Artefact Type	
		Core	
Non-PCT Core - Generic Type	A1 - Alternate	4	*16.0%*
	A2 - Alternate and Parallel	7	*28.0%*
	A3 - Parallel single platform	1	*4.0%*
	A4 - Parallel multiple platform	1	*4.0%*
	A5 - Single	3	*12.0%*
	A6 - Mixture of A1 - A5	8	*32.0%*
	A7 - Other non-PCT	1	*4.0%*
	Total	**25**	***100.0%***
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	0	*.0%*
	B2 - Discoid	0	*.0%*
	B3 - Other	2	*100.0%*
	Total	**2**	***100.0%***
PCT Core Type	C1- Radial	0	*.0%*
	C2 - Convergent	0	*.0%*
	C3 - Parallel / laminar	0	*.0%*
	C3a - Simple prepared cores	1	*100.0%*
	C4 - Other	0	*.0%*
	Total	**1**	***100.0%***
Total N = 28			

Table A2.84: Showing the relationship between Core Type and Artefact Type for Cuxton.

Table A2.84 shows that there are 28 unbroken cores in total recorded from the Cuxton Tester Collection. The cores would not appear to be restricted to a particular type of reduction sequence. It is interesting to note that the majority of the cores from Cuxton are classed as non-PCT generic cores, with only two considered to have a fixed perimeter and only one considered to be PCT. This is not entirely expected for MIS 7 where we would expect to see a greater proportion of PCT present within the assemblage. However, given the excavation strategy, a series of small trenches and test pits, it is possible that the PCT elements were not found, or that the hominins at Cuxton, did not feel they needed to utilise a PCT method in their core reduction, possibly due to an abundance of good quality raw material in the form of flint nodules. In terms of examining the cores from the Cuxton Tester Collection for any form of standardisation in artefact proportion, figures A2.48, below shows the relationship between length, width and the core type.

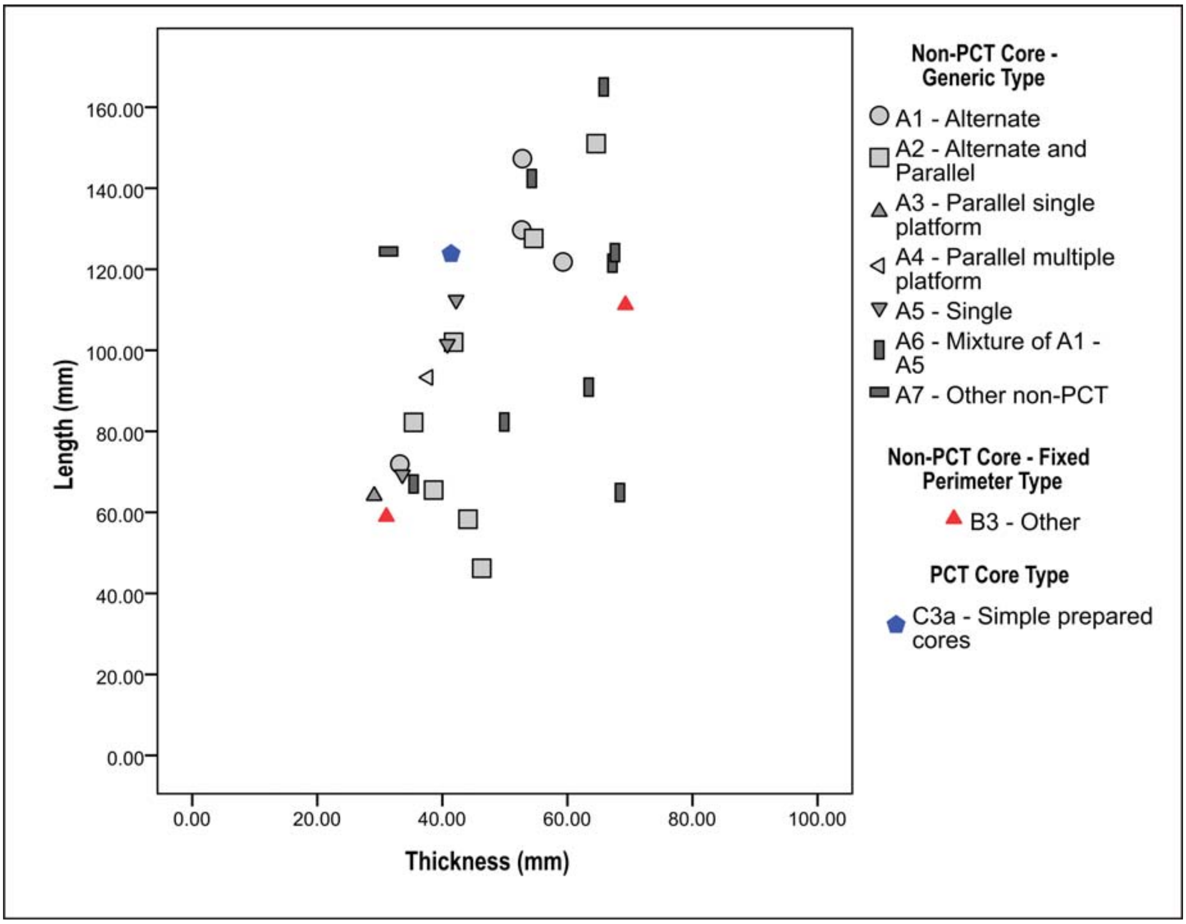


Figure A2.48: Showing the relationship between artefact proportion and cores types for Cuxton.

From figures A2.48 it would seem that all non-PCT generic cores and PCT cores are being reduced and discarded through a whole range artefact proportions. This in turn would indicate that there is no predetermined or socially significant standard to which these core types are being worked. Rather the core pattern would seem to support the conclusions from the flake analysis where flakes and cores are worked through opportunistic knapping to fulfil a specific need at a specific time, and then being discarded. However, it should be noted that from such a small sample of fixed perimeter and PCT cores, such broad interpretations of hominin behaviour are difficult to substantiate.

Conclusion

In conclusion, the three artefact categories under study in the Cuxton Tester Collection (detached pieces and cores) all seem to display a lack of extensive form imposition and standardisation.

Lynford Quarry

The site history and details for Lynford Quarry can be found in Chapter 6. As mentioned above, a total of 427 artefacts were examined from Lynford dated to late MIS 4 to early MIS 3 (Boismier *et al* 2003). There is only one raw material type found within the Lynford Quarry assemblage, flint, a locally common source of raw material. Given the predominantly fresh nature of the Lynford artefacts and the presence of microdebitage suggesting a largely *in situ* assemblage I shall examine the Lynford artefacts as a single assemblage example from early MIS 3 despite the mixed contextual nature of the Lynford artefacts. Table A2.85 shows the make up of the Lynford Quarry assemblage in relation to artefact completeness.

		Artefact Type					
		LCT	Flake	Flake tool	Core	Hammer Stone	**Total**
Completeness	Unbroken	51	190	23	8	1	**273**
	Broken	4	143	7	0	0	**154**
	Total	**55**	**333**	**30**	**8**	**1**	**427**

Table A2.85: Showing the relationship between artefact completeness and artefact type for Lynford Quarry.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed from Lynford Quarry 273. Table A2.86 shows the relationship between artefact type and condition.

		Artefact Condition							
		Abraded		Fresh		Lightly Abraded		**Total**	
Artefact Type	LCT	0	*.0%*	51	*18.7%*	0	*.0%*	**51**	***18.7%***
	Flake	11	*4.0%*	137	*50.2%*	42	*15.4%*	**190**	***69.6%***
	Flake tool	0	*.0%*	21	*7.7%*	2	*.7%*	**23**	***8.4%***
	Core	0	*.0%*	7	*2.6%*	1	*.4%*	**8**	***2.9%***
	Hammer Stone	0	*.0%*	1	*.4%*	0	*.0%*	**1**	***.4%***
	Total	**11**	***4.0%***	**217**	***79.5%***	**45**	***16.5%***	**273**	***100.0%***

Table A2.86: Showing the relationship between artefact condition and artefact type for Lynford Quarry.

Table A2.86 shows that the majority of unbroken artefacts from Lynford Quarry are classified as fresh (79.5%), lightly abraded (16.5%) and finally a small minority classed as abraded (11.0%). This pattern of condition would suggest that the majority of the Lynford Quarry assemblage has not been subjected to a large degree of post depositional movement and abrasion and reinforces the importance of looking at Lynford Quarry as a general example of MIS 3 artefacts, despite the contextual palimpsest.

I shall now examine the more specific elements to the Lynford Quarry assemblage by looking at the LCTs, Flakes, Flake Tools and Cores in greater depth.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. From table A2.86 above it can be seen that the 51 unbroken LCTs from Lynford Quarry come in a wholly fresh condition. In order to assess the imposition of form and symmetry upon the LCTs from the Lynford Quarry Assemblage, table A2.87 shows the relationship between tip shape and symmetry.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	2.0%	3.9%	.0%	5.9%	2.0%	9.8%	2.0%	2.0%	**27.5%**
	Convergent with a Square Tip	.0%	2.0%	.0%	2.0%	.0%	.0%	.0%	.0%	**3.9%**
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	.0%	5.9%	.0%	.0%	**5.9%**
	Convergent with a Generalised Tip	5.9%	2.0%	5.9%	5.9%	5.9%	21.6%	5.9%	2.0%	**54.9%**
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	3.9%	.0%	.0%	**3.9%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	.0%	.0%	.0%	.0%	.0%	2.0%	.0%	.0%	**2.0%**
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	2.0%	.0%	.0%	**2.0%**
	Total	**7.8%**	**7.8%**	**5.9%**	**13.7%**	**7.8%**	**45.1%**	**7.8%**	**3.9%**	**100.0%**

Total N - 51

Table A2.87: Showing the relationship between Tip Shape and Symmetry by Eye for Lynford Quarry.

From table A2.87 it is clear that the hominins from Lynford did not place a high significance on absolute LCT symmetry (only 7.8% of the assemblage described as wholly symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 25.4% of the LCTs in table A2.87 display evidence for tip symmetry. However, all of the LCTs with a symmetrical element to their tip form also have a convergent element, the degree of symmetry present within tip form may therefore result from producing a convergent tip, rather than a genuine and conscious imposition of symmetry. The large component of non-symmetrical LCTs (45.1%) would reinforce the initial observation that symmetry did not play a significant role in LCT production for in the Lynford Quarry assemblage. However, in regards to tip shape there would appear to be an overall tendency for convergent tips (92.2%) over other types possibly hinting at a deliberate preference for a particular tip form being imposed on the LCTs.

Figures A2.49 below examines the relationship between symmetry and artefact proportion.

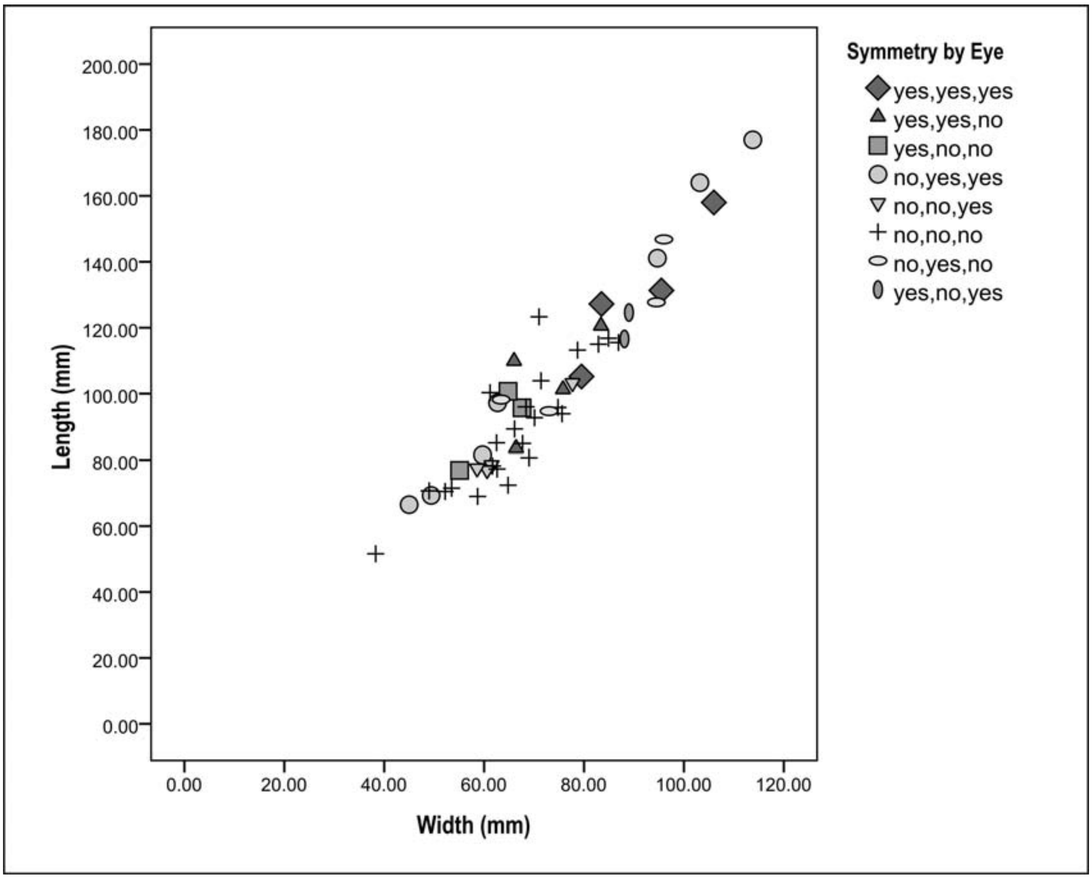


Figure A2.49: Showing the relationship between LCT proportion and symmetry for Lynford Quarry.

Figure A2.49 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. A Kruskal Wallis H Test (Ebdon 1977:68) suggests that there is a statistically significant relationship (to 0.05 significance) between symmetry and length (x^2 = 14.612; df = 7; p = 0.041) and width (x^2 = 14.376; df = 7; p = 0.045), but not thickness (x^2 = 5.360; df = 7; p = 0.616). From figure A2.49, it can be seen that the larger the LCT (+140.00mm), the more symmetry is present within LCT form. This could suggest that the larger the artefact, the easier it was for the hominins of Lynford Quarry to impose an aspect of symmetry to the original blank. However, given that symmetrical aspects to LCT form are also found the same proportions as those LCTs that have no symmetrical aspect to their form, and given such a small sample it is difficult to ascertain how significant the statistical link between LCT length, width and symmetry really is.

Figure A2.50 shows the relationship between tip shape and artefact proportion.

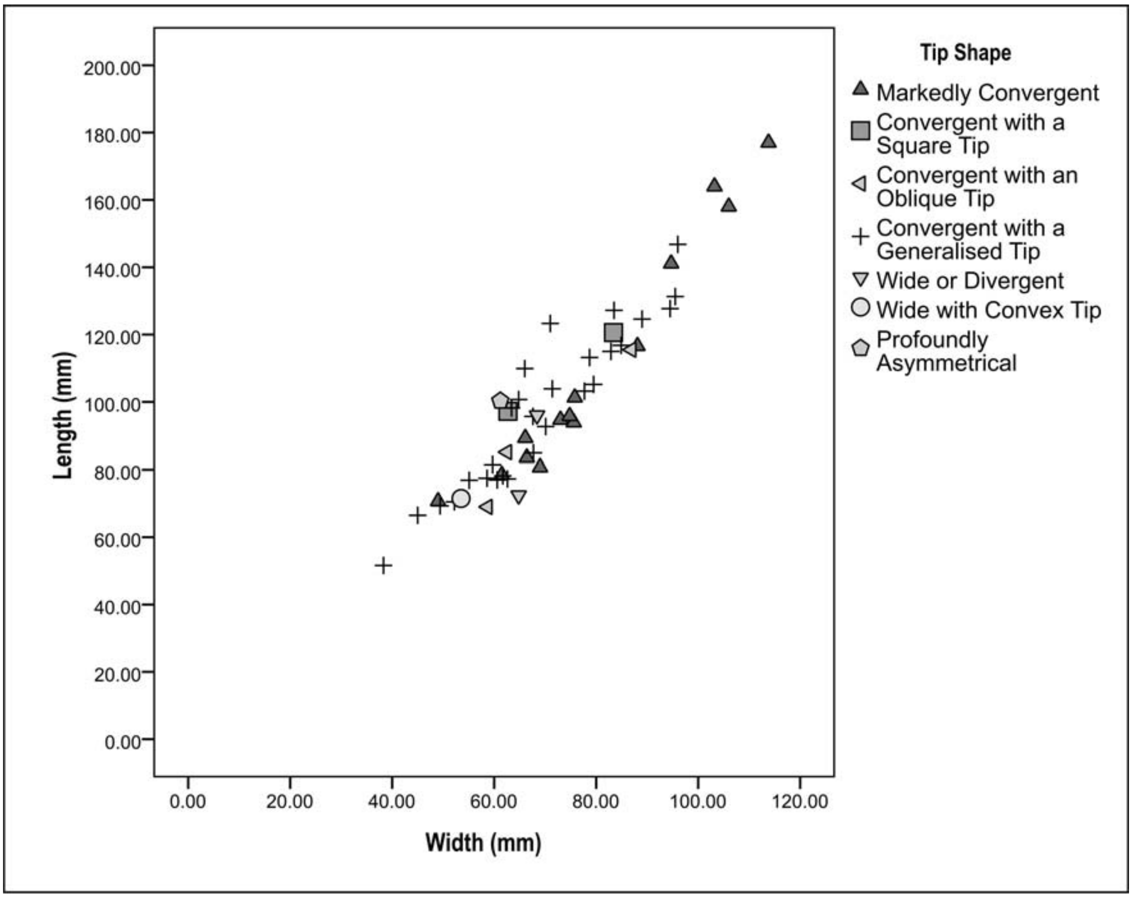


Figure A2.50: Showing the relationship between LCT proportion and tip shape for Lynford Quarry.

Figure A2.50 shows that there would appear to be no definitive relationships between artefact proportion and tip shape other than LCTs with a non-convergent element to their tip shape are generally smaller than those with a general or markedly convergent element to their form. A Kruskal Wallis H Test (Ebdon 1977:68) seems to confirm that there is no statistically significant relationship (to 0.05 significance) between observed tip shape and length (x^2 = 4.143; df = 6; p = 0.657), width (x^2 = 6.162; df = 6; p = 0.405) or thickness (x^2 = 2.910; df = 6; p = 0.820). Therefore from figures A2.49 and A2.50, it would seem that there are no noteworthy relationships between LCT proportion and tip shape, although symmetry may be linked to LCT size. In regards to standardisation of form imposition and artefact size, I would suggest that there is no obvious relationship that emerges although it is interesting to note that the larger the LCT, the more convergent the tip shape, and the more symmetry is present within the LCT form. Therefore, the patterns of symmetry may well be linked to the knapping of a convergent tip shape, rather than through deliberate design.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of the Lynford Quarry assemblage (table A2.88).

		Flaking Extent Second Face					
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	35.3%	2.0%	5.9%	.0%	7.8%	**51.0%**
	Complete Marginal	.0%	.0%	.0%	.0%	.0%	**.0%**
	Partial Marginal	.0%	2.0%	.0%	.0%	7.8%	**9.8%**
	Partial	2.0%	.0%	3.9%	2.0%	.0%	**7.8%**
	Substantial	9.8%	2.0%	2.0%	.0%	17.6%	**31.4%**
	Total	**47.1%**	**5.9%**	**11.8%**	**2.0%**	**33.3%**	**100.0%**

Total N = 51

Table A2.88: Showing the relationship between Flaking Extent of the first and second LCT face for Lynford Quarry.

From table A2.88 it can be seen that the hominins from Lynford Quarry clearly seemed to have favoured a complete and substantial flaking strategy. Furthermore, table A2.88 suggests that the first and second faces have been worked in similar fashions, suggesting that the hominins of Lynford Quarry were working LCTs through a standardised system of initial shaping. If seen in relation to the overwhelming preference for convergent tip shapes, it may be possible to suggest that the Lynford hominins were imposing culturally significant form upon a range of initial blank shapes (nodules and flakes). The lack of full symmetry within the Lynford LCT assemblage may suggest that if cultural form imposition was present, it was not expressed through symmetry imposition.

In order to test this idea further, a relative index of edge working extent was described in Chapter 5 and applied to symmetry in table A2.89 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	.0%	7.8%	.0%	.0%	**7.8%**
	yes,yes,no	.0%	5.9%	2.0%	.0%	**7.8%**
	yes,no,no	3.9%	2.0%	.0%	.0%	**5.9%**
	no,yes,yes	3.9%	5.9%	3.9%	.0%	**13.7%**
	no,no,yes	3.9%	3.9%	.0%	.0%	**7.8%**
	no,no,no	33.3%	11.8%	.0%	.0%	**45.1%**
	no,yes,no	2.0%	3.9%	2.0%	.0%	**7.8%**
	yes,no,yes	2.0%	2.0%	.0%	.0%	**3.9%**
	Total	**49.0%**	**43.1%**	**7.8%**	**.0%**	**100.0%**

Total N = 51

Table A2.89: Showing the relationship between Symmetry and Edge Working for Lynford Quarry.

From table A2.89 it can be seen that the majority of LCTs have an overall low amount of edge working (49.0% at 12 – 24 and 43.1% at 25 -36). Such a low index for edge working is surprising given the suggested amount of standardised initial working seen in table A2.88. Perhaps the hominins saw the initial flaking as enough to produce the overall desired form, whilst secondary edge working was restricted to creating a working edge (personal observation).

Table A2.90 shows the relationship between tip shape and edge working for Lynford Quarry.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Tip Shape	Markedly Convergent	7.8%	15.7%	3.9%	.0%	**27.5%**
	Convergent with a Square Tip	.0%	3.9%	.0%	.0%	**3.9%**
	Convergent with an Oblique Tip	3.9%	2.0%	.0%	.0%	**5.9%**
	Convergent with a Generalised Tip	29.4%	21.6%	3.9%	.0%	**54.9%**
	Wide or Divergent	3.9%	.0%	.0%	.0%	**3.9%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	2.0%	.0%	.0%	.0%	**2.0%**
	Profoundly Asymmetrical	2.0%	.0%	.0%	.0%	**2.0%**
	Total	**49.0%**	**43.1%**	**7.8%**	**.0%**	**100.0%**

Total N = 51

Table A2.90: Showing the relationship between Tip Shape and Edge Working for the fresh assemblage for Lynford Quarry.

Table A2.90 shows that the degree of edge working is not dependent on particular tip shape other than there is a low extent of edge working regardless of tip shape and symmetry imposition (table A2.89). This would seem to support the general conclusion that there does not appear to be any definitive form being imposed on the LCTs at Lynford through secondary edge working. Given the range in LCT proportion and flaking extents, there would appear to be no adverse impact of raw material beyond original blank size on LCT production.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry or edge working, although there may be deliberate and conscious form imposed through tip shape and initial flaking extent. Form imposition may be linked to cultural significance, but may also still be influenced through original blank form. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form, rather given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Flint is the only raw material type present in the Lynford Quarry assemblage. Flint is well a known raw material for its knapping versatility and therefore is unlikely to adversely limit artefact symmetry or form imposition beyond original blank size.

Flake and Flake Tool Analysis

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. In order to get an understanding on the number of detached pieces recorded from the Lynford Quarry assemblage, table A2.91 shows the breakdown of unbroken flakes and flake tools in relation to the flake types described in Chapter 5.

		Artefact Type					
		Flake		Flake tool		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R2 - Denticulated scraper	0	*.0%*	1	*.5%*	**1**	***.5%***
	R3 - Side scraper	0	*.0%*	4	*1.9%*	**4**	***1.9%***
	R4 - End / Traverse scraper	0	*.0%*	1	*.5%*	**1**	***.5%***
	R5 - Flake with scraper retouch	0	*.0%*	10	*4.7%*	**10**	***4.7%***
	R6 - Scraper used as wedge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R7 - Retouched point (awl)	0	*.0%*	1	*.5%*	**1**	***.5%***
	R8 - Retouched point (projectile)	0	*.0%*	0	*.0%*	**0**	***.0%***
	R9 - Retouched notch	0	*.0%*	3	*1.4%*	**3**	***1.4%***
	R10 - Retouch non diagnostic	0	*.0%*	0	*.0%*	**0**	***.0%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	0	*.0%*	**0**	***.0%***
	R12 - Multiple tool	0	*.0%*	3	*1.4%*	**3**	***1.4%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R14 - Utilised flake with no retouch	0	*.0%*	0	*.0%*	**0**	***.0%***
	R15 - Flake with edge damage	121	*56.8%*	0	*.0%*	**121**	***56.8%***
	R16 - Flake with no retouch	69	*32.4%*	0	*.0%*	**69**	***32.4%***
	Total	**190**	***89.2%***	**23**	***10.8%***	**213**	***100.0%***

Table A2.91: Showing the breakdown between flakes and flake tools in relation to flake type for Lynford Quarry.

As can be seen there are far more flakes than flake tools present within the unbroken detached artefacts studied from Lynford Quarry which may suggest three possible explanations, firstly that the hominins did not need to adapt the flakes (through retouch) they were producing for specific tasks on a regular basis, rather preferring to use the unmodified edge of flakes. Secondly, retouch tools were favoured for curation and removed from the site and transported elsewhere whilst unretouched flakes were left at the site of production. A possible third option is that the high degree of edge damage present on the flakes in table A2.91 could potentially mask the presence of retouch on the flakes. In terms of tool type being produced, table A2.91 illustrates that there would not appear to be any dominant retouch form or type preferred by the knappers.

Table A2.92 shows the relationship between flake type and Toth type (Toth 1985) illustrating that Toth types 2, 3, 4, 5 and 6 are present within the Lynford Quarry unbroken flake assemblage. Of particular dominance is Toth type 6 (completely non cortical) at 42.3% and Toth type 5 (some cortex on the dorsal) at 40.8% of the flakes and flake tools. This would suggest that the majority of the detached pieces from Lynford Quarry come from cores that were toward the end of the reduction sequence where most of the cortex has been knapped off the core through earlier reductions.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R2 - Denticulated scraper	.0%	.0%	.5%	.0%	.0%	.0%	**.5%**
	R3 - Side scraper	.0%	.0%	.0%	.0%	.9%	.9%	**1.9%**
	R4 - End / Traverse scraper	.0%	.0%	.0%	.0%	.5%	.0%	**.5%**
	R5 - Flake with scraper retouch	.0%	.0%	.5%	.0%	.9%	3.3%	**4.7%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	.0%	.0%	.0%	.0%	.5%	.0%	**.5%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R9 - Retouched notch	.0%	.5%	.0%	.0%	.5%	.5%	**1.4%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	.0%	.0%	.0%	.5%	.9%	**1.4%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R15 - Flake with edge damage	.0%	6.6%	.9%	4.7%	28.6%	16.0%	**56.8%**
	R16 - Flake with no retouch	.0%	.0%	1.9%	1.4%	8.5%	20.7%	**32.4%**
	Total	**.0%**	**7.0%**	**3.8%**	**6.1%**	**40.8%**	**42.3%**	**100.0%**

Total N = 213

Table A2.92: Showing the relationship between Flake Type and Toth type for Lynford Quarry.

However, the presence of flakes with cortex present on the butt (Toth Type 2 and 3) shows that flakes and flake tools were also knapped on site. In terms of the technological make up of the Lynford detached pieces, table A2.93 shows that 98.1% of the unbroken detached pieces from Lynford are Non-PCT in character, whilst only 1.9% of the flakes or flake tools display PCT characteristics, yet they are not fully PCT in character.

		Flake Technology Type		
		Non-PCT	PCT?	**Total**
Flake Type	R1 - Denticulated edge	.0%	.0%	**.0%**
	R2 - Denticulated scraper	.5%	.0%	**.5%**
	R3 - Side scraper	1.4%	.5%	**1.9%**
	R4 - End / Traverse scraper	.5%	.0%	**.5%**
	R5 - Flake with scraper retouch	4.7%	.0%	**4.7%**
	R6 - Scraper used as wedge	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	.5%	.0%	**.5%**
	R8 - Retouched point (projectile)	.0%	.0%	**.0%**
	R9 - Retouched notch	1.4%	.0%	**1.4%**
	R10 - Retouch non diagnostic	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	**.0%**
	R12 - Multiple tool	1.4%	.0%	**1.4%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	**.0%**
	R15 - Flake with edge damage	55.9%	.9%	**56.8%**
	R16 - Flake with no retouch	31.9%	.5%	**32.4%**
	Total	**98.1%**	**1.9%**	**100.0%**

Total N = 213

Table A2.93: Showing the relationship between flake type and flake technology type for Lynford Quarry.

Table A2.93 further illustrates that there does not seem to be a particular preference for a specific tool type from any of the flake technology type categories, which may suggest that the hominins were not producing tools to specific form templates, but rather as opportunistic responses to required tasks. This finding corresponds with those of Boismeir *et al* (2003).

Figure A2.51 illustrates the relationship between flake technology type and flake proportion.

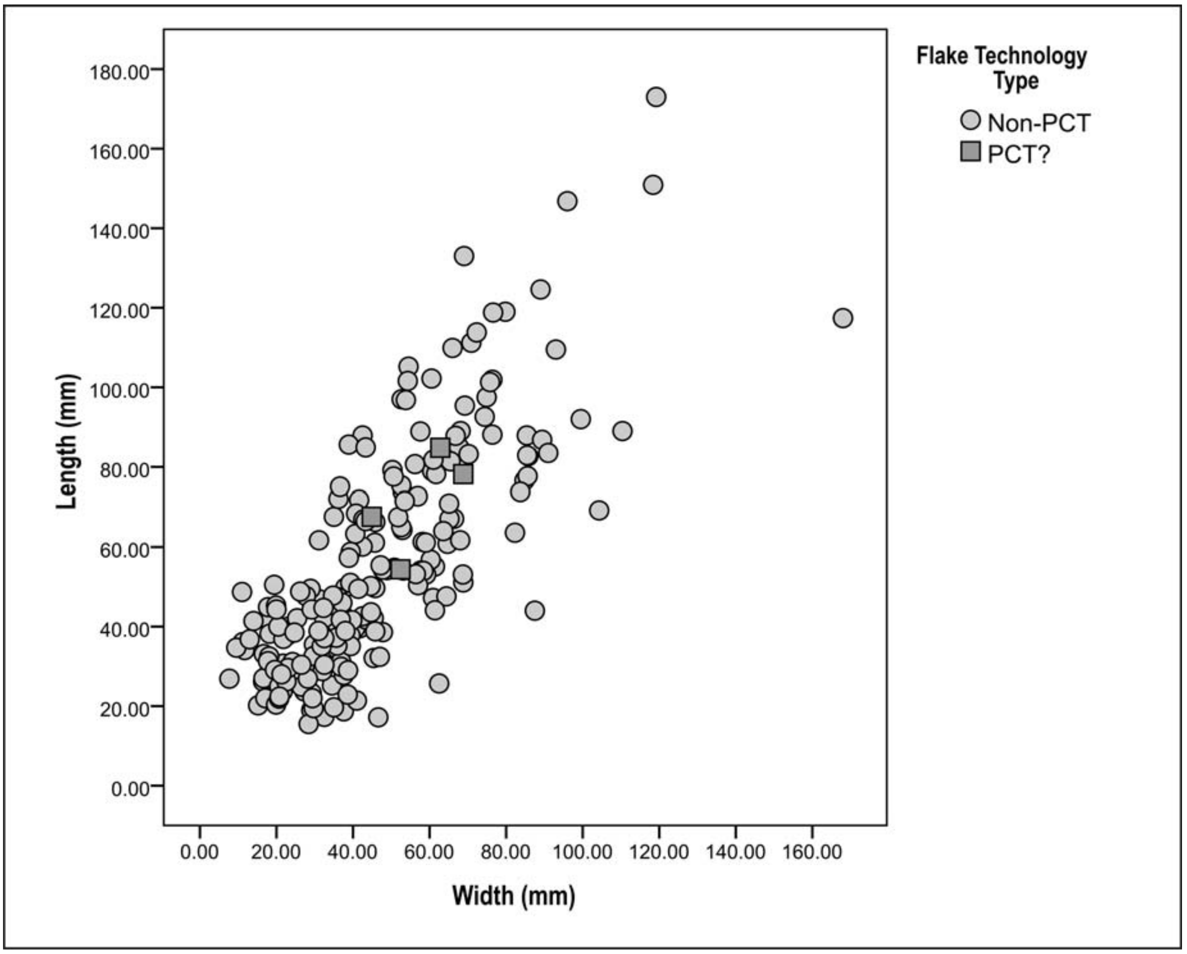


Figure A2.51: Showing the relationship between flake proportion and flake technology type for Lynford Quarry.

Once again there would not seem to be a relationship between flake proportion and potential (PCT?) technology type. This pattern seems to be confirmed by a Kruskal Wallis H Test (Ebdon 1977:68) shows that there is no statistically significant relationship to a 0.05 significance level between flake technology type and artefact length (x^2 = 2.851; df = 1; p = 0.091), width (x^2 = 2.305; df = 1; p = 0.129) or thickness (x^2 = 1.046; df = 1; p = 0.306). Table A2.94 illustrates the relationship between retouch and flake technology.

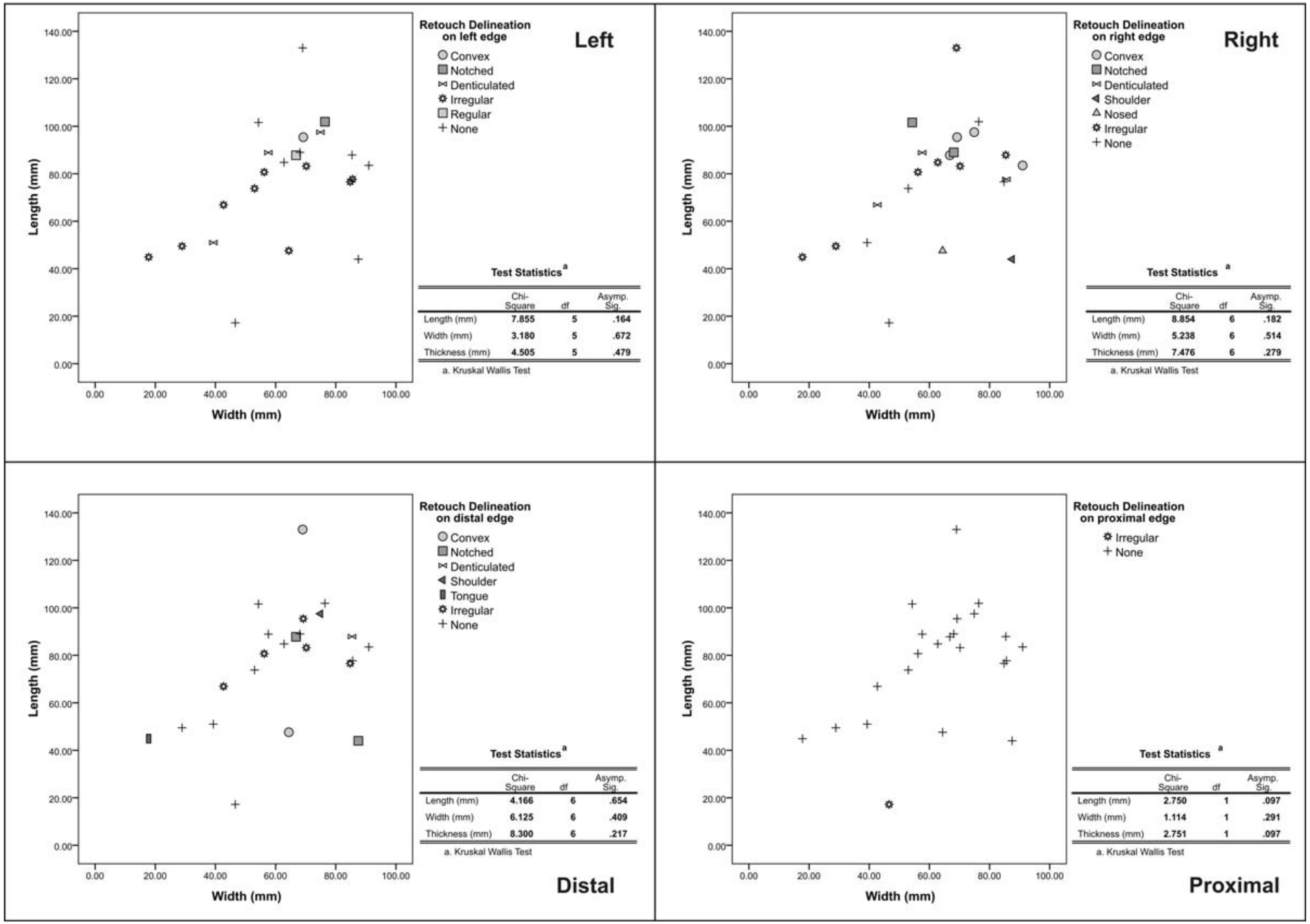
		Flake Technology Type					
		Non-PCT		PCT?		**Total**	
Retouch present on left edge	Yes	15	*65.2%*	0	*.0%*	**15**	***65.2%***
	No	7	*30.4%*	1	*4.3%*	**8**	***34.8%***
	Total	**22**	***95.7%***	**1**	***4.3%***	**23**	***100.0%***
Retouch present on distal edge	Yes	12	*52.2%*	0	*.0%*	**12**	***52.2%***
	No	10	*43.5%*	1	*4.3%*	**11**	***47.8%***
	Total	**22**	***95.7%***	**1**	***4.3%***	**23**	***100.0%***
Retouch present on right edge	Yes	17	*73.9%*	1	*4.3%*	**18**	***78.3%***
	No	5	*21.7%*	0	*.0%*	**5**	***21.7%***
	Total	**22**	***95.7%***	**1**	***4.3%***	**23**	***100.0%***
Retouch present on proximal edge	Yes	1	*4.3%*	0	*.0%*	**1**	***4.3%***
	No	21	*91.3%*	1	*4.3%*	**22**	***95.7%***
	Total	**22**	***95.7%***	**1**	***4.3%***	**23**	***100.0%***

Table A2.94: Showing the relationship between retouch presence and artefact type for Lynford Quarry.

Table A2.94 shows that there are 23 flake tools with retouch on at least one flake edge corresponding with the data in table A2.91. The following tests below regarding retouch and flake proportion are only conducted on the 23 unbroken detached pieces that have retouch present on at least one of their edges. Although I should stress that from such a small sample any patterns relating to retouch and form imposition must be treated with a degree of caution.

Retouch Delineation

Figure A2.52 (below) shows the relationship between retouch delineation and flake proportion where there would appear to be a range of retouch delineation types present within the Lynford Quarry flake tools. Although all flake tool edges display a variety of retouch delineations, there would appear to be a preference for irregular retouch on the left right and distal edges (figure A2.52). The proximal edge is characterised by a total lack of retouch presence. A Kruskal Wallis H Test (Ebdon 1977:68) shows there is no statistically significant relationship (to 0.05 significance) between flake length, width, or thickness and retouch delineation for the left, right and distal edges (figure A2.52). Irregular retouch is an unstructured form of retouch and probably related to the knapper following the shape of the original flake edge rather than imposing any particular form of their own. As there would not appear to be a specific pattern of retouch delineation and flake proportion in figure A2.52, it is unlikely that retouch delineation is deliberately planned (in terms of overall flake shape), but rather a result of opportunistic manipulation of the flake edge.



Left – Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	7.855	5	.164
Width (mm)	3.180	5	.672
Thickness (mm)	4.505	5	.479

a. Kruskal Wallis Test

Right – Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	8.854	6	.182
Width (mm)	5.238	6	.514
Thickness (mm)	7.476	6	.279

a. Kruskal Wallis Test

Distal – Test Statistics[a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	4.166	6	.654
Width (mm)	6.125	6	.409
Thickness (mm)	8.300	6	.217

a. Kruskal Wallis Test

Proximal – Test Statistics[a]

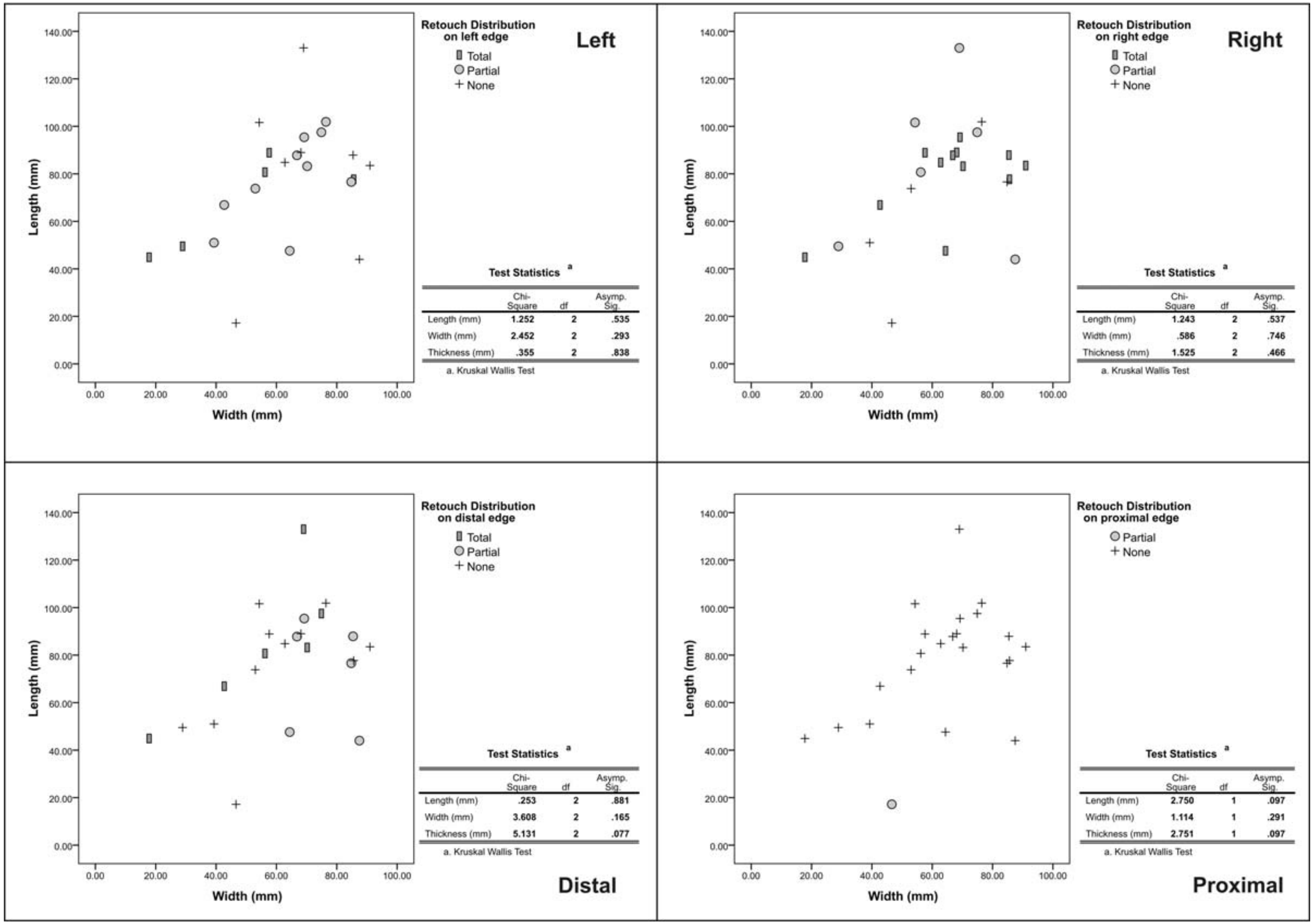
	Chi-Square	df	Asymp. Sig.
Length (mm)	2.750	1	.097
Width (mm)	1.114	1	.291
Thickness (mm)	2.751	1	.097

a. Kruskal Wallis Test

Figure A2.52: Showing the relationship between flake proportion and retouch delineation for Lynford Quarry.

Retouch distribution

Figure A2.53 (below) shows the relationship between flake proportion and retouch distribution. Where retouch is present, there appears to be clear preference for a partial style of retouch distribution on the left and distal edges, whilst the right is dominated by a total distribution. Total retouch implies that the whole of the flake edge had been retouched and may indicate particular that form was being imposed by the knapper through retouch, however, a Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch distribution (figure A2.53) for the left, right, distal and proximal edges. Figure A2.53 further suggests that where patterns of retouch are present then the hominins are utilising a mixture of partial and total edges of the flake, possibly as a means of opportunistically adapting edges that were deemed conducive to retouch, rather than examples of culturally mediated form imposition on flake tools.



Left — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	1.252	2	.535
Width (mm)	2.452	2	.293
Thickness (mm)	.355	2	.838

a. Kruskal Wallis Test

Right — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	1.243	2	.537
Width (mm)	.586	2	.746
Thickness (mm)	1.525	2	.466

a. Kruskal Wallis Test

Distal — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.253	2	.881
Width (mm)	3.608	2	.165
Thickness (mm)	5.131	2	.077

a. Kruskal Wallis Test

Proximal — Test Statistics [a]

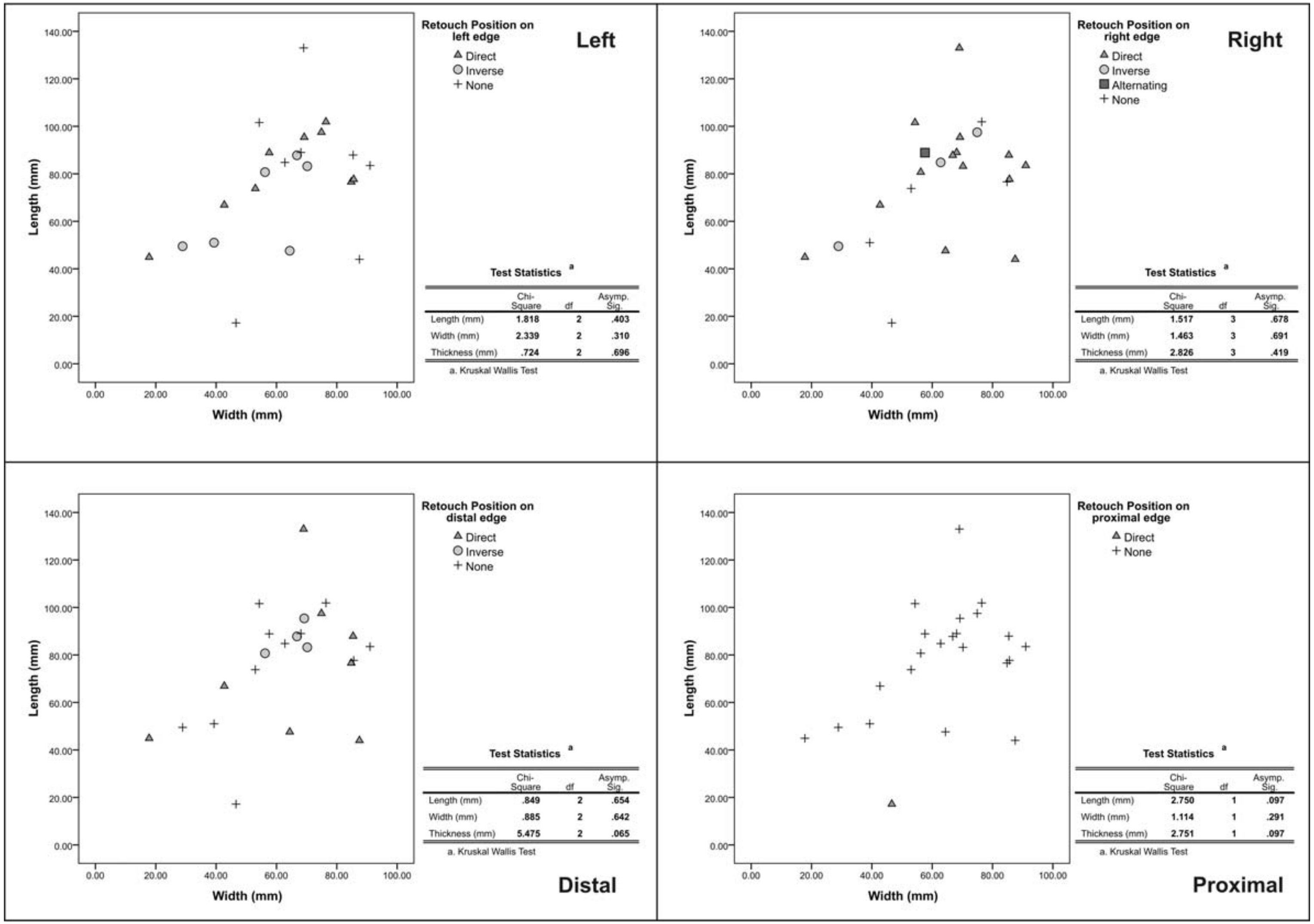
	Chi-Square	df	Asymp. Sig.
Length (mm)	2.750	1	.097
Width (mm)	1.114	1	.291
Thickness (mm)	2.751	1	.097

a. Kruskal Wallis Test

Figure A2.53: Showing the relationship between flake proportion and retouch distribution for Lynford Quarry.

Retouch Position

Figure A2.54 (below) shows the relationship between flake proportion and retouch position. Where retouch is present, there appears to be a preference for a direct style of retouch position. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch position (figure A2.54) for the left, right, distal and proximal edges. From the lack of standardised retouch imposition on flake tool, I would suggest that figures A2.52, A2.53 and A2.54 do not suggest culturally mediated form imposition on flake tools through secondary retouch.



Left — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	1.818	2	.403
Width (mm)	2.339	2	.310
Thickness (mm)	.724	2	.696

a. Kruskal Wallis Test

Right — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	1.517	3	.678
Width (mm)	1.463	3	.691
Thickness (mm)	2.826	3	.419

a. Kruskal Wallis Test

Distal — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.849	2	.654
Width (mm)	.885	2	.642
Thickness (mm)	5.475	2	.065

a. Kruskal Wallis Test

Proximal — Test Statistics [a]

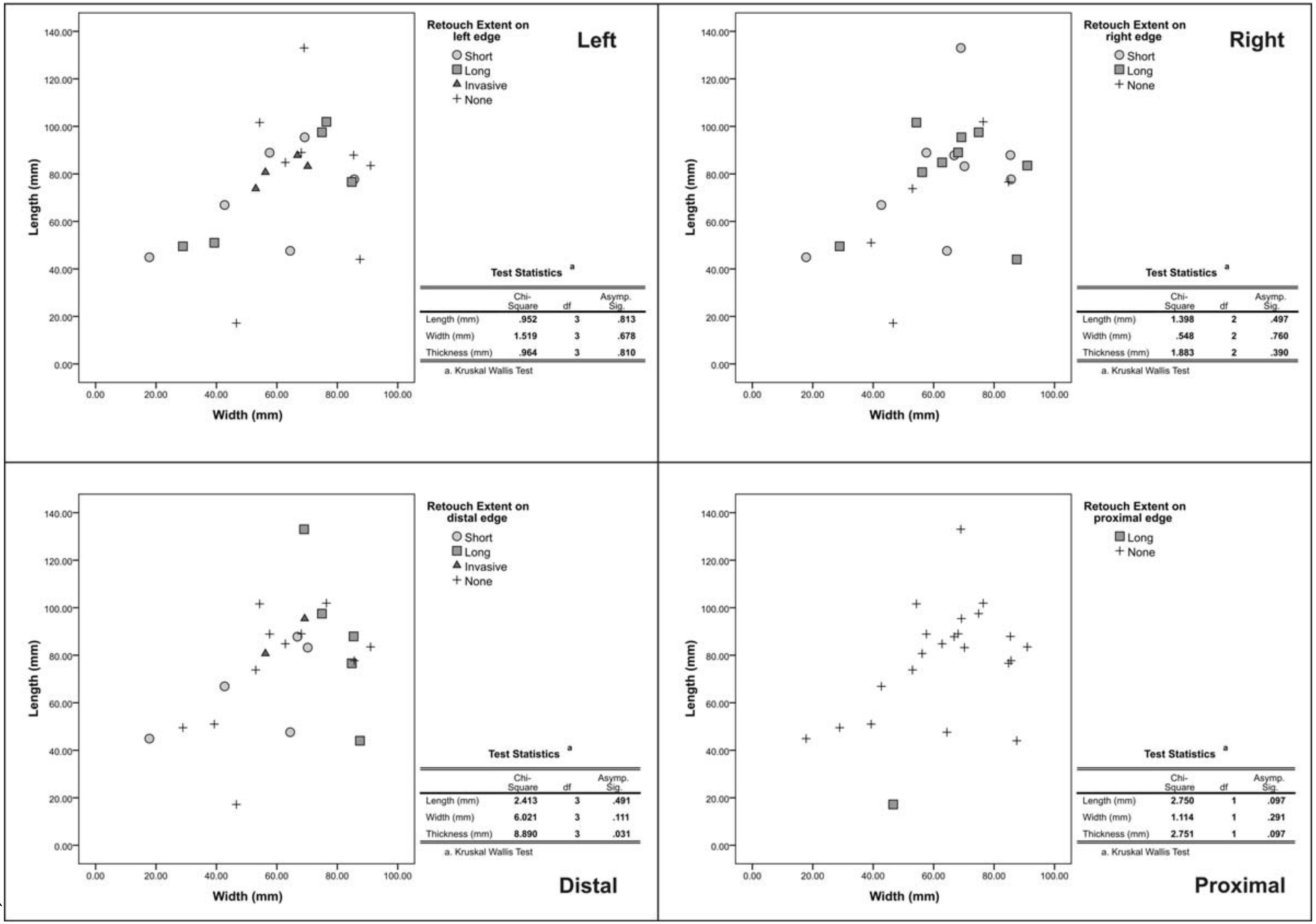
	Chi-Square	df	Asymp. Sig.
Length (mm)	2.750	1	.097
Width (mm)	1.114	1	.291
Thickness (mm)	2.751	1	.097

a. Kruskal Wallis Test

Figure A2.54: Showing the relationship between flake proportion and retouch position for Lynford Quarry.

Retouch Extent

Figure A2.55 (below) shows the relationship between flake proportion and retouch extent, where there would not appear to be a dominant form retouch extent but a close mixture between long and short extents, with invasive retouch playing a small role on the left and distal edges. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch extent (figure A2.55) for the left, right and proximal edges. However, on the distal edge there would appear to be a relationship between retouch extent and flake thickness (x^2 = 8.890; df = 3; p = 0.031) but not for length or thickness (figure A2.55). From such a limited sample number, any statistical relationships that are suggested should be treated with a certain degree of caution. Retouch extent can be directly linked to flake thickness, and the mixture of short, long and invasive retouch may suggest a degree of deliberate form imposition being seen. However, given the lack of any standardised retouch imposition I would suggest that the pattern of retouch extent seen in figure A2.55 supports the idea that deliberate form imposition through secondary working and in terms of artefact aesthetic is not present within the Lynford Quarry assemblage. The retouch would appear to be functional in character and limited to edge modification that mirrors the shape of the original edge (personal observation), rather than deliberately changing it to a different preconceived form.



Left — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	.952	3	.813
Width (mm)	1.519	3	.678
Thickness (mm)	.964	3	.810

a. Kruskal Wallis Test

Right — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	1.398	2	.497
Width (mm)	.548	2	.760
Thickness (mm)	1.883	2	.390

a. Kruskal Wallis Test

Distal — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	2.413	3	.491
Width (mm)	6.021	3	.111
Thickness (mm)	8.890	3	.031

a. Kruskal Wallis Test

Proximal — Test Statistics [a]

	Chi-Square	df	Asymp. Sig.
Length (mm)	2.750	1	.097
Width (mm)	1.114	1	.291
Thickness (mm)	2.751	1	.097

a. Kruskal Wallis Test

Figure A2.55: Showing the relationship between flake proportion and retouch extent for Lynford Quarry.

Conclusion

Given that the only raw material present within this assemblage was flint, a raw material renowned for it knapping versatility coupled with the fact that a range of artefact sizes has been produced from to large flakes and flake tools it is deemed that raw material did not adversely affect artefact proportion or form imposition. From examining the detached pieces where retouch was present, it would appear that there are no patterns reflecting a specific retouched tool form, however I stress that given the extremely limited sample size, it is difficult to ascertain whether these patterns are genuine reflections of tool making from Lynford in general. The comparatively small component of retouched tools verses unretouched flakes would also indicate that either hominins curated retouched tools and transported them around the landscape, or that retouched tools were produced as and when a need arose or as is more likely, the high degree of edge damage within the assemblage may have unduly masked the presence of retouch within the assemblage. There would appear to be no degree of standardisation in terms of flake proportion for retouched flakes.

Cores

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. The Lynford Quarry assemblage had a total of 8 cores, 5 of which had a fixed perimeter either discoidal or non-specific (other) fixed perimeter in nature (table A2.95).

		Artefact Type	
		Core	
Non-PCT Core - Generic Type	A1 - Alternate	0	*.0%*
	A2 - Alternate and Parallel	1	*33.3%*
	A3 - Parallel single platform	0	*.0%*
	A4 - Parallel multiple platform	0	*.0%*
	A5 - Single	0	*.0%*
	A6 - Mixture of A1 - A5	2	*66.7%*
	A7 - Other non-PCT	0	*.0%*
	Total	**3**	***100.0%***
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	0	*.0%*
	B2 - Discoid	2	*40.0%*
	B3 - Other	3	*60.0%*
	Total	**5**	***100.0%***
Total N = 8			

Table A2.95: Showing the relationship between Core Type and Artefact Type for Lynford Quarry.

The cores would not appear to be restricted to a particular type of reduction sequence, although there would seem to be a preference for fixed perimeter cores (table A2.95). In terms of examining the cores of the Lynford Quarry assemblage for any form of standardisation in artefact proportion, figure A2.56 below shows the relationship between length, width and the Lynford Quarry cores.

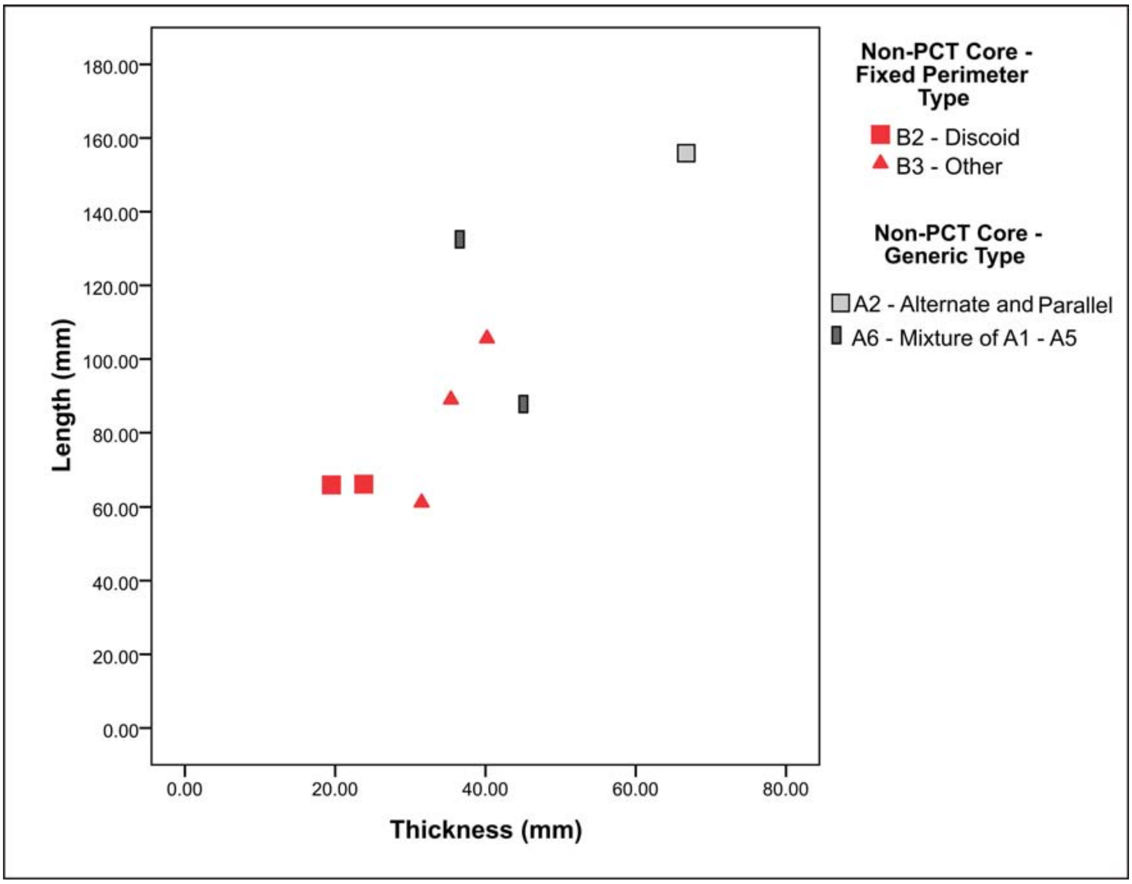


Figure A2.56: Showing the relationship between artefact proportion and core type for Lynford Quarry.

From figure A2.56 it would seem that the non-PCT generic cores are generally larger than the fixed margin cores with no hint at a standardised proportion to which they are reduced. However, the fixed margin cores would suggest that the discoid cores may have been reduced to a specific size (figure A2.56). However I must stress once again the limited sample size and reiterate that any patterns seen here must be treated cautiously when making inferences regarding hominin behaviour.

Conclusion

In conclusion, the three artefact categories under study in the Lynford Quarry assemblage (detached pieces, LCTS and cores) all seem to display a lack of extensive form imposition and standardisation with the possibly exception of discoid reduction. LCTs may have a deliberate convergent form being imposed through initial flaking extents, however, it is difficult to say for certain whether this is an example of cultural influences.

Africa and the Middle East

Cave of Hearths

The site history and details for Cave of Hearths can be found in Chapter 6. Table A2.96 below shows the relationship between LCT and completeness from the Cave of Hearths.

		LCT Type							
		Handaxe		Cleaver		Unclear		**Total**	
Completeness	Unbroken	70	*31.0%*	141	*62.4%*	12	*5.3%*	**223**	***98.7%***
	Broken	2	*.9%*	1	*.4%*	0	*.0%*	**3**	***1.3%***
	Total	**72**	***31.9%***	**142**	***62.8%***	**12**	***5.3%***	**226**	***100.0%***

Table A2.96: Showing the relationship between LCT type and artefact completeness for the Cave of Hearths.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of LCTs analysed 223. The majority of the LCTs under study are cleavers with handaxes being a minority component of the assemblage, and twelve artefacts that were unclear as to whether they would be a handaxe or cleaver. Table A2.97 shows the relationship between LCT type, raw material and artefact condition.

			Artefact Condition	
			Lightly Abraded	
LCT Type	Handaxe	Quartzite	45	*20.2%*
		Non-Quartzites	25	*11.2%*
		Total	70	*31.4%*
	Cleaver	Quartzite	95	*42.6%*
		Non-Quartzites	46	*20.6%*
		Total	141	*63.2%*
	Unclear	Quartzite	7	*3.1%*
		Non-Quartzites	5	*2.2%*
		Total	12	*5.4%*
	Total	Quartzite	147	*65.9%*
		Non-Quartzites	76	*34.1%*
		Total	**223**	***100.0%***

Table A2.97: Showing the relationship between LCT type, Raw Material and Artefact Condition for the Cave of Hearths.

As can be seen from table A2.97, the majority of artefacts from the Cave of Hearths were knapped from Quartzite, a common raw material readily available from the environs of the Mwaridzi valley. Given that all the artefacts are in the same condition – lightly abraded – it is not unreasonable within the scope of this thesis and research question to analyse the artefacts as a single assemblage, although it is understood that the Cave of Hearths LCTs represent an accumulation over time spanning a large time range of MIS 15 – 11.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. In order to assess imposition of form and symmetry upon the LCTs of the Cave of Hearths, table A2.98 shows the relationship between tip shape and symmetry by eye.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	1.3%	2.2%	1.8%	.4%	.0%	3.1%	.4%	.9%	**10.3%**
	Convergent with a Square Tip	.9%	1.3%	1.8%	.0%	1.8%	6.7%	.0%	.4%	**13.0%**
	Convergent with an Oblique Tip	.0%	.0%	.0%	.4%	1.3%	1.3%	1.3%	.0%	**4.5%**
	Convergent with a Generalised Tip	.4%	1.3%	1.3%	.4%	.9%	14.8%	3.1%	.4%	**22.9%**
	Wide or Divergent	.4%	4.0%	2.7%	.4%	.0%	20.2%	1.8%	.0%	**29.6%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.9%	1.3%	8.5%	3.1%	.0%	**13.9%**
	Wide with Convex Tip	.0%	.0%	.9%	.4%	.4%	4.0%	.0%	.0%	**5.8%**
	Total	**3.1%**	**9.0%**	**8.5%**	**3.1%**	**5.8%**	**58.7%**	**9.9%**	**1.8%**	**100.0%**

Total N = 223

Table A2.98: Showing the relationship between Tip Shape and Symmetry by Eye for the Cave of Hearths.

From table A2.98 it is clear that the hominins from the Cave of Hearths did not place a high significance on absolute LCT symmetry (only 3.1% of the assemblage described as symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 22.4% of the LCTs in table A2.98 display evidence for tip symmetry. However, as 14.0% of LCTs with a symmetrical element to their tip form also have a convergent element, the degree of symmetry present within tip form is probably a result of producing a convergent tip, rather than a genuine and conscious imposition of symmetry. So even though the hominins from the Cave of Hearths are clearly capable of producing fully symmetrical LCTs on a variety of tip shapes, the overwhelming component of non-symmetrical LCTs (58.7%), and LCTs with a non-symmetrical tip shape (19.2%) would reinforce the initial observation that symmetry did not play a significant role in LCT production. In regards to tip shape there would not appear to be a favoured tip shape, suggesting that the hominins from the Cave of Hearths did not impose a specific form upon the LCTs they were producing.

Figure A2.57 below examines the relationship between symmetry and artefact proportion.

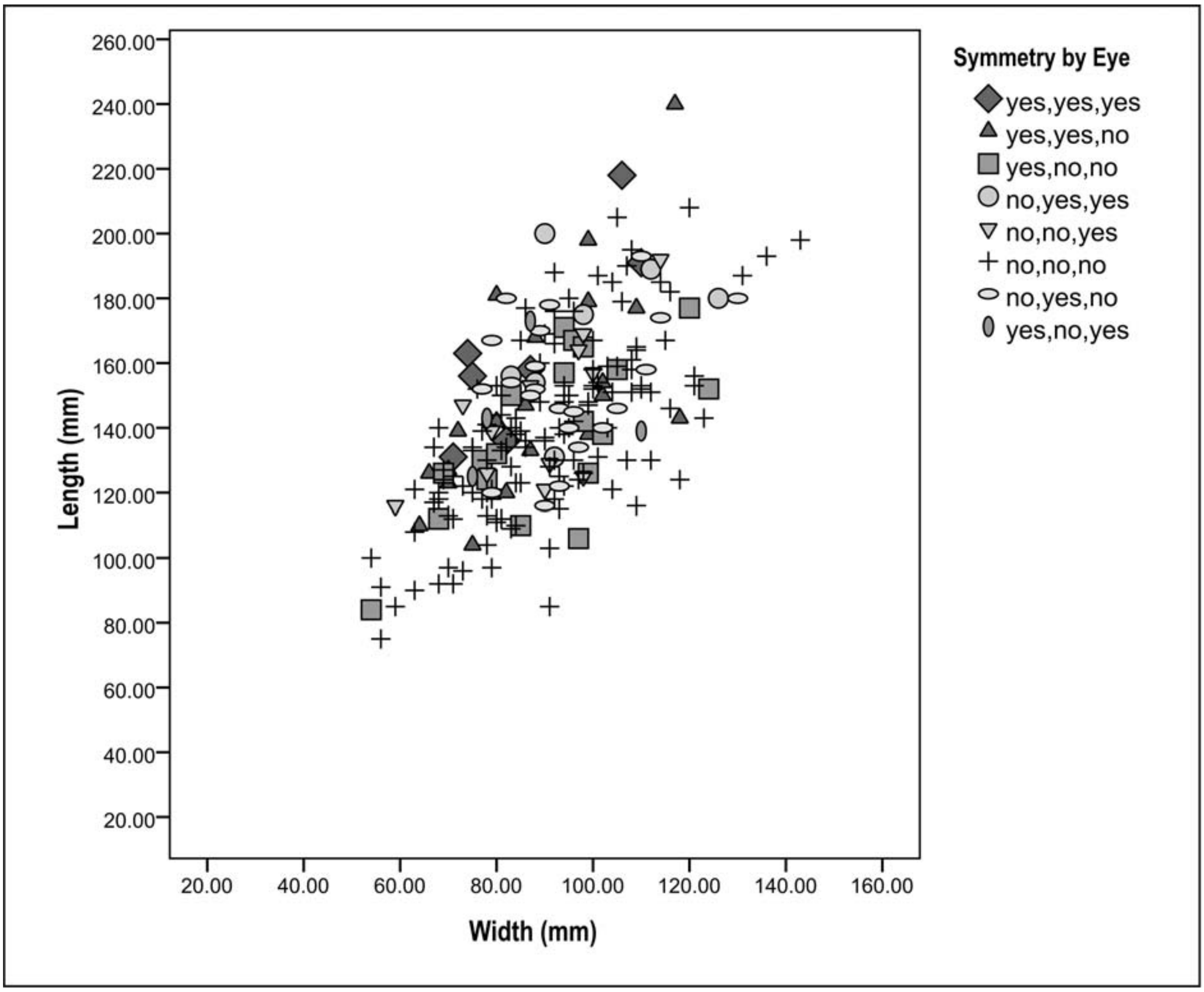


Figure A2.57: Showing the relationship between LCT proportion and symmetry for the Cave of Hearths.

Figure A2.57 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. Furthermore, figure A2.57 shows that symmetry categories are not clustered in particular proportions as all symmetry categories are found throughout the scale of artefact proportions. This would suggest that symmetry and LCT proportion have no significant relationship at the Cave of Hearths. However, a Kruskal Wallis H Test (Ebdon 1977:68) shows that there is a statistically significant relationship (to 0.05 significance) between observed symmetry and artefact length (x^2 = 18.092; df = 7; p = 0.012), although not between width (x^2 = 4.092; df = 7; p = 0.769) and thickness (x^2 = 9.431; df = 7; p = 0.223). Looking at figure A2.57 it is not clear as to what the statistically significant relationship may be given the spread of symmetry categories through artefact proportion. Figure A2.58 shows the relationship between tip shape and artefact proportion.

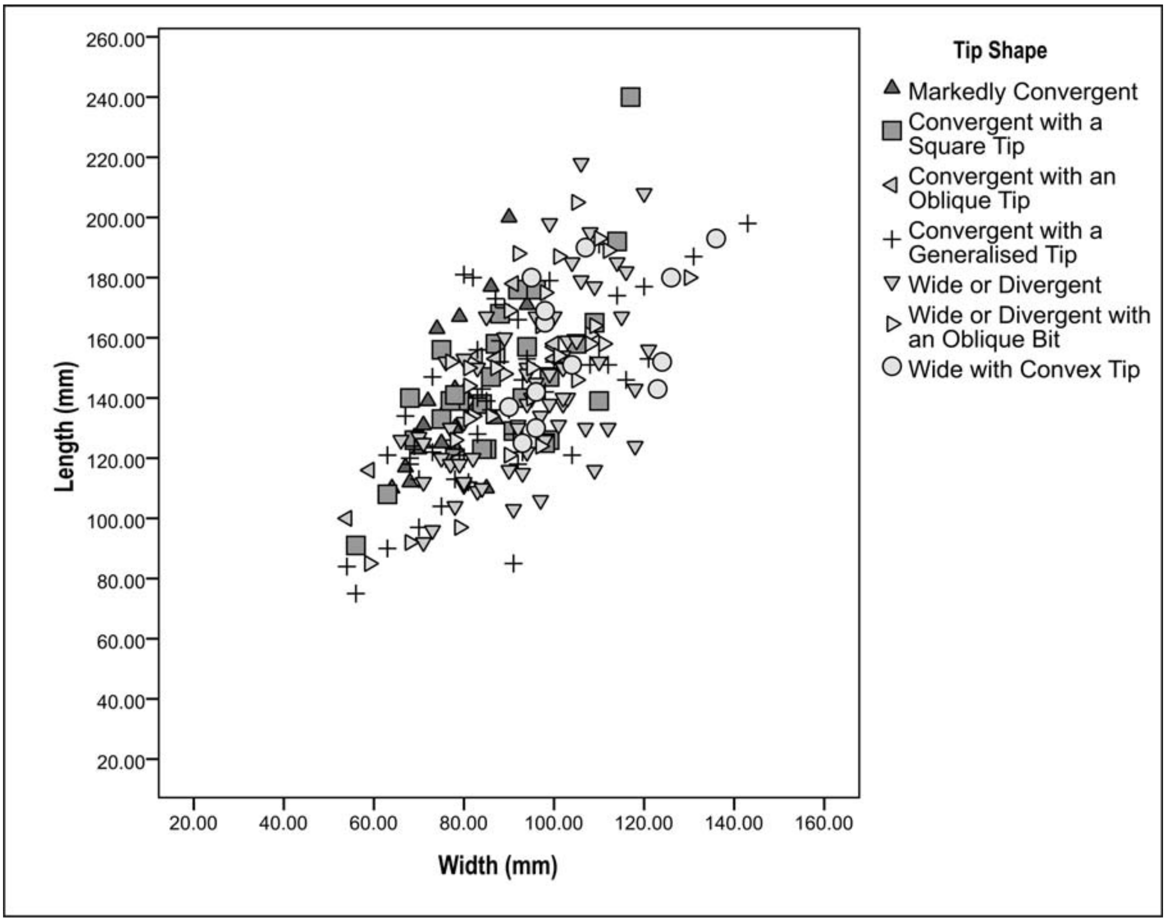


Figure A2.58: Showing the relationship between LCT proportion and tip shape for the Cave of Hearths.

Figure A2.58 shows that there would appear to be no definitive relationships between artefact proportion and tips shape. However, a Kruskal Wallis H Test (Ebdon 1977:68) suggests that there is no statistically significant relationship (to 0.05 significance) between observed tip shape, length (x^2 = 11.260; df = 6; p = 0.081) and thickness (x^2 = 8.166; df = 6; p = 0.226) but there is between symmetry and width (x^2 = 39.277; df = 6; p = 0.000). However, looking at figure A2.58 it is not clear as to what the statistically significant relationship may be given the spread of tip shape categories through artefact proportion. The only relationship that I suggest may be significant is the large proportion of LCTs convergent with a wide or divergent tip would also appear to be generally wider than the LCTs with alternative tip shapes.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of the Cave of Hearths (table A2.99).

		Flaking Extent Second Face						
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	None	**Total**
Flaking Extent First Face	Complete	.9%	1.3%	.9%	.0%	.0%	.0%	**3.1%**
	Complete Marginal	.4%	3.1%	4.0%	.0%	1.3%	.0%	**9.0%**
	Partial Marginal	.0%	2.7%	75.8%	.4%	.9%	4.5%	**84.3%**
	Partial	.0%	.4%	.0%	.0%	.0%	.4%	**.9%**
	Substantial	.0%	.0%	.4%	.0%	1.8%	.0%	**2.2%**
	None	.0%	.0%	.4%	.0%	.0%	.0%	**.4%**
	Total	**1.3%**	**7.6%**	**81.6%**	**.4%**	**4.0%**	**4.9%**	**100.0%**

Total N = 223

Table A2.99: Showing the relationship between Flaking Extent of the first and second LCT face for the Cave of Hearths.

From table A2.99 it can be seen that the hominins seemed to have preferred a partial marginal method of initial thinning and shaping. This is the least work approach to thinning and shaping and implies that the hominins were not concerned about a standardised working of the LCT being knapped. Furthermore, table A2.99 suggests that the first and second faces have been worked in similar ways (based on sample size) but I also think differing fashions - if the pattern of flaking combinations is examined they appear to be randomly spread across the data set – which may add support to the lack of standardised form being imposed upon the LCTs.

A relative index of edge working extent was described in Chapter 5 and applied to symmetry and tip shape in table A2.100 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	.0%	.0%	1.3%	1.8%	**3.1%**
	yes,yes,no	.0%	2.2%	1.8%	4.9%	**9.0%**
	yes,no,no	.0%	2.7%	3.1%	2.7%	**8.5%**
	no,yes,yes	.0%	1.3%	.9%	.9%	**3.1%**
	no,no,yes	.0%	1.3%	3.6%	.9%	**5.8%**
	no,no,no	4.9%	20.2%	25.1%	8.5%	**58.7%**
	no,yes,no	.9%	4.5%	3.6%	.9%	**9.9%**
	yes,no,yes	.0%	.0%	.9%	.9%	**1.8%**
	Total	**5.8%**	**32.3%**	**40.4%**	**21.5%**	**100.0%**

Total N = 223

Table A2.100: Showing the relationship between Symmetry and Edge Working for the Cave of Hearths.

Form table A2.100 it can be seen that the majority of LCTs have an overall medium to high index of edge working (40.4% at 37-38). This could suggest that although initial thinning and shaping plays a relatively minor role in LCT production, secondary edge working is where the form is imposed upon the blank. Where symmetry is present within the assemblage, it is found within the medium to high and high indices of edge working. This adds to the idea that where form is present, it was imposed through secondary working.

Table A2.101 shows the relationship between tip shape and edge working.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Tip Shape	Markedly Convergent	.0%	.9%	2.7%	6.7%	**10.3%**
	Convergent with a Square Tip	.0%	2.2%	7.2%	3.6%	**13.0%**
	Convergent with an Oblique Tip	.0%	1.3%	2.2%	.9%	**4.5%**
	Convergent with a Generalised Tip	.9%	3.1%	13.0%	5.8%	**22.9%**
	Wide or Divergent	2.7%	17.0%	8.1%	1.8%	**29.6%**
	Wide or Divergent with an Oblique Bit	1.3%	6.3%	4.5%	1.8%	**13.9%**
	Wide with Convex Tip	.9%	1.3%	2.7%	.9%	**5.8%**
	Total	**5.8%**	**32.3%**	**40.4%**	**21.5%**	**100.0%**

Total N = 223

Table A2.101: Showing the relationship between Tip Shape and Edge Working for the Cave of Hearths.

Table A2.101 shows that the more convergent the tip, the more secondary working was required to produce that particular form. This may also account for the relationship between symmetry presence and secondary working, where symmetry was not necessarily the intended form imposition, but rather a fortuitous by-product of a convergent tip shape. This would seem to support the general conclusion that there does not appear to be any definitive form being imposed on the LCTs at the Cave of Hearths beyond LCTs with a convergent element.

In order to assess whether raw material has influenced artefact proportion and form imposition, figure A2.59 shows the relationship between artefact proportion and raw material, whilst table A2.102 shows the relationship between symmetry, tip shape and raw material.

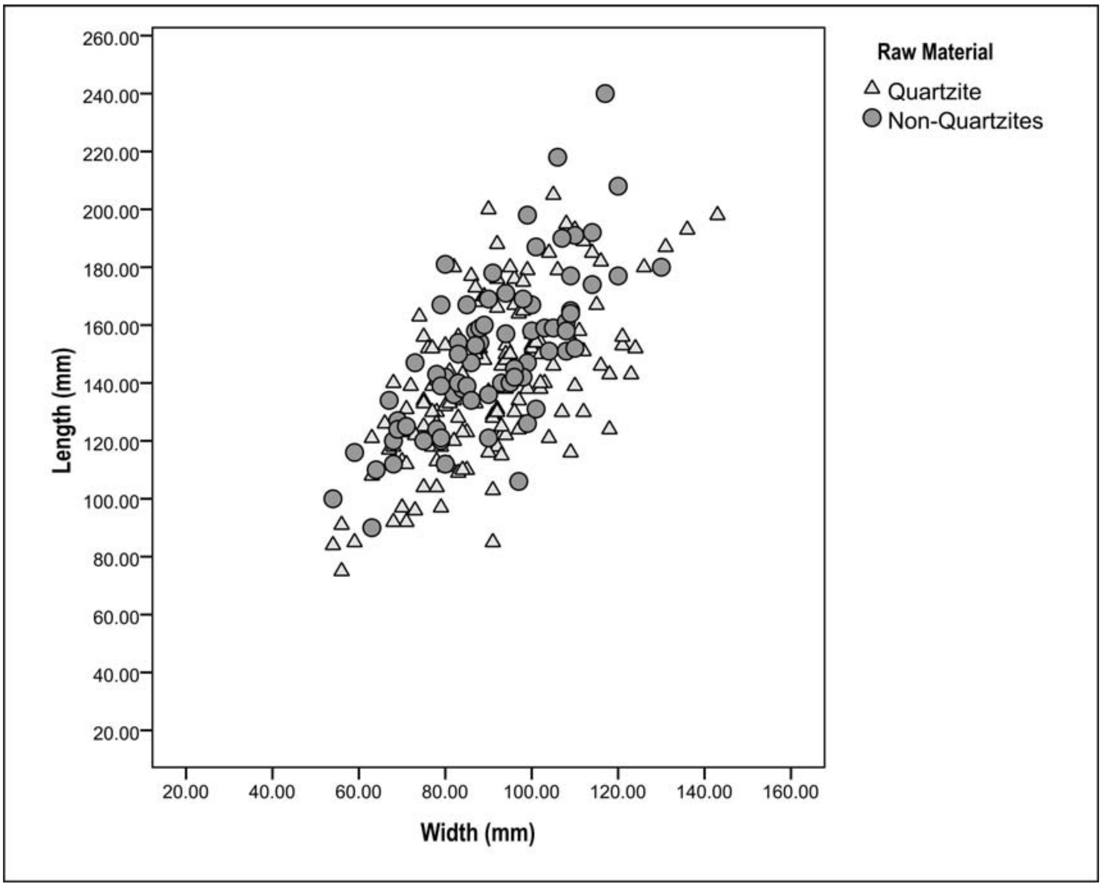


Figure A2.59: Showing the relationship between Artefact Proportion and Raw Material for the Cave of Hearths.

		Raw Material		
		Quartzite	Non-Quartzites	**Total**
Symmetry by Eye	yes,yes,yes	1.3%	1.8%	**3.1%**
	yes,yes,no	5.8%	3.1%	**9.0%**
	yes,no,no	4.5%	4.0%	**8.5%**
	no,yes,yes	2.7%	.4%	**3.1%**
	no,no,yes	2.7%	3.1%	**5.8%**
	no,no,no	41.7%	17.0%	**58.7%**
	no,yes,no	5.8%	4.0%	**9.9%**
	yes,no,yes	1.3%	.4%	**1.8%**
	Total	**65.9%**	**34.1%**	**100.0%**
Tip Shape	Markedly Convergent	5.8%	4.5%	**10.3%**
	Convergent with a Square Tip	8.1%	4.9%	**13.0%**
	Convergent with an Oblique Tip	.9%	3.6%	**4.5%**
	Convergent with a Generalised Tip	15.7%	7.2%	**22.9%**
	Wide or Divergent	21.5%	8.1%	**29.6%**
	Wide or Divergent with an Oblique Bit	9.9%	4.0%	**13.9%**
	Wide with Convex Tip	4.0%	1.8%	**5.8%**
	Total	**65.9%**	**34.1%**	**100.0%**

Total N = 223

Table A2.102: Showing the relationship between symmetry by eye, tip shape and raw material for the Cave of Hearths.

Figure A2.59 shows that there is a more or less equal spread of Quartzite and Non-Quartzite LCTs through all artefact proportion indicating that raw material did not adversely affect artefact proportion. Table A2.102 shows that raw material did not seem to adversely affect the imposition of tip shape or symmetry, and therefore it can be concluded that raw material did not impose constraints upon the Cave of Hearths LCT assemblage that would have impeded cultural imposition of form should culture have existed at this time.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no culturally significant imposition of symmetry or form through tip shape, flaking extent or edge working on the LCTs present within the Cave of Hearths assemblage. There is not a dominant tip form present within assemblage although a low degree of initial working and a fairly high degree of secondary edge working suggest that even though form was being imposed on LCT production, it may not have been culturally significant, but more linked to modifying the initial blank form toward the end of the LCT production sequence. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form for this Acheulean site, rather given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Based on artefact proportion and artefact proportion, raw material does not seem to have adversely affected LCT production at the Cave of Hearths.

Et Tabun Cave (Layers D – F)

The site history and details for Et Tabun can be found in Chapter 6. As mentioned above, a total of 2761 artefacts were analysed from Et Tabun dated to a range of dates depending on context (see Chapter 6). Table A2.103 shows the make up of the Et Tabun assemblage as analysed for this thesis.

		Artefact Type						
		LCT	Flake	Flake tool	Core	Hammer Stone	Core tool	**Total**
Context	D	5	1	91	14	0	1	**112**
	Ea	95	3	246	7	1	0	**352**
	Eb	68	11	358	33	2	1	**473**
	Ec	18	1	123	6	0	1	**149**
	Ed	53	1	218	11	0	4	**287**
	F	12	1	95	7	0	0	**115**
	T.D	1	0	0	0	0	0	**1**
	T.Ea	21	4	90	2	0	1	**118**
	T.Eb	113	2	195	16	1	3	**330**
	T.Ec	18	0	57	9	0	0	**84**
	T.Ed	180	2	351	35	0	0	**568**
	T.F	79	2	60	30	0	1	**172**
	Total	**663**	**28**	**1884**	**170**	**4**	**12**	**2761**

Table A2.103: Showing the relationship between context and artefact type for Et Tabun.

As stated above (Chapter 6), artefacts excavated from the cave layers at Et Tabun were marked with either the context letter such as D, Ea etc or with the prefix T. Therefore, for the purposes of this thesis, I shall treat the artefacts labelled F or T.F (and so on) as coming from the same context. Table A2.104 shows the relationship between context and artefact completeness.

		Completeness		
		Unbroken	Broken	**Total**
Context	D	104	8	**112**
	Ea	331	21	**352**
	Eb	452	21	**473**
	Ec	141	8	**149**
	Ed	261	26	**287**
	F	111	4	**115**
	T.D	1	0	**1**
	T.Ea	113	5	**118**
	T.Eb	312	18	**330**
	T.Ec	80	4	**84**
	T.Ed	534	34	**568**
	T.F	163	9	**172**
	Total	**2603**	**158**	**2761**

Table A2.104: Showing the relationship between context and artefact completeness for Et Tabun.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed from Et Tabun 2603. I shall begin the Et Tabun analysis by looking at the artefact from Layer F.

Et Tabun Layer F: +330,000 years BP

The artefact distribution in relation to Layer F can be seen in table A2.105.

		Context					
		F		T.F		**Total**	
Artefact Type	LCT	12	*4.2%*	79	*27.5%*	**91**	***31.7%***
	Flake	1	*.3%*	2	*.7%*	**3**	***1.0%***
	Flake tool	95	*33.1%*	60	*20.9%*	**155**	***54.0%***
	Core	7	*2.4%*	30	*10.5%*	**37**	***12.9%***
	Core tool	0	*.0%*	1	*.3%*	**1**	***.3%***
	Total	**115**	***40.1%***	**172**	***59.9%***	**287**	***100.0%***

Table A2.105: Showing the relationship between artefact type and context Layer F.

There would appear to be a low proportion of flakes within the assemblage for Layer F, however, this is to be expected to some degree as the collection represents a collected sample, and therefore was heavily subjected to collector's bias favouring the flake tools and LCTs.

Table A2.106 shows the relationship between artefact type and completeness for Layer F.

		Completeness			
		Unbroken		Broken	
Artefact Type	LCT	83	*28.9%*	8	*2.8%*
	Flake	3	*1.0%*	0	*.0%*
	Flake tool	150	*52.3%*	5	*1.7%*
	Core	37	*12.9%*	0	*.0%*
	Core tool	1	*.3%*	0	*.0%*
	Total	**274**	***95.5%***	**13**	***4.5%***

Total N = 287

Table A2.106: Showing the relationship between artefact type and artefact completeness for Layer F.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed from Layer F 274.

Table A2.107 shows the relationship between artefact type and condition.

		Artefact Condition					
		Fresh		Lightly Abraded		**Total**	
Artefact Type	LCT	75	*27.4%*	8	*2.9%*	**83**	***30.3%***
	Flake	3	*1.1%*	0	*.0%*	**3**	***1.1%***
	Flake tool	144	*52.6%*	6	*2.2%*	**150**	***54.7%***
	Core	31	*11.3%*	6	*2.2%*	**37**	***13.5%***
	Core tool	1	*.4%*	0	*.0%*	**1**	***.4%***
	Total	**254**	***92.7%***	**20**	***7.3%***	**274**	***100.0%***

Table A2.107: Showing the relationship between artefact type and artefact condition for Layer F.

Table A2.107 shows that the majority of unbroken artefacts from Et Tabun Layer F are classified as fresh (92.7%) with a small minority classed as lightly abraded (7.3%). This pattern of artefact condition would suggest that the majority of the Et Tabun Layer F assemblage has not been subjected to a large degree of post depositional movement and abrasion and reinforces the contemporary nature of the artefacts labelled F and T.F.

I shall now examine the more specific elements to the Et Tabun Layer F assemblage by looking at the LCTs, Flakes, Flake Tools and Cores in greater depth.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. From tables A2.106 and A2.107 above it can be seen that the 83 unbroken LCTs from Et Tabun Layer F come in a fresh condition. In order to assess the imposition of form and symmetry upon the LCTs from the Layer F assemblage, table A2.108 shows the relationship between tip shape and symmetry.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	6.0%	3.6%	4.8%	2.4%	.0%	21.7%	.0%	.0%	**38.6%**
	Convergent with a Square Tip	.0%	1.2%	2.4%	.0%	.0%	4.8%	.0%	.0%	**8.4%**
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	1.2%	3.6%	.0%	.0%	**4.8%**
	Convergent with a Generalised Tip	.0%	3.6%	2.4%	.0%	.0%	10.8%	1.2%	.0%	**18.1%**
	Wide or Divergent	.0%	.0%	.0%	.0%	1.2%	6.0%	.0%	.0%	**7.2%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	.0%	1.2%	1.2%	.0%	.0%	16.9%	1.2%	2.4%	**22.9%**
	Total	**6.0%**	**9.6%**	**10.8%**	**2.4%**	**2.4%**	**63.9%**	**2.4%**	**2.4%**	**100.0%**

Total N = 83

Table A2.108: Showing the relationship between Tip Shape and Symmetry by Eye for Layer F.

From table A2.108 it is clear that the hominins from Et Tabun Layer F did not place a high significance on absolute LCT symmetry (only 6.0% of the assemblage described as wholly symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 28.8% of the LCTs in table A2.108 display evidence for tip symmetry. However, the majority of the LCTs with a symmetrical element to their tip form also have a convergent element, therefore, the degree of symmetry present within tip form may result from producing a convergent tip, rather than a genuine and conscious imposition of symmetry. The large component of non-symmetrical LCTs (63.9%), and LCTs with a non-symmetrical tip shape (7.2 %) would reinforce the initial observation that symmetry did not play a significant role in LCT production for in the Layer F assemblage.

Figures A2.60 below examines the relationship between symmetry and artefact proportion.

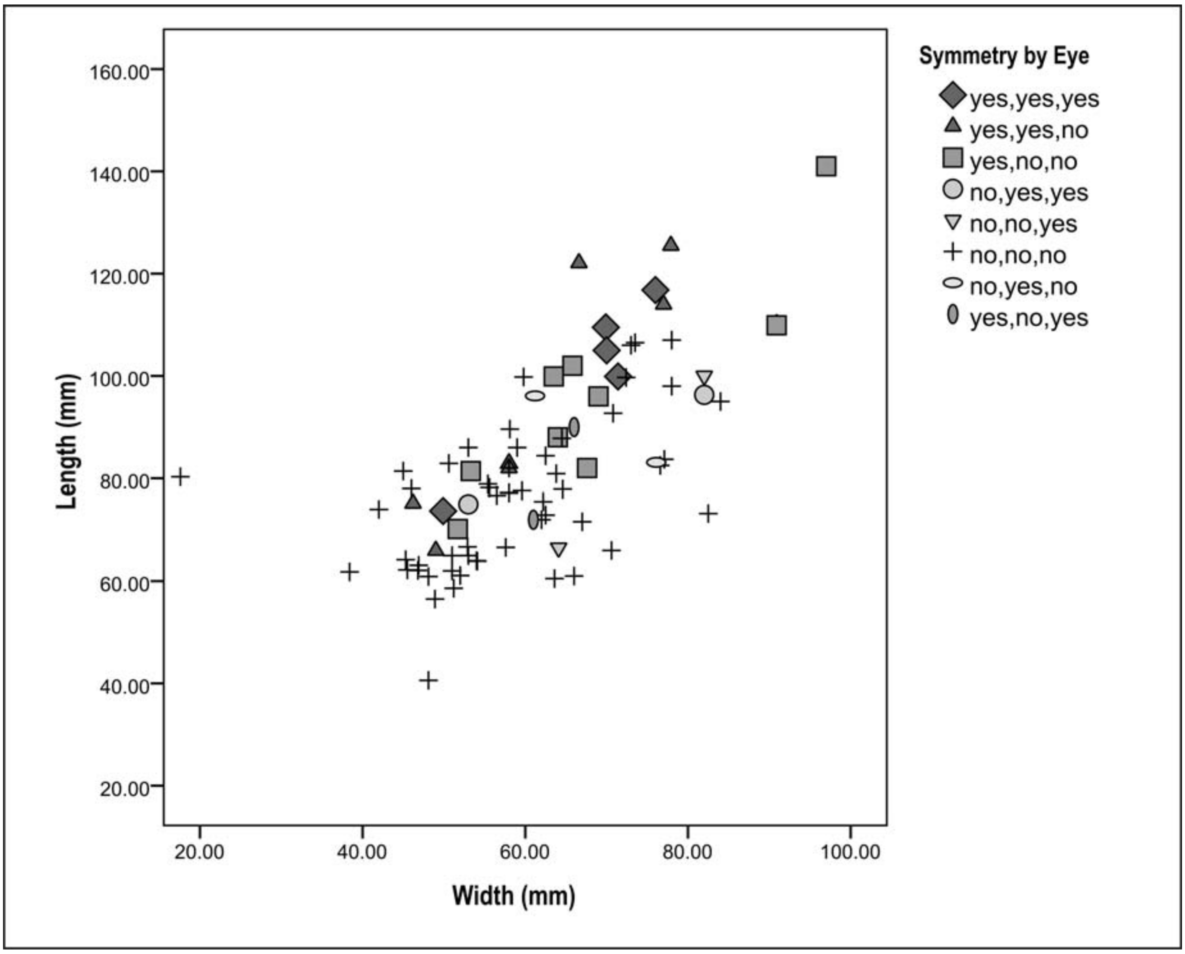


Figure A2.60: Showing the relationship between LCT proportion and symmetry for Layer F.

Figure A2.60 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. A Kruskal Wallis H Test (Ebdon 1977:68) suggests that there is a statistically significant relationship (to 0.05 significance) between symmetry and length (x^2 = 20.119; df = 7; p = 0.05), but not for width (x^2 = 9.498; df = 7; p = 0.219) or thickness (x^2 = 6.975; df = 7; p = 0.432). From figure A2.60, it can be seen that the larger the LCT (+100.00mm), the more symmetry is present within the LCT form. This could suggest that the larger the artefact, the easier it was for the hominins of Et Tabun Layer F to impose an aspect of symmetry to the original blank. However, given the small sample it is difficult to ascertain how significant the statistical link between LCT length and symmetry really is.

Figure A2.61 shows the relationship between tip shape and artefact proportion.

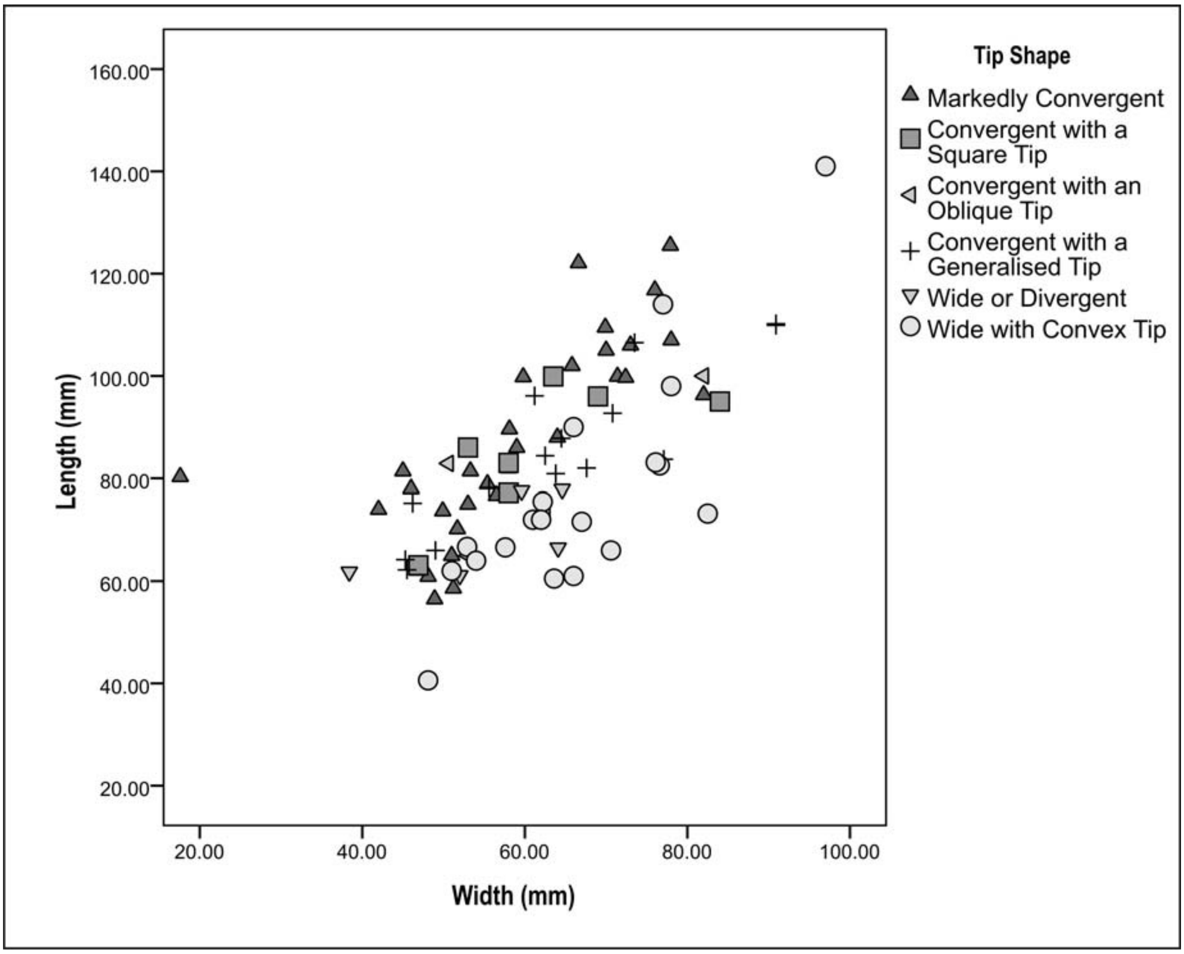


Figure A2.61: Showing the relationship between LCT proportion and tip shape for Layer F.

Figure A2.61 shows that there would appear to be no definitive relationships between artefact proportion and tip shape other than LCTs with a non-convergent element to their tip shape are generally smaller than those with a general or markedly convergent element to their form. A Kruskal Wallis H Test (Ebdon 1977:68) seems to confirm that there is a statistically significant relationship (to 0.05 significance) between observed tip shape and length (x^2 = 11.162; df = 5; p = 0.048), but not for width (x^2 = 5.127; df = 5; p = 0.401) or thickness (x^2 = 7.804; df = 5; p = 0.167). Figure A2.61 would seem to suggest that convergent LCTs are generally longer than they are wide, which may account for the statistically significant relationship indicated by the Kruskal Wallis H Test. In regards to standardisation of form imposition and artefact size, I would suggest that there is no obvious relationship that emerges apart from the larger the LCT, and the more convergent the tip shape, the more symmetry is present within the LCT form. Therefore, the patterns of symmetry may well be a result of knapping a convergent tip shape, rather than through deliberate design.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of the Et Tabun Layer F assemblage (table A2.109).

		Flaking Extent Second Face						
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	None	**Total**
Flaking Extent First Face	Complete	14.5%	1.2%	1.2%	.0%	4.8%	.0%	**21.7%**
	Complete Marginal	4.8%	2.4%	2.4%	.0%	.0%	.0%	**9.6%**
	Partial Marginal	2.4%	1.2%	22.9%	2.4%	2.4%	.0%	**31.3%**
	Partial	.0%	.0%	2.4%	9.6%	.0%	.0%	**12.0%**
	Substantial	1.2%	1.2%	6.0%	2.4%	13.3%	1.2%	**25.3%**
	None	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Total	**22.9%**	**6.0%**	**34.9%**	**14.5%**	**20.5%**	**1.2%**	**100.0%**

Table A2.109: Showing the relationship between Flaking Extent of the first and second LCT face for Layer F.

From table A2.109 it can be seen that the hominins from Layer F clearly seemed to have favoured a partial marginal flaking strategy (the easiest flaking option), however, complete and substantial flaking extents when combined indicate a more intensive flaking strategy may have prevailed. Furthermore, table A2.109 suggests that the first and second faces were worked in similar fashions, if combined with the complete and substantial initial working, it is possible that the hominins of Layer F were imposing deliberate form through a standardised system of initial LCT shaping. If seen in relation to the overwhelming preference for convergent tip shapes, it may be possible to suggest that the Layer F hominins were imposing culturally significant form upon a range of initial blank shapes (nodules and flakes). However, the more likely explanation is that the extensive initial flaking strategy formed as a result of a convergent tip preference on a functional level, rather than evidence for culturally significant form imposition. This is reinforced by the overall lack of full symmetry within the Layer F LCT assemblage.

In order to test this idea further, a relative index of edge working extent was described in Chapter 5 and applied to symmetry in table A2.110 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	1.2%	3.6%	.0%	1.2%	**6.0%**
	yes,yes,no	3.6%	.0%	2.4%	3.6%	**9.6%**
	yes,no,no	3.6%	4.8%	.0%	2.4%	**10.8%**
	no,yes,yes	1.2%	.0%	.0%	1.2%	**2.4%**
	no,no,yes	.0%	2.4%	.0%	.0%	**2.4%**
	no,no,no	28.9%	16.9%	10.8%	7.2%	**63.9%**
	no,yes,no	1.2%	1.2%	.0%	.0%	**2.4%**
	yes,no,yes	.0%	.0%	1.2%	1.2%	**2.4%**
	Total	**39.8%**	**28.9%**	**14.5%**	**16.9%**	**100.0%**

Total N = 83

Table A2.110: Showing the relationship between Symmetry and Edge Working from Layer F.

From table A2.110 it can be seen that the majority of LCTs have an overall low amount of edge working (39.8% at 12 – 24 and 28.9% at 25 -36). There presence of some higher degrees of edge working (14.5% at 37 - 48 and 16.9% at 49 – 60) may indicate a degree of standardisation in edge working, however, as this does not seem to be directly linked to absolute symmetry imposition, it is unlikely that the edge working standardisation is culturally motivated.

Table A2.111 shows the relationship between tip shape and edge working.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Tip Shape	Markedly Convergent	12.0%	13.3%	6.0%	7.2%	**38.6%**
	Convergent with a Square Tip	2.4%	1.2%	1.2%	3.6%	**8.4%**
	Convergent with an Oblique Tip	.0%	2.4%	2.4%	.0%	**4.8%**
	Convergent with a Generalised Tip	13.3%	3.6%	1.2%	.0%	**18.1%**
	Wide or Divergent	3.6%	3.6%	.0%	.0%	**7.2%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	8.4%	4.8%	3.6%	6.0%	**22.9%**
	Total	**39.8%**	**28.9%**	**14.5%**	**16.9%**	**100.0%**

Table A2.111: Showing the relationship between Tip Shape and Edge Working for Layer F.

Table A2.111 shows that the degree of edge working is not dependent on particular tip shape other than there is an overall low index of edge working regardless of tip shape and symmetry imposition (table A2.110). This would seem to support the general conclusion that there does not appear to be any definitive standardised edge working practice being imposed on the LCTs from Layer F through secondary edge working.

In order to assess whether raw material has influenced artefact proportion and form imposition, figure A2.62 shows the relationship between LCT proportion and raw material, whilst table A2.112 shows the relationship between symmetry, tip shape and raw material.

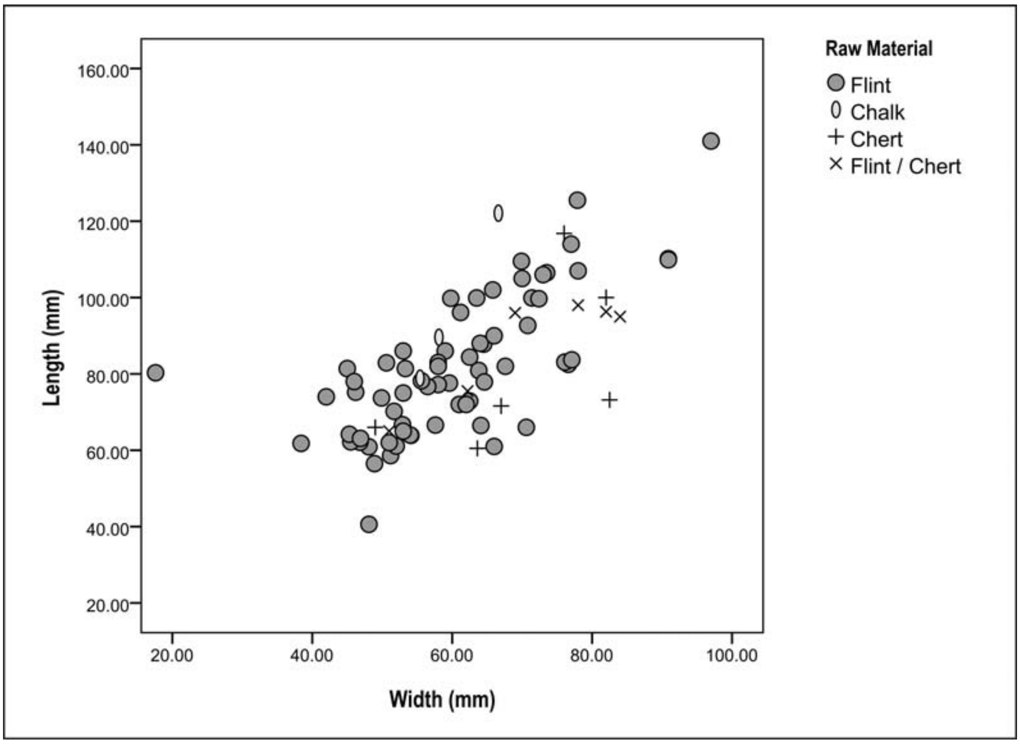


Figure A2.62: Showing the relationship between LCT Proportion and Raw Material from Layer F.

		Raw Material				
		Flint	Chalk	Chert	Flint / Chert	**Total**
Symmetry by Eye	yes,yes,yes	4.8%	.0%	1.2%	.0%	**6.0%**
	yes,yes,no	7.2%	1.2%	1.2%	.0%	**9.6%**
	yes,no,no	9.6%	.0%	.0%	1.2%	**10.8%**
	no,yes,yes	1.2%	.0%	.0%	1.2%	**2.4%**
	no,no,yes	1.2%	.0%	1.2%	.0%	**2.4%**
	no,no,no	53.0%	2.4%	3.6%	4.8%	**63.9%**
	no,yes,no	2.4%	.0%	.0%	.0%	**2.4%**
	yes,no,yes	2.4%	.0%	.0%	.0%	**2.4%**
	Total	**81.9%**	**3.6%**	**7.2%**	**7.2%**	**100.0%**
Tip Shape	Markedly Convergent	31.3%	3.6%	1.2%	2.4%	**38.6%**
	Convergent with a Square Tip	6.0%	.0%	.0%	2.4%	**8.4%**
	Convergent with an Oblique Tip	3.6%	.0%	1.2%	.0%	**4.8%**
	Convergent with a Generalised Tip	16.9%	.0%	1.2%	.0%	**18.1%**
	Wide or Divergent	7.2%	.0%	.0%	.0%	**7.2%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	16.9%	.0%	3.6%	2.4%	**22.9%**
	Total	**81.9%**	**3.6%**	**7.2%**	**7.2%**	**100.0%**

Total N = 83

Table A2.112: Showing the relationship between symmetry by eye, tip shape and raw material for Layer F.

Figure A2.62 and Table A2.112 show that flint has the majority of representation within the Layer F LCT assemblage, and that raw material did not seem to have adversely affected LCT production given the spread of symmetry and tip types represented in all raw material categories.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry or edge working, although there may be deliberate and conscious form imposed through tip shape and initial flaking extent. Furthermore, there would appear to be no convincing indicators for a standardised practice of LCT working that could be linked to cultural significance. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form although a tips with a convergent element seem to have been preferred. Given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Given the range of LCT proportions, symmetry categories and tip shapes represented across raw material categories, raw material is unlikely to have affected LCT production in the Layer F assemblage at Et Tabun.

Flake and Flake Tool Analysis

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. In order to get an understanding on the number of detached pieces recorded from the Layer F assemblage, table A2.113 shows the breakdown of unbroken flakes and flake tools in relation to the flake types described in Chapter 5.

		Artefact Type					
		Flake		Flake tool		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	2	*1.3%*	**2**	***1.3%***
	R2 - Denticulated scraper	0	*.0%*	1	*.7%*	**1**	***.7%***
	R3 - Side scraper	0	*.0%*	60	*39.2%*	**60**	***39.2%***
	R4 - End / Traverse scraper	0	*.0%*	12	*7.8%*	**12**	***7.8%***
	R5 - Flake with scraper retouch	0	*.0%*	45	*29.4%*	**45**	***29.4%***
	R6 - Scraper used as wedge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R7 - Retouched point (awl)	0	*.0%*	10	*6.5%*	**10**	***6.5%***
	R8 - Retouched point (projectile)	0	*.0%*	0	*.0%*	**0**	***.0%***
	R9 - Retouched notch	0	*.0%*	0	*.0%*	**0**	***.0%***
	R10 - Retouch non diagnostic	0	*.0%*	0	*.0%*	**0**	***.0%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	0	*.0%*	**0**	***.0%***
	R12 - Multiple tool	0	*.0%*	8	*5.2%*	**8**	***5.2%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R14 - Utilised flake with no retouch	0	*.0%*	5	*3.3%*	**5**	***3.3%***
	R15 - Flake with edge damage	0	*.0%*	7	*4.6%*	**7**	***4.6%***
	R16 - Flake with no retouch	3	*2.0%*	0	*.0%*	**3**	***2.0%***
	Total	**3**	***2.0%***	**150**	***98.0%***	**153**	***100.0%***

Table A2.113: Showing the breakdown between flakes and flake tools in relation to flake type for Layer F.

As can be seen, probably as a result of collector’s bias, there are far more flake tools than flakes present within the unbroken detached artefacts studied from Layer F. Within this collected sample there would appear to be a preference for side scrapers, however, whether this is a genuine example of knapper’s intent or a result of collection bias is uncertain.

Table A2.114 shows the relationship between flake type and Toth type (Toth 1985) illustrating that Toth types 2, 3, 5 and 6 are present within the Layer F unbroken flake assemblage. Of particular dominance is Toth type 5 (completely non cortical) at 55.6% of the flakes and flake tools. This would suggest that the majority of the collected detached pieces from Layer F come from cores that were toward the end of the reduction sequence where most of the cortex has been knapped off the core through earlier reductions.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	1.3%	.0%	.0%	.0%	.0%	**1.3%**
	R2 - Denticulated scraper	.0%	.0%	.0%	.0%	.7%	.0%	**.7%**
	R3 - Side scraper	.0%	5.9%	.7%	.0%	22.9%	9.8%	**39.2%**
	R4 - End / Traverse scraper	.0%	.7%	.7%	.0%	5.2%	1.3%	**7.8%**
	R5 - Flake with scraper retouch	.0%	3.9%	.7%	.0%	15.7%	9.2%	**29.4%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	.0%	.7%	.0%	.0%	2.0%	3.9%	**6.5%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R9 - Retouched notch	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	.7%	.0%	.0%	2.0%	2.6%	**5.2%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.7%	.0%	.0%	2.0%	.7%	**3.3%**
	R15 - Flake with edge damage	.0%	.0%	.0%	.0%	3.9%	.7%	**4.6%**
	R16 - Flake with no retouch	.0%	.0%	.0%	.0%	1.3%	.7%	**2.0%**
	Total	**.0%**	**13.7%**	**2.0%**	**.0%**	**55.6%**	**28.8%**	**100.0%**

Total N = 153

Table A2.114: Showing the relationship between Flake Type and Toth type for Layer F.

In terms of the technological make up of the collected Layer F detached pieces, table A2.115 shows that 7.8% of the unbroken collected detached pieces for Layer F are PCT in character, 1.3% (PCT?) display PCT characteristics but are not definitively PCT in nature, whilst 90.8% are Non-PCT.

		Flake Technology Type			
		Non-PCT	PCT	PCT?	**Total**
Flake Type	R1 - Denticulated edge	1.3%	.0%	.0%	**1.3%**
	R2 - Denticulated scraper	.7%	.0%	.0%	**.7%**
	R3 - Side scraper	38.6%	.7%	.0%	**39.2%**
	R4 - End / Traverse scraper	7.8%	.0%	.0%	**7.8%**
	R5 - Flake with scraper retouch	24.8%	3.3%	1.3%	**29.4%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	5.2%	1.3%	.0%	**6.5%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	**.0%**
	R9 - Retouched notch	.0%	.0%	.0%	**.0%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	5.2%	.0%	.0%	**5.2%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	1.3%	2.0%	.0%	**3.3%**
	R15 - Flake with edge damage	3.9%	.7%	.0%	**4.6%**
	R16 - Flake with no retouch	2.0%	.0%	.0%	**2.0%**
	Total	**90.8%**	**7.8%**	**1.3%**	**100.0%**

Total N = 153

Table A2.115: Showing the relationship between flake type and flake technology type for Layer F.

Table A2.115 further illustrates that there does not seem to be a particular preference for a specific tool type from any of the flake technology type categories, which may suggest that the hominins were not producing tools to specific form templates, but rather as opportunistic responses to required tasks. A closer look at the PCT flakes in table A2.116 shows that the majority of PCT flakes (13 in total) are radial or laminar in character and not confined to a specific tool type – beyond a generic flake with scraper retouch.

		PCT Flake Type									
		Radial		Convergent		Convergent / Laminar		Laminar		Total	
Flake Type	R3 - Side scraper	0	*.0%*	0	*.0%*	1	*7.7%*	0	*.0%*	**1**	***7.7%***
	R5 - Flake with scraper retouch	4	*30.8%*	0	*.0%*	0	*.0%*	2	*15.4%*	**6**	***46.2%***
	R7 - Retouched point (awl)	0	*.0%*	1	*7.7%*	1	*7.7%*	0	*.0%*	**2**	***15.4%***
	R14 - Utilised flake with no retouch	0	*.0%*	1	*7.7%*	0	*.0%*	2	*15.4%*	**3**	***23.1%***
	R15 - Flake with edge damage	0	*.0%*	0	*.0%*	1	*7.7%*	0	*.0%*	**1**	***7.7%***
	Total	**4**	***30.8%***	**2**	***15.4%***	**3**	***23.1%***	**4**	***30.8%***	**13**	***100.0%***

Table A2.116: Showing the relationship between Flake type and PCT type for Layer F.

Table A2.117 (below) shows that the hominins of Et Tabun Layer F were able to extract Non-PCT and PCT flakes over the two main raw materials (flint and chert) found within the Layer F context. The majority of flakes are related to flint, however, chert is also a raw material conducive to knapping which suggests that raw material type did not play a limiting factor in flake or flake tool production.

		Flake Technology Type			
		Non-PCT	PCT	PCT?	**Total**
Raw Material	Flint	81.0%	7.2%	1.3%	**89.5%**
	Chert	7.8%	.7%	.0%	**8.5%**
	Flint / Chert	2.0%	.0%	.0%	**2.0%**
	Total	**90.8%**	**7.8%**	**1.3%**	**100.0%**
Total N = 153					

Table A2.117: Showing the relationship between raw material and flake technology type for Layer F.

Figure A2.63 shows the relationship between raw material and flake / flake tool size, and as can be seen, raw material would not appear to play a limiting factor in flake / flake tool production.

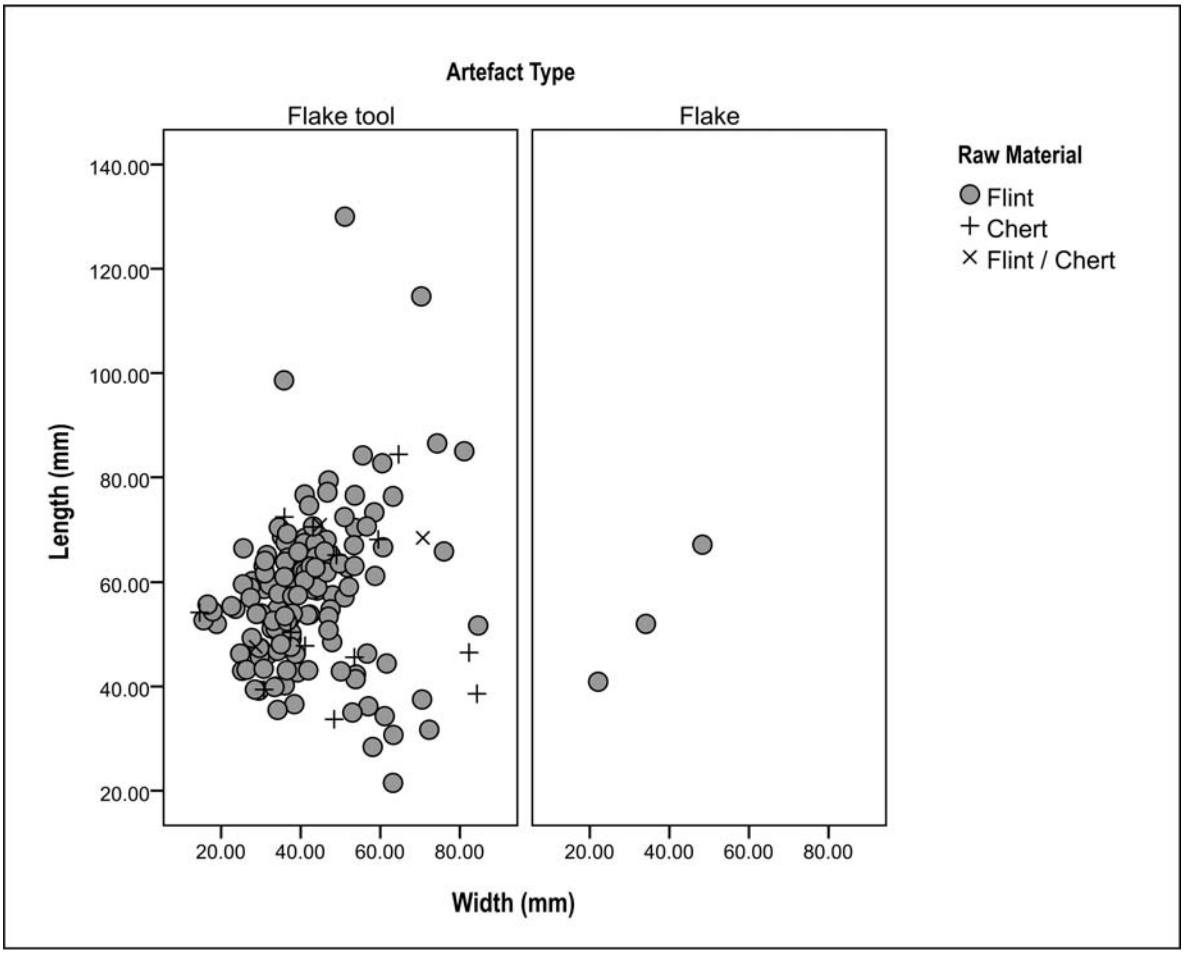


Figure A2.63: Showing the relationship between flake and flake tool proportion and raw material for Layer F.

Figure A2.64 illustrates the relationship between flake technology type and flake proportion.

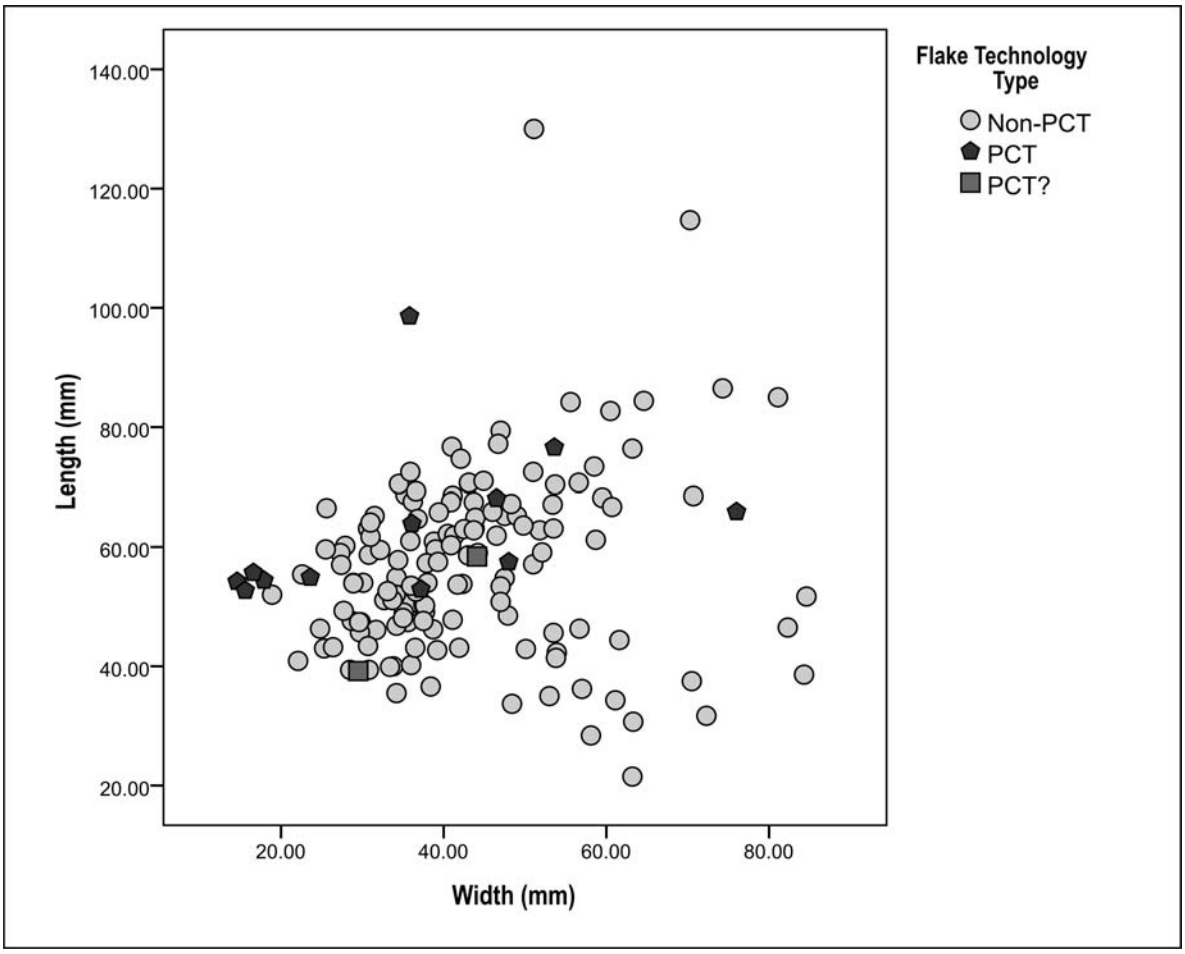


Figure A2.64: Showing the relationship between flake proportion and flake technology type for Layer F.

Once again there would not seem to be a relationship between flake proportion and technology type, with the possible exception of four clustered PCT flakes. Table A2.118 illustrates the relationship between retouch and flake technology.

		Flake Technology Type							
		Non-PCT		PCT		PCT?		**Total**	
Retouch present on left edge	Yes	78	*56.5%*	7	*5.1%*	2	*1.4%*	**87**	***63.0%***
	No	50	*36.2%*	1	*.7%*	0	*.0%*	**51**	***37.0%***
	Total	**128**	***92.8%***	**8**	***5.8%***	**2**	***1.4%***	**138**	***100.0%***
Retouch present on distal edge	Yes	77	*55.8%*	6	*4.3%*	2	*1.4%*	**85**	***61.6%***
	No	51	*37.0%*	2	*1.4%*	0	*.0%*	**53**	***38.4%***
	Total	**128**	***92.8%***	**8**	***5.8%***	**2**	***1.4%***	**138**	***100.0%***
Retouch present on right edge	Yes	84	*60.9%*	8	*5.8%*	2	*1.4%*	**94**	***68.1%***
	No	44	*31.9%*	0	*.0%*	0	*.0%*	**44**	***31.9%***
	Total	**128**	***92.8%***	**8**	***5.8%***	**2**	***1.4%***	**138**	***100.0%***
Retouch present on proximal edge	Yes	9	*6.5%*	2	*1.4%*	0	*.0%*	**11**	***8.0%***
	No	119	*86.2%*	6	*4.3%*	2	*1.4%*	**127**	***92.0%***
	Total	**128**	***92.8%***	**8**	***5.8%***	**2**	***1.4%***	**138**	***100.0%***

Table A2.118: Showing the relationship between retouch presence and artefact type for Layer F.

Table A2.118 shows that there are 138 flake tools with retouch on at least one flake edge. Table A2.118 seems to imply that where retouch is present, it is mostly present on more than one edge, which may indicate that specific form and shape is being applied to the flake tools. However, given the wide range of flake tools present in table A2.113, this may not be the case, although this is explored in greater detail below during the retouch analysis.

The following tests below regarding retouch and flake proportion are only conducted on the 138 unbroken detached pieces that have retouch present on at least one of their edges. Although I should stress that from such a small sample any patterns relating to retouch and form imposition must be treated with a degree of caution. According to the predictions in table 4.3 (Chapter 4) the form imposition through Non-PCT and PCT would be primarily functional in character, however if there was an extensive amount of secondary working on the flake after detachment (i.e. through retouch) then the artefacts may display some tendency toward being culturally significant.

Retouch Delineation

Figure A2.65 (below) shows the relationship between retouch delineation and flake proportion where there would appear to be a large spread of retouch delineation types present within the Et Tabun Layer F flake tools. Although all flake tool edges display a variety of retouch delineations, there is a clear preference for convex retouch on all but the proximal edge. The proximal edge is characterised by a general lack of retouch although there are a few examples of retouch presence. A Kruskal Wallis H Test (Ebdon 1977:68) shows there is no statistically significant relationship (to 0.05 significance) between flake length, width, or thickness and retouch delineation for the left, distal and proximal edges (figure A2.65). However, A Kruskal Wallis H Test does suggest that there may be statistically significant relationship (to 0.05 significance) between the right edge and length (x^2 = 18.925; df = 7; p = 0.008) and thickness (x^2 = 14.042; df = 7; p = 0.05) but not width (x^2 = 9.654; df = 7; p = 0.209). From figure A2.65 it can be seen that retouch delineation on the right edge is present on all large flakes, or flakes that are proportionately longer than they are wide. Therefore, the statistical relationship alluded to above may simply reflect the fact that the right edge of the flake tools from Layer F would appear to be more extensively retouched than the other edges. This pattern shall be examined as the retouch analysis continues below. As there would not appear to be a specific pattern of retouch delineation in that all edges display a range of retouch delineations, it is likely that deliberate form is not being imposed through retouch delineation, and that retouch is more a reaction to demand than cultural significance.

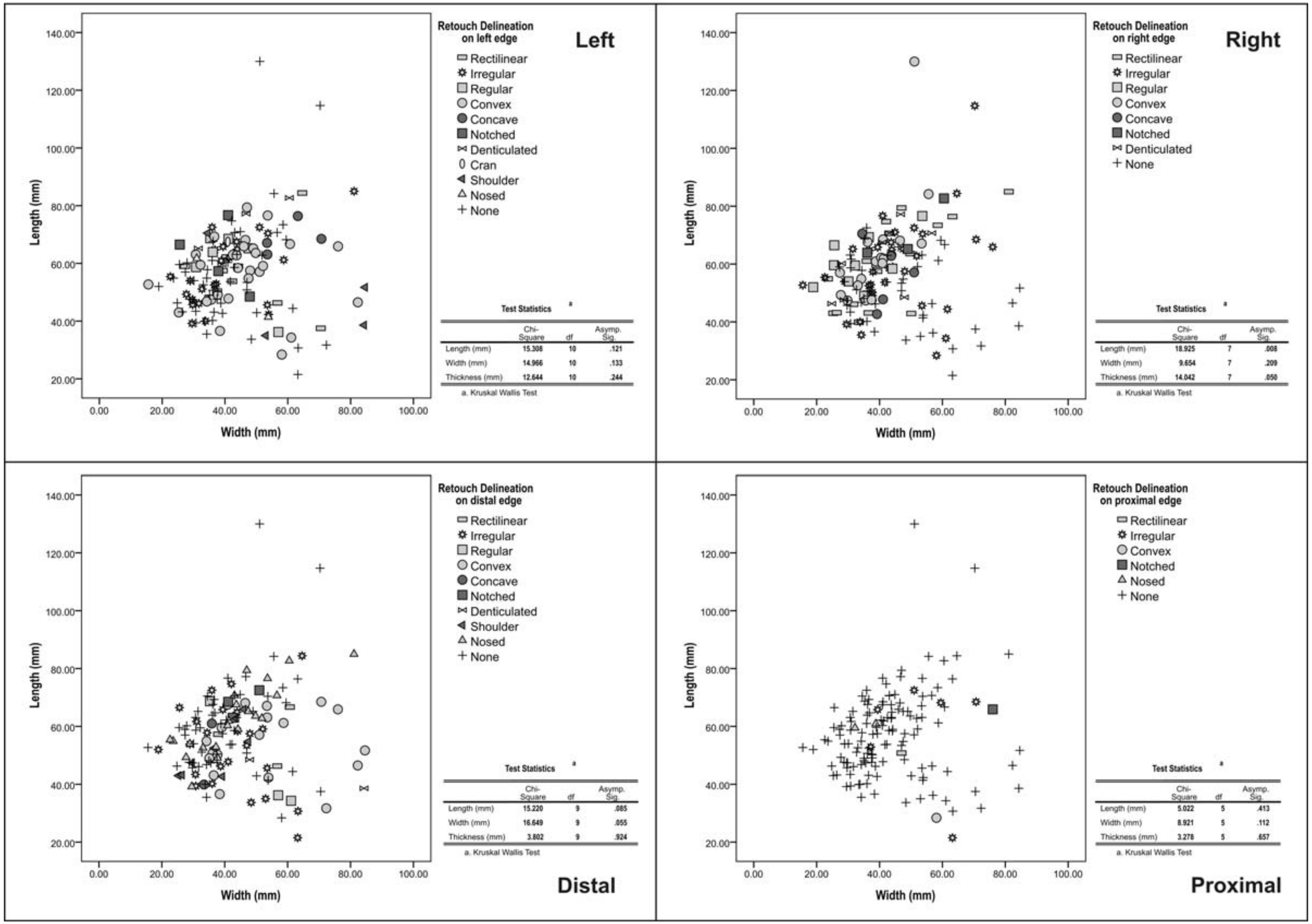


Figure A2.65: Showing the relationship between flake proportion and retouch delineation for Layer F.

Retouch distribution

Figure A2.66 (below) shows the relationship between flake proportion and retouch distribution. There appears to be clear preference for a total style of retouch distribution although partial and discontinuous retouch distributions are present within the sample. Total retouch implies that the whole of the flake edge had been retouched and may indicate that particular form was being imposed by the knapper through retouch. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch distribution (figure A2.66) for the left, distal and proximal edges. However, on the right edge there would appear to be a statistically significant relationship between retouch distribution and flake length (x^2 = 15.667; df = 2; p = 0.000) but not for width or thickness (figure A2.66). If there is a genuine relationship between retouch distribution on the right edge and flake length then perhaps we are seeing a preference for the use of the right edge over the use of other edges (although they are clearly utilised). Figure A2.66 suggests that where patterns of retouch are present then the hominins are utilising the full edge of the flake. However, figures A2.65 and A2.66 do not suggest culturally mediated form imposition on flake tools through secondary retouch.

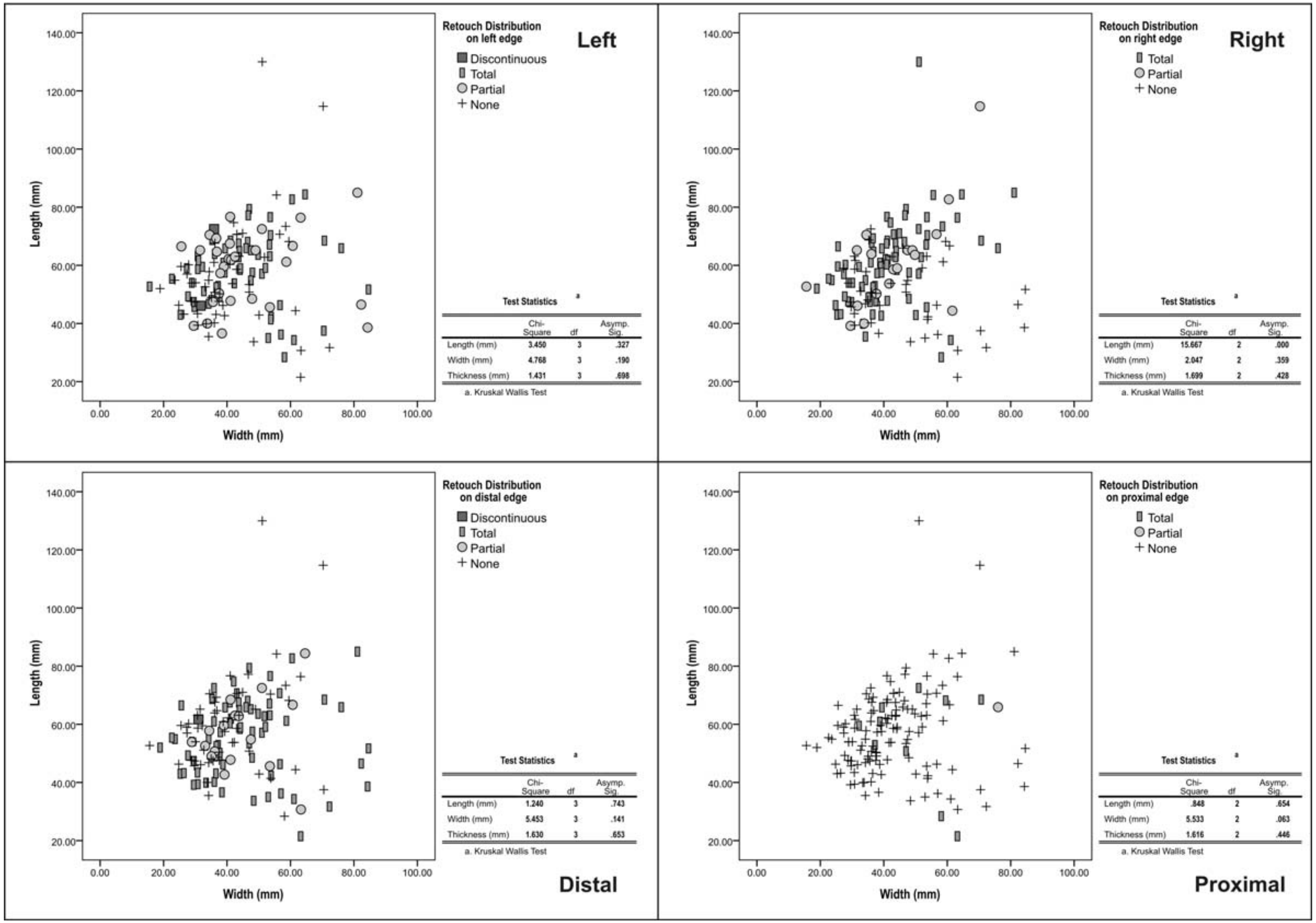


Figure A2.66: Showing the relationship between flake proportion and retouch distribution for Layer F.

Retouch Position

Figure A2.67 (below) shows the relationship between flake proportion and retouch position. There appears to be clear preference for a direct style of retouch position whilst inverse, alternating and bifacial retouch have a limited presence within the sample. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch position (figure A2.67) for the left, distal and proximal edges. However, on the right edge there would appear to be a continued statistically significant relationship between retouch position and flake length (x^2 = 19.184; df = 3; p = 0.000) but not for width or thickness (figure A2.67). This example of statistical significance is likely linked to the reasons given above and as the favoured type of retouch position is direct, the pattern plays out again here. That is, where retouch is present on the distal it is total in distribution, direct in position and varied in delineation. Therefore I would suggest that figures A2.65, A2.66 and A2.67 do not suggest culturally mediated form imposition on flake tools through secondary retouch.

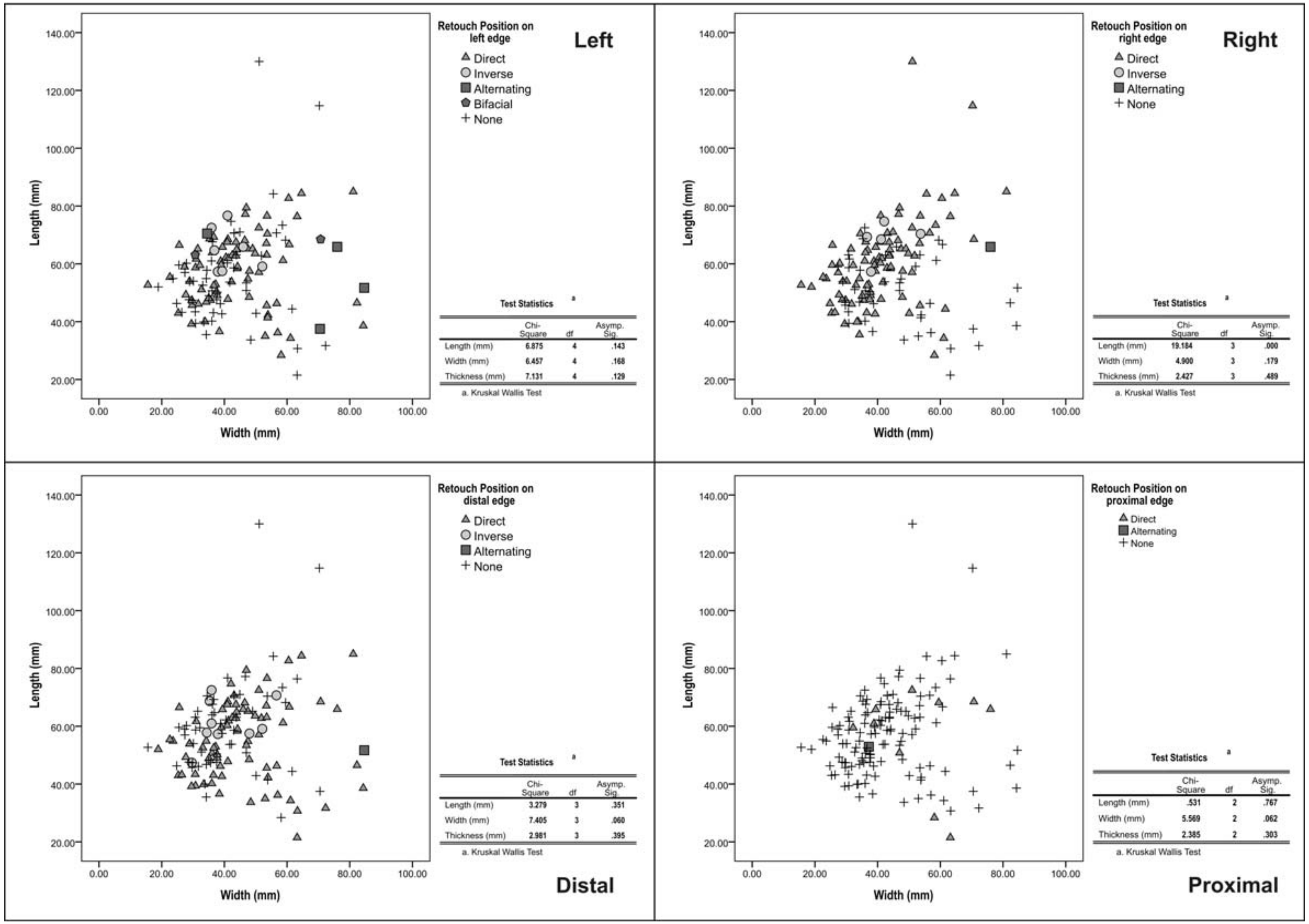


Figure A2.67: Showing the relationship between flake proportion and retouch position for Layer F.

Retouch Extent

Figure A2.68 (below) shows the relationship between flake proportion and retouch extent, where the dominant form retouch extent being short. A Kruskal Wallis H Test (Ebdon 1977:68) indicates that to a 0.05 significance level, there would appear to be no statistically significant relationship between flake proportion and retouch extent (figure A2.68) for the left, distal and proximal edges. However, on the right edge the statistically significant relationship persists between retouch position and flake length (x^2 = 18.494; df = 3; p = 0.000) but not for width or thickness (figure A2.68). Short retouch is not invasive across the surface of the flake and therefore is limited to edge manipulation only. Therefore I would propose that the pattern of retouch extent seen in figures A2.65 - A2.68 supports the idea that deliberate form imposition through secondary working in terms of artefact aesthetic is not present within the Et Tabun Layer F assemblage. The retouch would appear to be functional in character and limited to edge modification that mirrors the shape of the original edge (personal observation), rather than deliberately changing it to a different preconceived form.

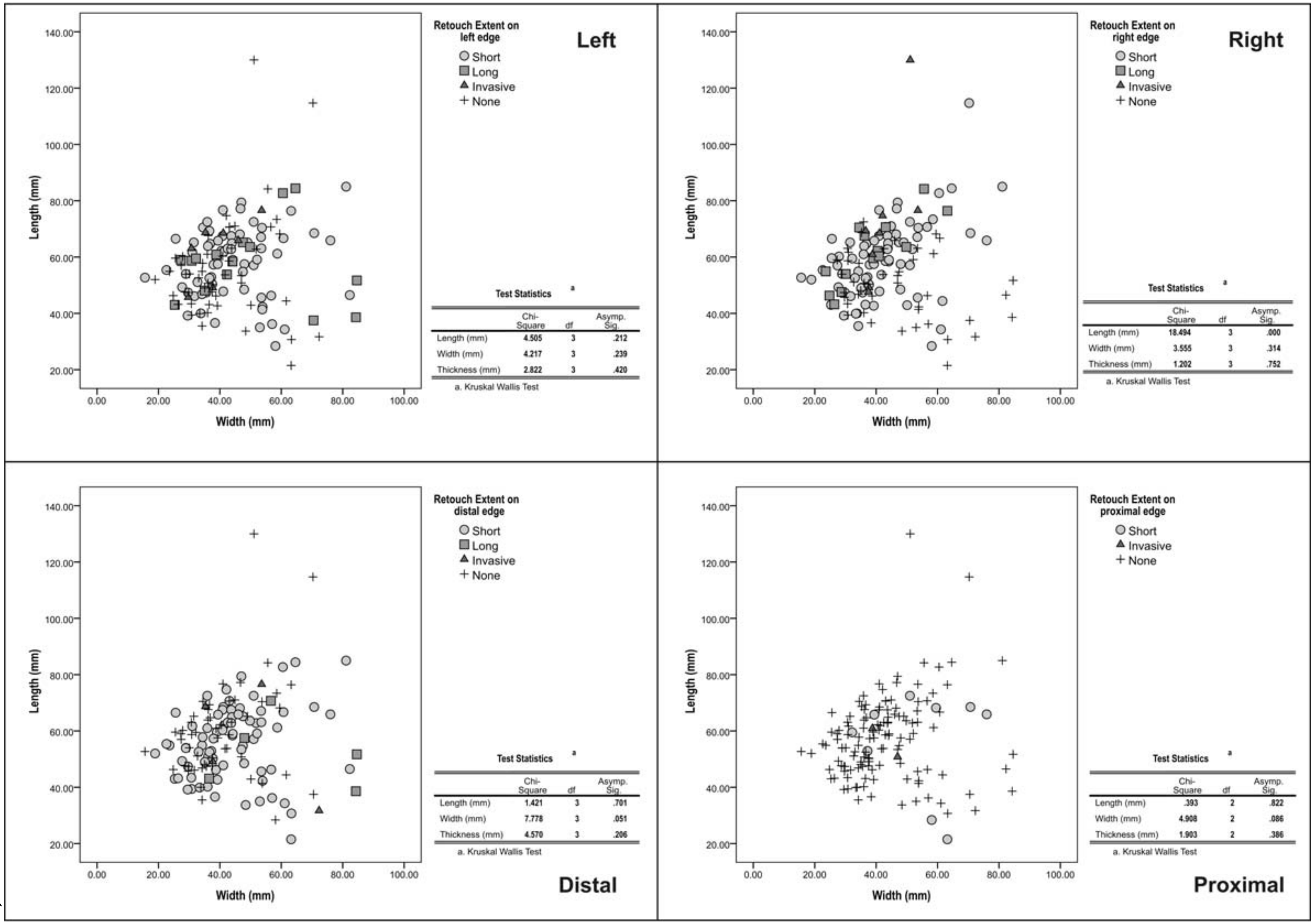


Figure A2.68: Showing the relationship between flake proportion and retouch extent for Layer F.

Conclusion

Given that the types of raw material represented at Et Tabun Layer F (Flint, Chert and Flint / Chert) are known raw materials for their conducive knapping qualities it is unlikely that that raw material played an adverse role in artefact production. From examining the detached pieces where retouch was present it would appear that there may have been a preference for utilising the right edge of the flake tools examined through retouch. However, whether this is a true reflection of the knapper's intent or a result of collector's bias is difficult to distinguish. The standardisation of tool form through PCT (PCT flake predominantly being radial and laminar in nature) is not necessarily culturally significant standardisation, and given the lack of specific secondary form imposition through retouch, it is more likely a result of manufacturing technique. There would appear to be no degree of standardisation in terms of flake proportion for both retouched and unretouched flakes from Non-PCT and PCT manufacturing.

Cores

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. In correlation with the flake data, the cores from Et Tabun Layer F are a mixture of non-PCT and PCT (table A2.119).

		Artefact Type					
		Core		Core tool		**Total**	
Non-PCT Core - Generic Type	A1 - Alternate	1	*5.0%*	0	*.0%*	**1**	***5.0%***
	A2 - Alternate and Parallel	1	*5.0%*	0	*.0%*	**1**	***5.0%***
	A3 - Parallel single platform	7	*35.0%*	1	*5.0%*	**8**	***40.0%***
	A4 - Parallel multiple platform	1	*5.0%*	0	*.0%*	**1**	***5.0%***
	A5 - Single	1	*5.0%*	0	*.0%*	**1**	***5.0%***
	A6 - Mixture of A1 - A5	4	*20.0%*	0	*.0%*	**4**	***20.0%***
	A7 - Other non-PCT	4	*20.0%*	0	*.0%*	**4**	***20.0%***
	Total	**19**	***95.0%***	**1**	***5.0%***	**20**	***100.0%***
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	0	*.0%*	0	*.0%*	**0**	***.0%***
	B2 - Discoid	6	*42.9%*	0	*.0%*	**6**	***42.9%***
	B3 - Other	8	*57.1%*	0	*.0%*	**8**	***57.1%***
	Total	**14**	***100.0%***	**0**	***.0%***	**14**	***100.0%***
PCT Core Type	C1- Radial	1	*25.0%*	0	*.0%*	**1**	***25.0%***
	C2 - Convergent	0	*.0%*	0	*.0%*	**0**	***.0%***
	C3 - Parallel / laminar	3	*75.0%*	0	*.0%*	**3**	***75.0%***
	C3a - Simple prepared cores	0	*.0%*	0	*.0%*	**0**	***.0%***
	C4 - Other	0	*.0%*	0	*.0%*	**0**	***.0%***
	Total	**4**	***100.0%***	**0**	***.0%***	**4**	***100.0%***

Total N = 38

Table A2.119: Showing the relationship between Core Type and Artefact Type for Layer F.

Table A2.119 shows that there are 38 unbroken cores in total from Layer F not restricted to a particular type of reduction sequence, although there would seem to be a preference for parallel / laminar preferential removals in the PCT cores (a pattern reflected in the PCT flakes). In terms of examining the cores of the Et Tabun Layer F assemblage for any form of standardisation in artefact proportion, figures A2.69 - A2.71 below show the relationship between length, width and the Layer F cores.

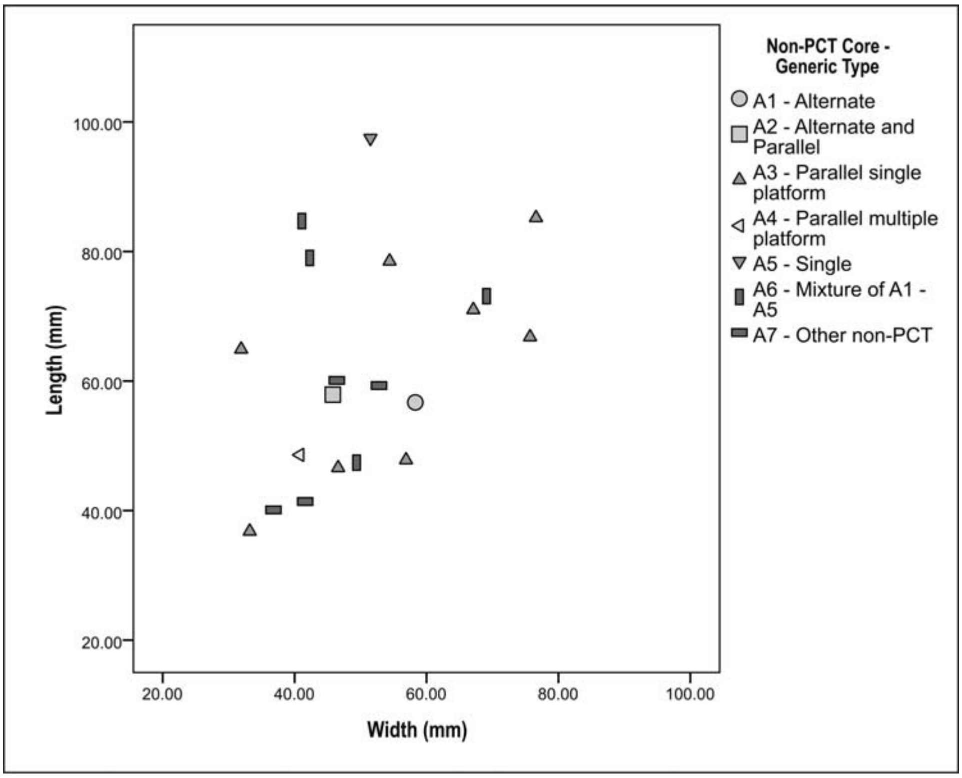


Figure A2.69: Showing the relationship between artefact proportion and Non-PCT Generic cores for Layer F.

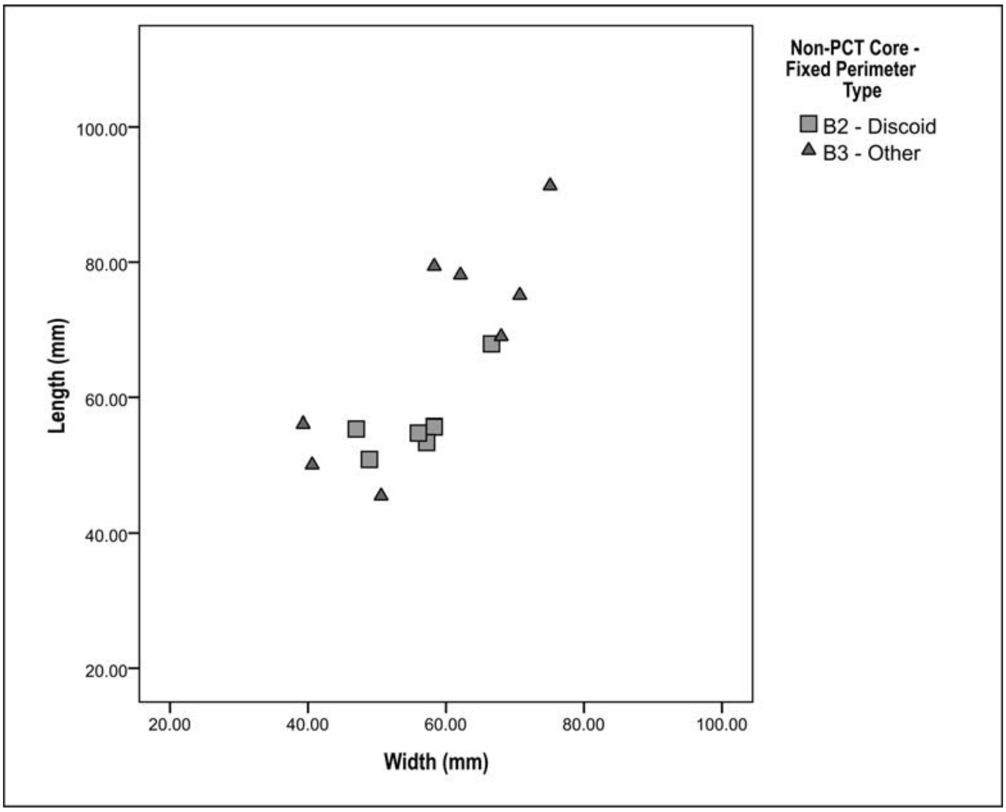


Figure A2.70: Showing the relationship between artefact proportion and Non-PCT fixed perimeter cores for Layer F.

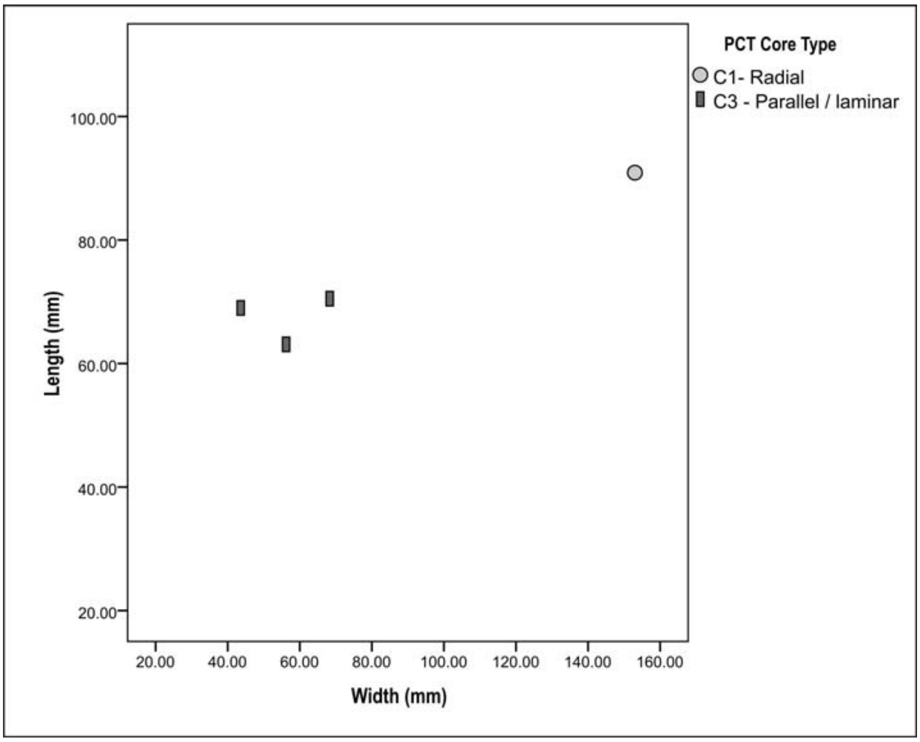


Figure A2.71: showing the relationship between artefact proportion and PCT cores for Layer F.

From figures A2.69 – A2.71 it would seem that all non-PCT generic cores and PCT cores are being reduced and discarded through a range of artefact proportions. This in turn would indicate that there is no predetermined or socially significant standard to which these core types are being worked. Rather the core pattern would seem to support the conclusions from the flake analysis where flakes and cores are worked through opportunistic knapping to fulfil a specific need at a specific time, and then being discarded. In terms of raw material, the predominant raw material is flint with only the Non-PCT fixed margin cores showing any variety in raw material (figure A2.72).

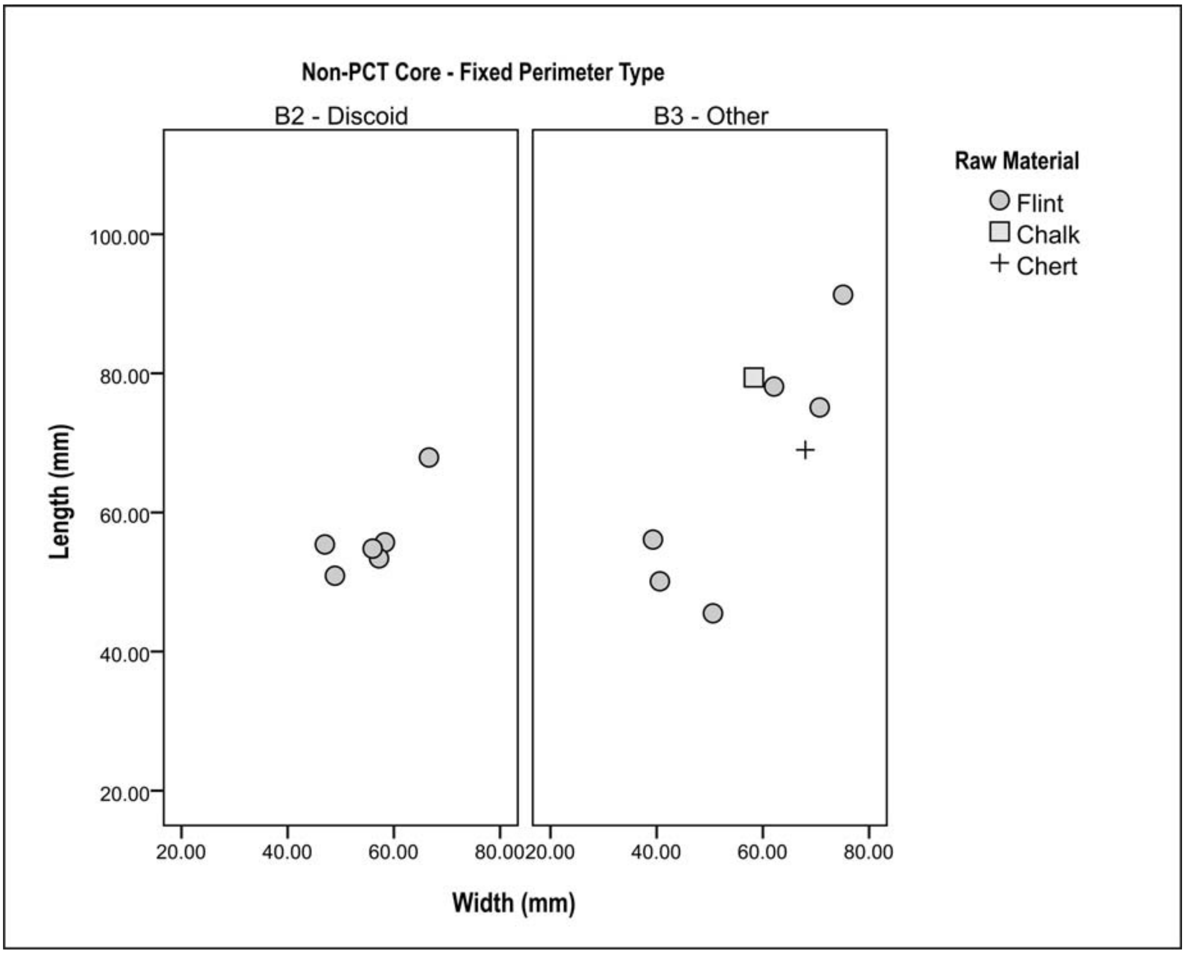


Figure A2.72: showing the relationship between artefact proportion, Non-PCT fixed Perimeter Type and Raw Material for Layer F.

From figure A2.72 it is difficult to tell whether the use of an alternate raw material to flint adversely affected core reduction or not.

Conclusion

In conclusion, the three artefact categories under study in the Et Tabun Layer F assemblage (LCTs, detached pieces and cores) all seem to display a lack of extensive form imposition and standardisation with raw material not seeming to play an adverse role in artefact production.

Et Tabun Layers Ed – Ea: 330 - 306,000 years BP

The artefact distribution in relation to Layers Ed - Ea can be seen in table A2.120.

		Artefact Type													
		LCT		Flake		Flake tool		Core		Hammer Stone		Core tool		**Total**	
Context	Ea	95	*4.0%*	3	*.1%*	246	*10.4%*	7	*.3%*	1	*.0%*	0	*.0%*	**352**	***14.9%***
	Eb	68	*2.9%*	11	*.5%*	358	*15.2%*	33	*1.4%*	2	*.1%*	1	*.0%*	**473**	***20.0%***
	Ec	18	*.8%*	1	*.0%*	123	*5.2%*	6	*.3%*	0	*.0%*	1	*.0%*	**149**	***6.3%***
	Ed	53	*2.2%*	1	*.0%*	218	*9.2%*	11	*.5%*	0	*.0%*	4	*.2%*	**287**	***12.2%***
	T.Ea	21	*.9%*	4	*.2%*	90	*3.8%*	2	*.1%*	0	*.0%*	1	*.0%*	**118**	***5.0%***
	T.Eb	113	*4.8%*	2	*.1%*	195	*8.3%*	16	*.7%*	1	*.0%*	3	*.1%*	**330**	***14.0%***
	T.Ec	18	*.8%*	0	*.0%*	57	*2.4%*	9	*.4%*	0	*.0%*	0	*.0%*	**84**	***3.6%***
	T.Ed	180	*7.6%*	2	*.1%*	351	*14.9%*	35	*1.5%*	0	*.0%*	0	*.0%*	**568**	***24.1%***
	Total	**566**	***24.0%***	**24**	***1.0%***	**1638**	***69.4%***	**119**	***5.0%***	**4**	***.2%***	**10**	***.4%***	**2361**	***100.0%***

Table A2.120: Showing the relationship between artefact type and context Layers Ed - Ea.

Of the 2361 artefacts belonging to layers Ed- Ea, there would appear to be a low proportion of flakes within the assemblage for Layers Ed- Ea, however, this is to be expected to as the collection represents a collected sample, and therefore was heavily subjected to collector's bias favouring the flake tools and LCTs. Table A2.121 shows the relationship between artefact type and completeness for Layers Ed - Ea.

		Completeness					
		Unbroken		Broken		**Total**	
Artefact Type	LCT	530	*22.4%*	36	*1.5%*	**566**	***24.0%***
	Flake	23	*1.0%*	1	*.0%*	**24**	***1.0%***
	Flake tool	1539	*65.2%*	99	*4.2%*	**1638**	***69.4%***
	Core	118	*5.0%*	1	*.0%*	**119**	***5.0%***
	Hammer Stone	4	*.2%*	0	*.0%*	**4**	***.2%***
	Core tool	10	*.4%*	0	*.0%*	**10**	***.4%***
	Total	**2224**	***94.2%***	**137**	***5.8%***	**2361**	***100.0%***

Table A2.121: Showing the relationship between artefact type and artefact completeness for Layers Ed - Ea.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed from Layers Ed - Ea 2224. Table A2.122 shows the relationship between artefact type and condition.

		Artefact Condition							
		Abraded		Fresh		Lightly Abraded		**Total**	
Artefact Type	LCT	2	*.1%*	456	*20.5%*	72	*3.2%*	**530**	***23.8%***
	Flake	0	*.0%*	18	*.8%*	5	*.2%*	**23**	***1.0%***
	Flake tool	0	*.0%*	1321	*59.4%*	218	*9.8%*	**1539**	***69.2%***
	Core	0	*.0%*	98	*4.4%*	20	*.9%*	**118**	***5.3%***
	Hammer Stone	1	*.0%*	1	*.0%*	2	*.1%*	**4**	***.2%***
	Core tool	0	*.0%*	7	*.3%*	3	*.1%*	**10**	***.4%***
	Total	**3**	***.1%***	**1901**	***85.5%***	**320**	***14.4%***	**2224**	***100.0%***

Table A2.122: Showing the relationship between artefact type and artefact condition for Layers Ed - Ea.

Table A2.122 shows that the majority of unbroken artefacts from Et Tabun Layers Ed – Ea are classified as fresh (85.5%) with a small minority classed as lightly abraded (14.4%) or abraded (0.1%). This pattern of artefact condition would suggest that the majority of the Layers Ed – Ea assemblage has not been subjected to a large degree of post depositional movement and abrasion and reinforces the contemporary nature of the artefacts labelled E* and T.E*. Furthermore, the scope of this thesis and the low degree of abrasion present within the Layers Ed – Ea suggests that it would be acceptable to consider all the artefacts as being broadly contemporary and I shall proceed accordingly.

I shall now examine the more specific elements to the Et Tabun Layers Ed – Ea assemblage by looking at the LCTs, Flakes, Flake Tools and Cores in greater depth.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. From tables A2.121 and A2.122 above it can be seen that the 530 unbroken LCTs from Layers Ed - Ea come in a range of conditions, but predominantly fresh. In order to assess the imposition of form and symmetry upon the LCTs from the Layers Ed – Ea assemblage, table A2.123 shows the relationship between tip shape and symmetry.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	2.6%	6.0%	10.6%	.8%	1.5%	7.9%	.6%	.8%	**30.8%**
	Convergent with a Square Tip	.4%	.6%	2.3%	.6%	.6%	5.5%	.6%	.2%	**10.6%**
	Convergent with an Oblique Tip	.0%	.0%	.2%	.2%	.2%	4.2%	.8%	.0%	**5.5%**
	Convergent with a Generalised Tip	1.1%	1.1%	4.2%	.8%	1.3%	16.8%	.9%	.4%	**26.6%**
	Wide or Divergent	.0%	.6%	.6%	.6%	.4%	3.0%	.0%	.0%	**5.1%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	.2%	.0%	.0%	**.2%**
	Wide with Convex Tip	.8%	1.9%	4.0%	1.1%	.6%	11.5%	.8%	.0%	**20.6%**
	Profoundly Asymmetrical	.0%	.0%	.0%	.0%	.0%	.8%	.0%	.0%	**.8%**
	Total	**4.9%**	**10.2%**	**21.7%**	**4.0%**	**4.5%**	**49.8%**	**3.6%**	**1.3%**	**100.0%**

Total N = 530

Table A2.123: Showing the relationship between Tip Shape and Symmetry by Eye for Layers Ed - Ea.

From table A2.123 it is clear that the hominins from Et Tabun Layers Ed - Ea did not place a high significance on absolute LCT symmetry (only 4.9% of the assemblage described as wholly symmetrical). If symmetrical form is extended to tip shapes that contain a symmetrical component, then 38.1% of the LCTs in table A2.123 display evidence for tip symmetry. However, the majority of the LCTs with a symmetrical element to their tip form also have a convergent element (30.5%), therefore, the degree of symmetry present within tip form may result from producing a convergent tip, rather than a genuine and conscious imposition of symmetry. The large component of non-symmetrical LCTs (49.8%), and LCTS with a non-symmetrical tip shape (12.1 %) would reinforce the initial observation that symmetry did not play a significant role in LCT production for in the Layers Ed- Ea assemblage.

Figures A2.73 below examines the relationship between symmetry and artefact proportion.

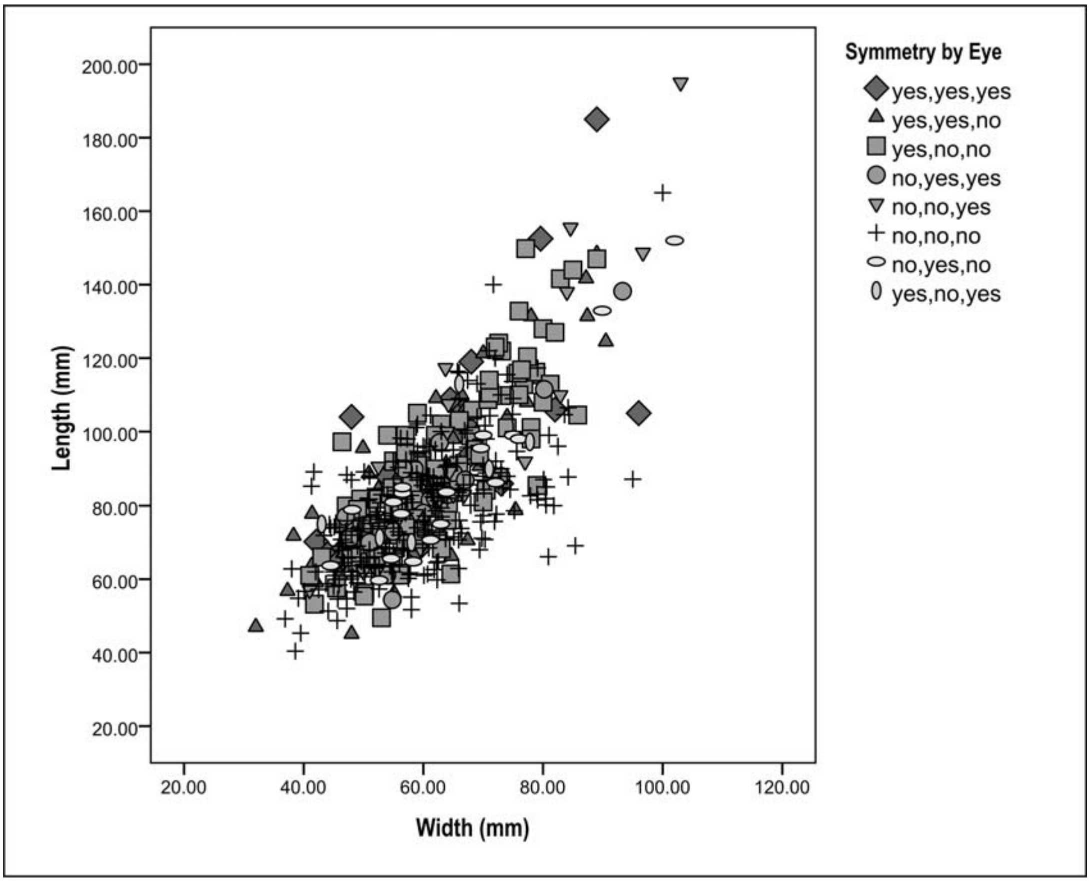


Figure A2.73: Showing the relationship between LCT proportion and symmetry for Layers Ed - Ea.

Figure A2.73 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in LCT proportion. A Kruskal Wallis H Test (Ebdon 1977:68) suggests that there is a statistically significant relationship (to 0.05 significance) between symmetry and length (x^2 = 24.416; df = 7; *p* = 0.001), but not for width (x^2 = 6.654; df = 7; *p* = 0.466) or thickness (x^2 = 4.936; df = 7; *p* = 0.668). From figure A2.73, it can be seen that the larger the LCT (+100.00mm), the more symmetry is present within LCT form. This could suggest that the larger the artefact, the easier it was for the hominins of Et Tabun Layers Ea – Ed to impose an aspect of symmetry to the original blank.

Figure A2.74 shows the relationship between tip shape and artefact proportion.

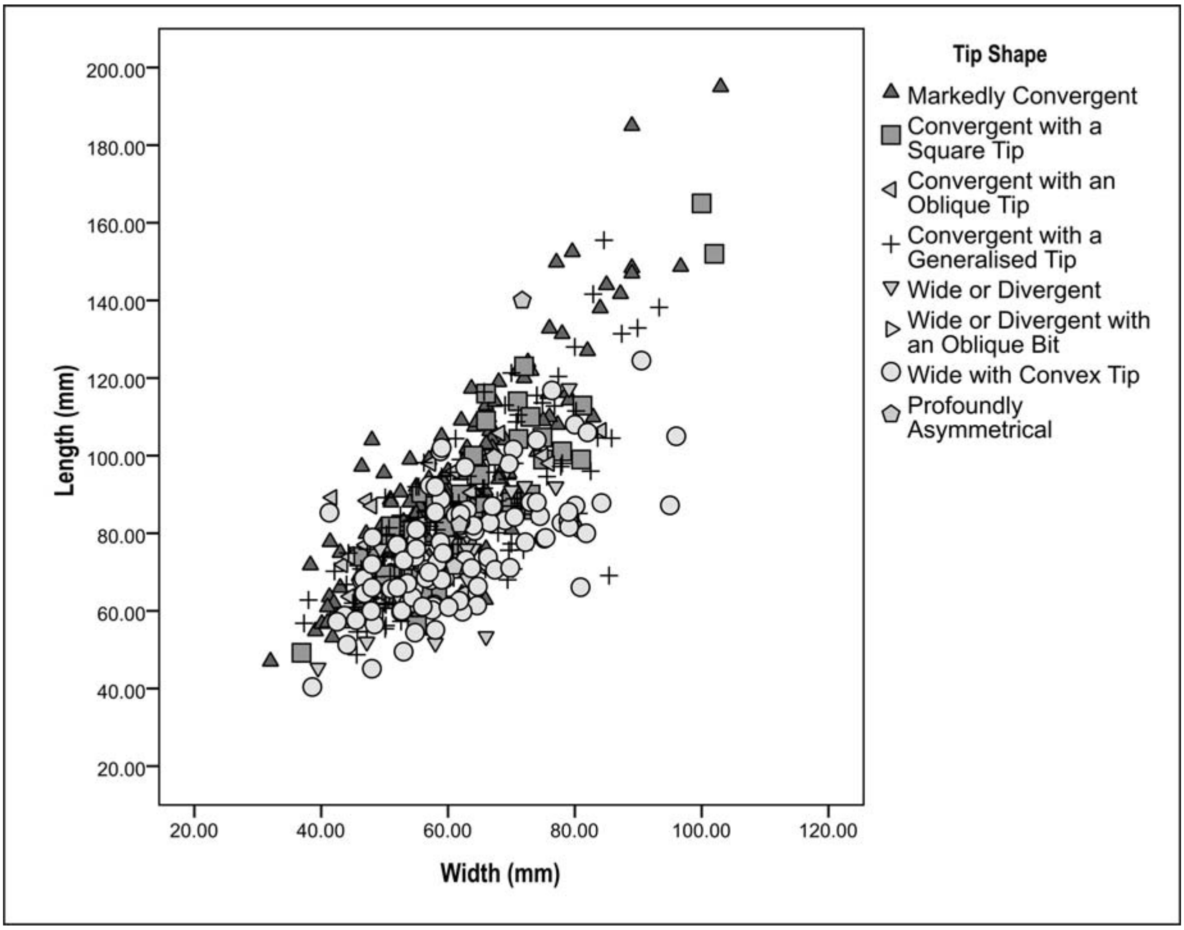


Figure A2.74: Showing the relationship between LCT proportion and tip shape for Layers Ed - Ea.

Figure A2.74 shows that there would appear to be no definitive relationships between artefact proportion and tip shape other than LCTs with a non-convergent element to their tip shape are generally smaller than those with a general or markedly convergent element to their form. A Kruskal Wallis H Test (Ebdon 1977:68) seems to confirm that there is a statistically significant relationship (to 0.05 significance) between observed tip shape and length (x^2 = 39.850; df = 7; p = 0.000) and thickness (x^2 = 18.154; df = 7; p = 0.011), but not for width (x^2 = 7.500; df = 7; p = 0.379). Figure A2.74 would seem to suggest that LCTs with a convergent element are generally longer than they are wide, which may account for the statistical significance indicated by the Kruskal Wallis H Test. Interestingly if compared to figure A2.73, figure A2.74 shows that many of the LCTs that display symmetrical aspects are the same LCTs with a convergent element to their tip shape. In regards to standardisation of form imposition and artefact size, I would suggest that there is no culturally significant form that emerges although it is interesting to note that the larger the LCT, the more convergent the tip shape, and the more symmetry is present within the LCT form. Therefore, the patterns of symmetry may well be linked to the knapping of a convergent tip shape, rather than through deliberate design.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of the Et Tabun Layer F assemblage (table A2.124).

		Flaking Extent Second Face					
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	8.1%	1.5%	4.2%	2.5%	4.3%	**20.6%**
	Complete Marginal	1.5%	2.6%	1.3%	.9%	.8%	**7.2%**
	Partial Marginal	.6%	1.9%	26.2%	3.8%	1.5%	**34.0%**
	Partial	.9%	.2%	4.0%	7.5%	3.2%	**15.8%**
	Substantial	2.3%	.9%	2.5%	6.6%	10.2%	**22.5%**
	Total	**13.4%**	**7.2%**	**38.1%**	**21.3%**	**20.0%**	**100.0%**

Total N = 530

Table A2.124: Showing the relationship between Flaking Extent of the first and second LCT face for Layers Ed - Ea.

From table A2.124 it can be seen that the hominins from Layers Ed - Ea clearly seemed to have favoured a partial marginal flaking strategy. Furthermore, table A2.124 suggests that the first and second faces were worked in similar fashions, which may indicate that the hominins of Layers Ed - Ea were imposing deliberate form through a potentially standardised system of initial LCT shaping. If seen in relation to the overwhelming preference for convergent tip shapes, it may be possible to suggest that the Layers Ed - Ea hominins were imposing culturally significant form upon a range of initial blank shapes (nodules and flakes). However, the more likely explanation is that the extensive initial flaking strategy formed as a result of a convergent tip preference, rather than evidence for culturally significant form imposition. This is reinforced by the overall lack of full symmetry within the Layers Ed - Ea LCT assemblage.

In order to test this idea further, a relative index of edge working extent was described in Chapter 5 and applied to symmetry in table A2.125 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Symmetry by Eye	yes,yes,yes	.0%	.9%	1.7%	2.3%	**4.9%**
	yes,yes,no	.6%	4.5%	3.0%	2.1%	**10.2%**
	yes,no,no	2.5%	7.7%	7.2%	4.3%	**21.7%**
	no,yes,yes	.4%	1.7%	1.1%	.8%	**4.0%**
	no,no,yes	.4%	2.1%	.8%	1.3%	**4.5%**
	no,no,no	15.3%	14.5%	10.8%	9.2%	**49.8%**
	no,yes,no	.6%	1.5%	.9%	.6%	**3.6%**
	yes,no,yes	.2%	.2%	.2%	.8%	**1.3%**
	Total	**19.8%**	**33.2%**	**25.7%**	**21.3%**	**100.0%**

Total N = 530

Table A2.125: Showing the relationship between Symmetry and Edge Working from Layers Ed - Ea.

From table A2.125 it can be seen that the LCTs from Layers Ed – Ea have a fairly even distribution in regards to edge working distribution. However, due to the collected nature of this assemblage it is difficult to ascertain whether this pattern is significant in terms of deliberate form imposed by the knapper, or the bias of the collector toward such artefacts. Table A2.125 also illustrates that where symmetry is present, the degree of edge working also increases, however this could just be the result of imposing a convergent tip upon the artefact as discussed above.

Table A2.126 shows the relationship between tip shape and edge working.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	**Total**
Tip Shape	Markedly Convergent	3.6%	7.7%	10.4%	9.1%	**30.8%**
	Convergent with a Square Tip	.8%	1.7%	3.2%	4.9%	**10.6%**
	Convergent with an Oblique Tip	.8%	1.5%	1.7%	1.5%	**5.5%**
	Convergent with a Generalised Tip	7.2%	11.3%	5.8%	2.3%	**26.6%**
	Wide or Divergent	1.7%	2.5%	.8%	.2%	**5.1%**
	Wide or Divergent with an Oblique Bit	.2%	.0%	.0%	.0%	**.2%**
	Wide with Convex Tip	5.5%	8.1%	3.6%	3.4%	**20.6%**
	Profoundly Asymmetrical	.2%	.4%	.2%	.0%	**.8%**
	Total	**19.8%**	**33.2%**	**25.7%**	**21.3%**	**100.0%**

Total N = 530

Table A2.126: Showing the relationship between Tip Shape and Edge Working for Layers Ed - Ea.

Table A2.126 shows that the degree of edge working is not dependent on particular tip shape other than there is an overall low index of edge working regardless of tip shape and symmetry imposition (table A2.125). Table A2.126 also illustrates that tips with a convergent element to them were worked through secondary edge working to a greater extent than non-convergent tip shapes, which may indicate that the convergent tip was deliberately imposed with a possibility of cultural significance.

In order to assess whether raw material has influenced artefact proportion and form imposition, figure A2.75 shows the relationship between LCT proportion and raw material, whilst table A2.127 shows the relationship between symmetry, tip shape and raw material.

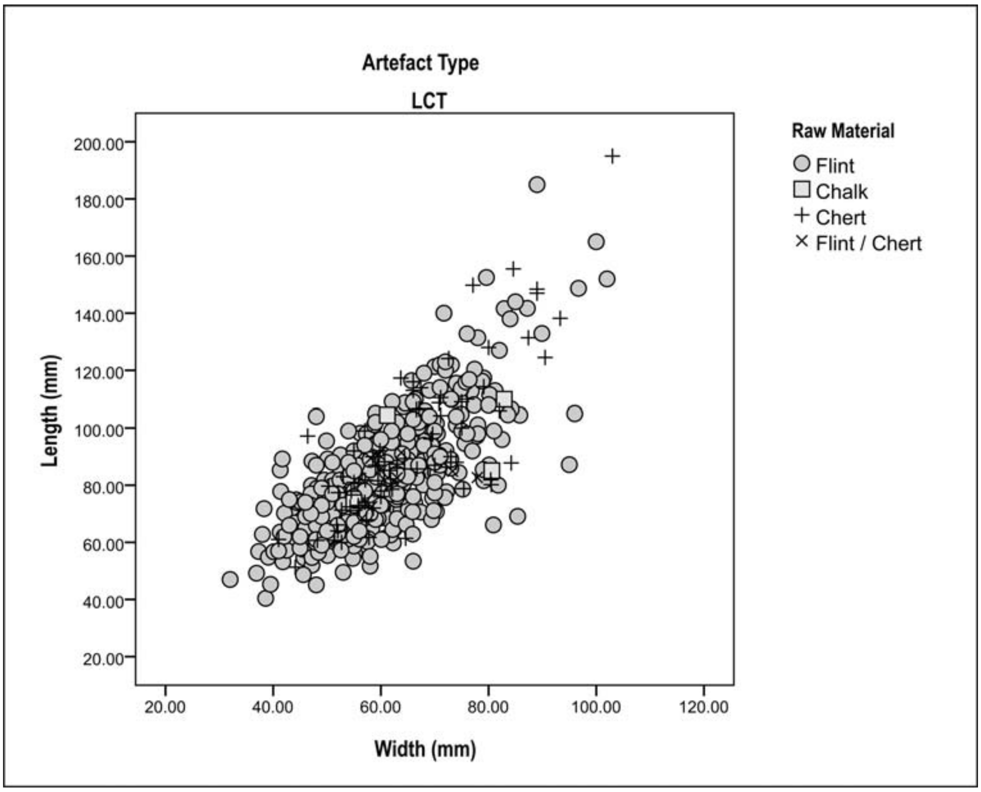


Figure A2.75: Showing the relationship between LCT Proportion and Raw Material from Layers Ed -Ea.

		Raw Material				
		Flint	Chalk	Chert	Flint / Chert	**Total**
Symmetry by Eye	yes,yes,yes	4.3%	.0%	.4%	.2%	**4.9%**
	yes,yes,no	8.5%	.0%	1.3%	.4%	**10.2%**
	yes,no,no	18.1%	.0%	3.4%	.2%	**21.7%**
	no,yes,yes	3.2%	.0%	.8%	.0%	**4.0%**
	no,no,yes	3.6%	.2%	.8%	.0%	**4.5%**
	no,no,no	41.3%	.6%	6.8%	1.1%	**49.8%**
	no,yes,no	3.2%	.0%	.4%	.0%	**3.6%**
	yes,no,yes	.9%	.0%	.4%	.0%	**1.3%**
	Total	**83.2%**	**.8%**	**14.2%**	**1.9%**	**100.0%**
Tip Shape	Markedly Convergent	25.8%	.2%	4.2%	.6%	**30.8%**
	Convergent with a Square Tip	9.4%	.0%	1.1%	.0%	**10.6%**
	Convergent with an Oblique Tip	4.7%	.0%	.8%	.0%	**5.5%**
	Convergent with a Generalised Tip	21.3%	.6%	4.2%	.6%	**26.6%**
	Wide or Divergent	4.5%	.0%	.6%	.0%	**5.1%**
	Wide or Divergent with an Oblique Bit	.2%	.0%	.0%	.0%	**.2%**
	Wide with Convex Tip	16.6%	.0%	3.2%	.8%	**20.6%**
	Profoundly Asymmetrical	.6%	.0%	.2%	.0%	**.8%**
	Total	**83.2%**	**.8%**	**14.2%**	**1.9%**	**100.0%**

Total N = 530

Table A2.127: Showing the relationship between symmetry by eye, tip shape and raw material for Layers Ed -Ea.

Figure A2.75 and Table A2.127 show that flint has the majority of representation within the Layers Ed – Ea LCT assemblage, and that raw material did not seem to have adversely affected LCT production given the spread of symmetry and tip types represented in all raw material categories.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry although there may be deliberate and conscious form being imposed through tip shape, initial and secondary working which may suggest a possible cultural significance to form imposition. However this may just be linked to the production of a convergent tip shape linked to functional over cultural reasons. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form although tips with a convergent element seem to be larger than those without. Given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Given the range of LCT proportions, symmetry categories and tip shapes represented across raw material categories, raw material is unlikely to have affected LCT production in the Layers Ed - Ea assemblage at Et Tabun.

Flake and Flake Tool Analysis

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. In order to get an understanding on the number of detached pieces recorded from the Layers Ed – Ea assemblage, table A2.128 shows the breakdown of unbroken flakes and flake tools in relation to the flake types described in Chapter 5.

		Artefact Type					
		Flake		Flake tool		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	7	*.4%*	**7**	***.4%***
	R2 - Denticulated scraper	0	*.0%*	7	*.4%*	**7**	***.4%***
	R3 - Side scraper	0	*.0%*	664	*42.5%*	**664**	***42.5%***
	R4 - End / Traverse scraper	0	*.0%*	213	*13.6%*	**213**	***13.6%***
	R5 - Flake with scraper retouch	0	*.0%*	448	*28.7%*	**448**	***28.7%***
	R6 - Scraper used as wedge	0	*.0%*	1	*.1%*	**1**	***.1%***
	R7 - Retouched point (awl)	0	*.0%*	30	*1.9%*	**30**	***1.9%***
	R8 - Retouched point (projectile)	0	*.0%*	63	*4.0%*	**63**	***4.0%***
	R9 - Retouched notch	0	*.0%*	2	*.1%*	**2**	***.1%***
	R10 - Retouch non diagnostic	0	*.0%*	1	*.1%*	**1**	***.1%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	1	*.1%*	**1**	***.1%***
	R12 - Multiple tool	0	*.0%*	74	*4.7%*	**74**	***4.7%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R14 - Utilised flake with no retouch	15	*1.0%*	19	*1.2%*	**34**	***2.2%***
	R15 - Flake with edge damage	1	*.1%*	8	*.5%*	**9**	***.6%***
	R16 - Flake with no retouch	7	*.4%*	1	*.1%*	**8**	***.5%***
	Total	**23**	***1.5%***	**1539**	***98.5%***	**1562**	***100.0%***

Table A2.128: Showing the breakdown between flakes and flake tools in relation to flake type for Layers Ed – Ea.

As can be seen, due to collector's bias, there are far more flake tools than flakes present within the unbroken detached artefacts studied from Layers Ed - Ea. Within this collected sample there would appear to be a preference for side scrapers, however, whether this is a genuine example of knapper's intent or a result of collection bias is uncertain.

Table A2.129 shows the relationship between flake type and Toth type (Toth 1985) illustrating that all Toth types are present within the Layers Ed - Ea unbroken flake assemblage. However, of particular dominance is Toth type 5 (some cortex present) at 61.6% of the flakes and flake tools. This would suggest that the majority of the collected detached pieces from Layers Ed - Ea come from cores that were toward the end of the reduction sequence where most of the cortex has been knapped off the core through earlier reductions.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	.0%	.0%	.0%	.4%	.0%	**.4%**
	R2 - Denticulated scraper	.0%	.1%	.1%	.0%	.3%	.0%	**.4%**
	R3 - Side scraper	.1%	6.1%	.4%	.1%	28.7%	7.1%	**42.5%**
	R4 - End / Traverse scraper	.0%	4.0%	.8%	.0%	6.3%	2.6%	**13.6%**
	R5 - Flake with scraper retouch	.0%	2.6%	1.1%	.1%	16.8%	8.1%	**28.7%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	.0%	.1%	.0%	**.1%**
	R7 - Retouched point (awl)	.0%	.1%	.0%	.0%	1.1%	.7%	**1.9%**
	R8 - Retouched point (projectile)	.0%	.4%	.2%	.0%	1.9%	1.5%	**4.0%**
	R9 - Retouched notch	.0%	.0%	.0%	.0%	.1%	.0%	**.1%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.1%	.0%	**.1%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.1%	**.1%**
	R12 - Multiple tool	.0%	.3%	.3%	.0%	3.3%	.8%	**4.7%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	.1%	.0%	1.7%	.4%	**2.2%**
	R15 - Flake with edge damage	.0%	.1%	.0%	.0%	.3%	.1%	**.6%**
	R16 - Flake with no retouch	.0%	.0%	.0%	.0%	.4%	.1%	**.5%**
	Total	**.1%**	**13.8%**	**2.9%**	**.1%**	**61.6%**	**21.5%**	**100.0%**

Total N = 1562

Table A2.129: Showing the relationship between Flake Type and Toth type for Layers Ed - Ea.

In terms of the technological make up of the collected Layers Ed - Ea detached pieces, table A2.130 shows that 11.8% of the unbroken collected detached pieces for Layers Ed – Ea are PCT in character, 7.6% (PCT?) display PCT characteristics but are not definitively PCT in nature, whilst 80.6% are Non-PCT.

		Flake Technology Type			
		Non-PCT	PCT	PCT?	**Total**
Flake Type	R1 - Denticulated edge	.4%	.0%	.0%	**.4%**
	R2 - Denticulated scraper	.4%	.1%	.0%	**.4%**
	R3 - Side scraper	34.3%	5.4%	2.9%	**42.5%**
	R4 - End / Traverse scraper	12.4%	.4%	.8%	**13.6%**
	R5 - Flake with scraper retouch	22.2%	4.2%	2.4%	**28.7%**
	R6 - Scraper used as wedge	.1%	.0%	.0%	**.1%**
	R7 - Retouched point (awl)	1.7%	.1%	.1%	**1.9%**
	R8 - Retouched point (projectile)	3.0%	.8%	.2%	**4.0%**
	R9 - Retouched notch	.1%	.0%	.0%	**.1%**
	R10 - Retouch non diagnostic	.1%	.0%	.0%	**.1%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.1%	.0%	**.1%**
	R12 - Multiple tool	4.0%	.3%	.4%	**4.7%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	1.0%	.5%	.7%	**2.2%**
	R15 - Flake with edge damage	.5%	.1%	.0%	**.6%**
	R16 - Flake with no retouch	.4%	.0%	.1%	**.5%**
	Total	**80.6%**	**11.8%**	**7.6%**	**100.0%**

Total N = 1562

Table A2.130: Showing the relationship between flake type and flake technology type for Layers Ed - Ea.

Table A2.130 further illustrates that there does not seem to be a particular preference for a specific tool type from any of the flake technology type categories (side scrapers aside), which may suggest that the hominins were not producing tools to specific form templates, but rather as opportunistic responses to required tasks. A closer look at the PCT flakes in table A2.131 shows that the majority of PCT flakes (185 in total) are radial in character and related to a side scraper tool type.

		PCT Flake Type						
		Radial	Convergent	Convergent / Laminar	Laminar	Non-pointed blades / flake blades	Pointed blades / flake blades	**Total**
Flake Type	R2 - Denticulated scraper	.0%	.5%	.0%	.0%	.0%	.0%	**.5%**
	R3 - Side scraper	17.3%	2.2%	5.4%	17.8%	2.2%	.5%	**45.4%**
	R4 - End / Traverse scraper	3.2%	.0%	.0%	.0%	.0%	.0%	**3.2%**
	R5 - Flake with scraper retouch	16.2%	4.9%	3.8%	5.4%	4.9%	.0%	**35.1%**
	R7 - Retouched point (awl)	.5%	.0%	.0%	1.1%	.0%	.0%	**1.6%**
	R8 - Retouched point (projectile)	1.1%	4.3%	.5%	1.1%	.0%	.5%	**7.6%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.5%	.0%	.0%	**.5%**
	R12 - Multiple tool	.5%	.0%	1.1%	.5%	.0%	.0%	**2.2%**
	R14 - Utilised flake with no retouch	.5%	.5%	2.2%	.0%	.0%	.0%	**3.2%**
	R15 - Flake with edge damage	.5%	.0%	.0%	.0%	.0%	.0%	**.5%**
	Total	**40.0%**	**12.4%**	**13.0%**	**26.5%**	**7.0%**	**1.1%**	**100.0%**

Total N = 185

Table A2.131: Showing the relationship between Flake type and PCT type for Layers Ed - Ea.

However, it is not clear whether this is a deliberate preference for a particular tool type upon the PCT flakes, or a result of collector’s bias. Table A2.132 (below) shows that the hominins of Et Tabun Layers Ed - Ea were able to extract Non-PCT and PCT flakes over a variety of raw materials found within the Layers Ed - Ea contexts.

		Flake Technology Type			
		Non-PCT	PCT	PCT?	**Total**
Raw Material	Flint	72.3%	10.0%	6.5%	**88.7%**
	Quartzite	.1%	.0%	.0%	**.1%**
	Chert	7.5%	1.8%	.8%	**10.1%**
	Flint / Chert	.8%	.1%	.3%	**1.1%**
	Total	**80.6%**	**11.8%**	**7.6%**	**100.0%**

Total N = 1562

Table A2.132: Showing the relationship between raw material and flake technology type for Layers Ed - Ea.

Figure A2.76 shows the relationship between raw material and flake / flake tool size, and as can be seen, raw material would not appear to play a limiting factor in flake / flake tool production.

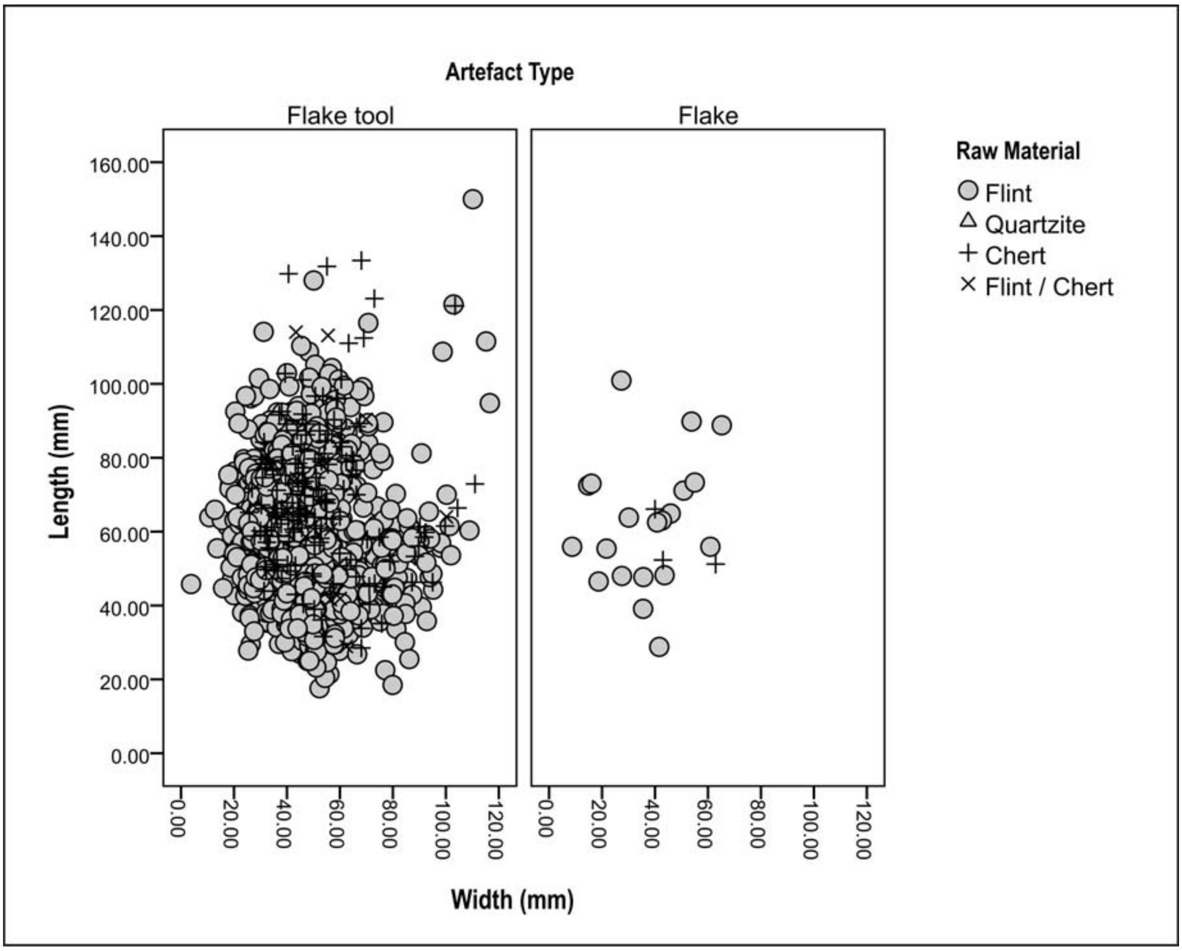


Figure A2.76: Showing the relationship between flake and flake tool proportion and raw material for Layers Ed - Ea.

Figure A2.77 illustrates the relationship between flake technology type and flake proportion.

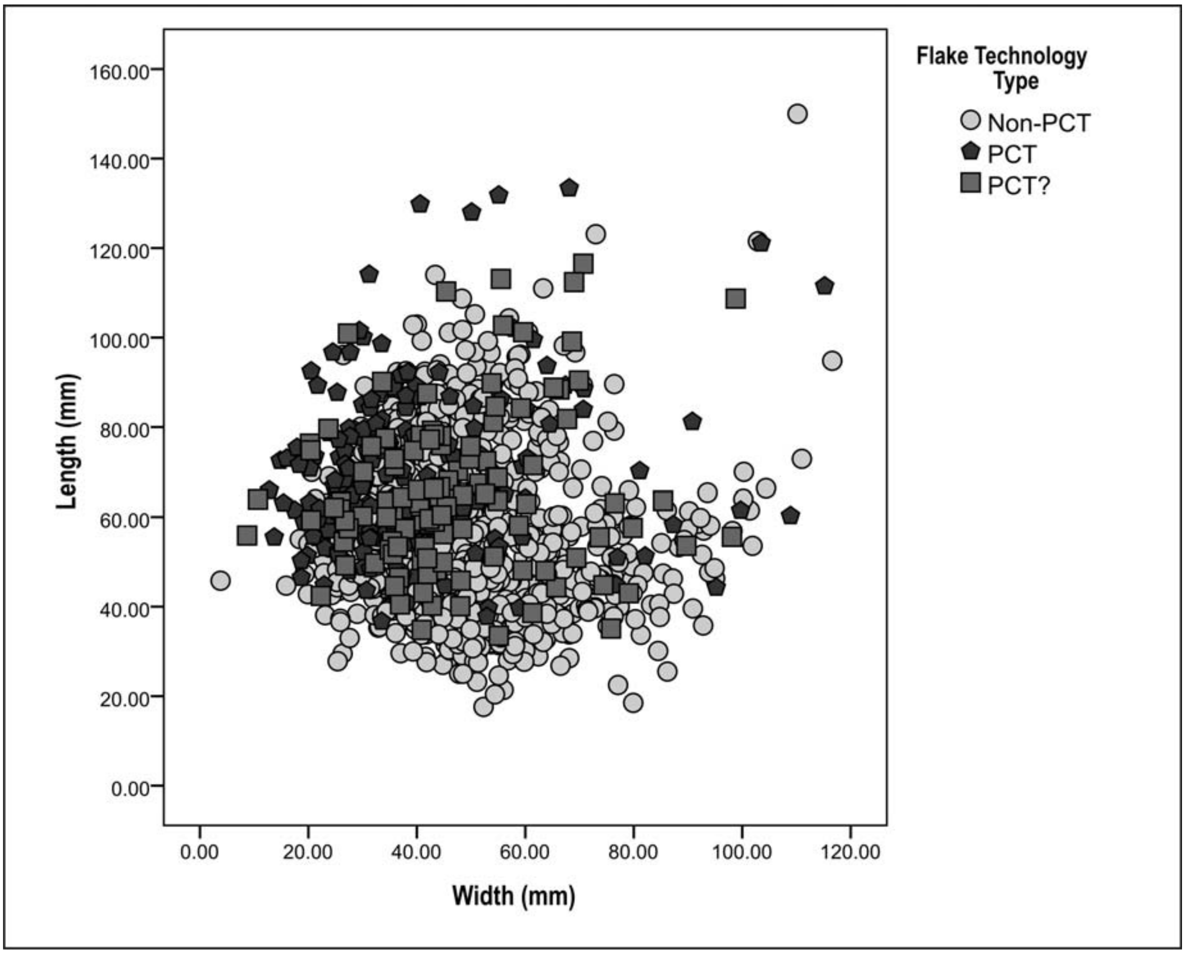


Figure A2.77: Showing the relationship between flake proportion and flake technology type for Layers Ed - Ea.

Figure A2.77 suggests that all the PCT flakes are fairly consistent in their size, which is to be expected from a technique that allows for non-culturally significant flake size standardisation. The non-PCT and the PCT? flakes display a variety of flake proportions which would indicate a lack of standardisation in flake non-PCT flake production. Table A2.133 illustrates the relationship between retouch and flake technology.

		Flake Technology Type							
		Non-PCT		PCT		PCT?		**Total**	
Retouch present on left edge	Yes	746	*49.4%*	140	*9.3%*	72	*4.8%*	**958**	***63.4%***
	No	482	*31.9%*	37	*2.4%*	34	*2.3%*	**553**	***36.6%***
	Total	**1228**	***81.3%***	**177**	***11.7%***	**106**	***7.0%***	**1511**	***100.0%***
Retouch present on distal edge	Yes	698	*46.2%*	91	*6.0%*	63	*4.2%*	**852**	***56.4%***
	No	530	*35.1%*	86	*5.7%*	43	*2.8%*	**659**	***43.6%***
	Total	**1228**	***81.3%***	**177**	***11.7%***	**106**	***7.0%***	**1511**	***100.0%***
Retouch present on right edge	Yes	811	*53.7%*	127	*8.4%*	77	*5.1%*	**1015**	***67.2%***
	No	417	*27.6%*	50	*3.3%*	29	*1.9%*	**496**	***32.8%***
	Total	**1228**	***81.3%***	**177**	***11.7%***	**106**	***7.0%***	**1511**	***100.0%***
Retouch present on proximal edge	Yes	86	*5.7%*	21	*1.4%*	9	*.6%*	**116**	***7.7%***
	No	1142	*75.6%*	156	*10.3%*	97	*6.4%*	**1395**	***92.3%***
	Total	**1228**	***81.3%***	**177**	***11.7%***	**106**	***7.0%***	**1511**	***100.0%***

Table A2.133: Showing the relationship between retouch presence and artefact type for Layers Ed - Ea.

Table A2.133 shows that there are 1511 flake tools with retouch on at least one flake edge. Table A2.133 seems to imply that where retouch is present, it is mostly present on more than one edge, which may indicate that specific form and shape is being applied to the flake tools. However, given the wide range of flake tools present in table A2.128, this may not be the case, although this is explored in greater detail below during the retouch analysis.

The following tests below regarding retouch and flake proportion are only conducted on the 1511 unbroken detached pieces that have retouch present on at least one of their edges. According to the predictions in table 4.3 (Chapter 4) the form imposition through Non-PCT and PCT would be primarily functional in character, however if there was an extensive amount of secondary working on the flake after detachment (i.e. through retouch) then the artefacts may display some tendency toward being culturally significant.

Retouch Delineation

Figure A2.78 (below) shows the relationship between retouch delineation and flake proportion where there would appear to be a large spread of retouch delineation types present within the Et Tabun Layers Ed - Ea flake tools. Although all flake tool edges display a variety of retouch delineations, there does not appear to be a clear preference for retouch delineations on any edge. A Kruskal Wallis H Test (Ebdon 1977:68) shows there is a statistically significant (to 0.05) relationship between flake length and width for the left and right edges, and a statistically significant relationship (to 0.05) between retouch delineation and flake length, width and thickness for the distal and flake width for the proximal edges (figure A2.78). From figure A2.78 it can be seen that retouch delineation does not seem to follow any particular pattern in regards to flake edge other than the left and right edges would appear to have more retouch present than the distal and proximal edges. Therefore it is not clear what the statistical relationship is, however this shall be examined in further detail as the retouch analysis continues below.

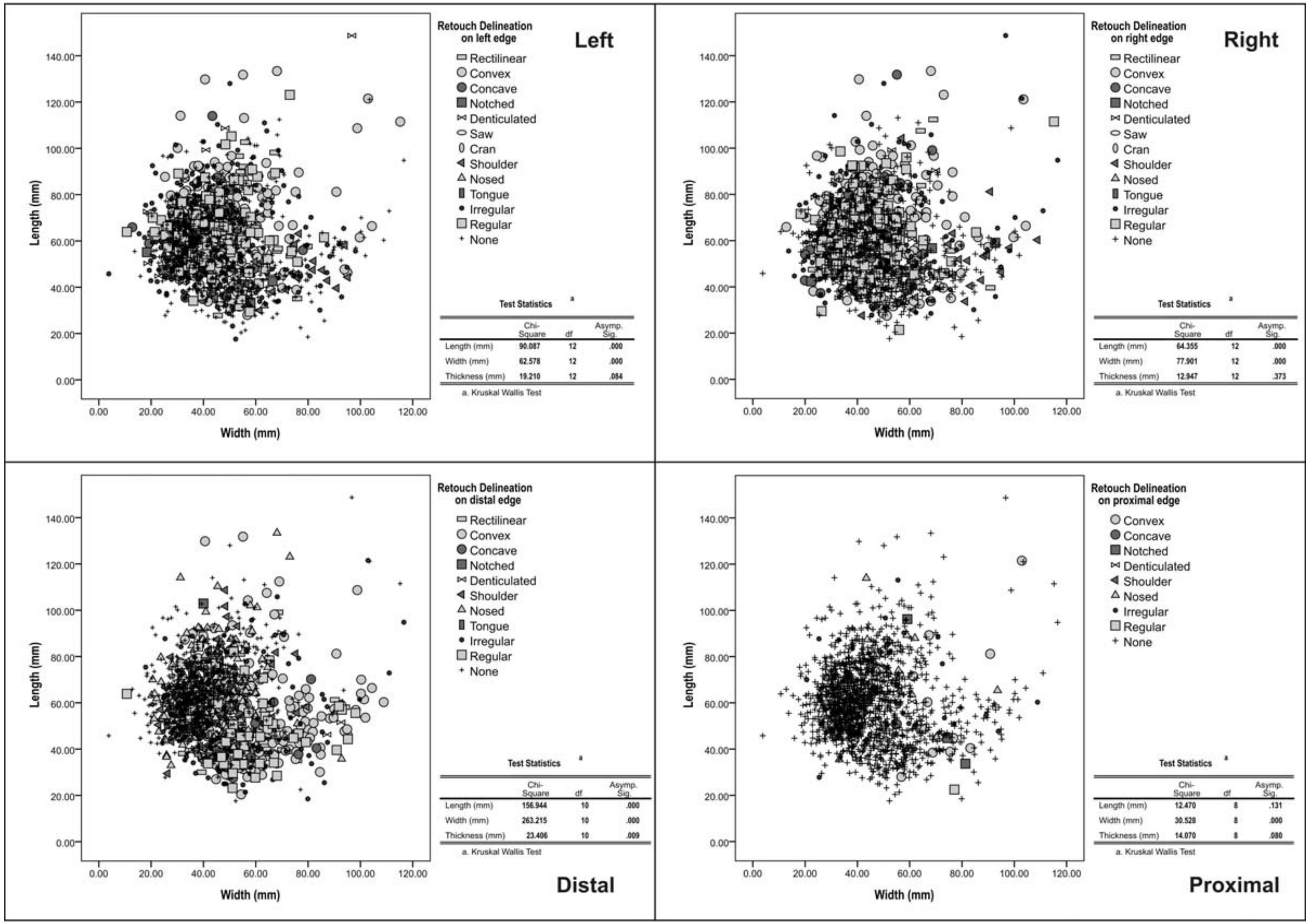


Figure A2.78: Showing the relationship between flake proportion and retouch delineation for Layers Ed - Ea.

Retouch distribution

Figure A2.79 (below) shows the relationship between flake proportion and retouch distribution. There appears to be clear preference for a total and partial style of retouch distribution although discontinuous retouch distributions are present within the sample. Total retouch implies that the whole of the flake edge has been retouched and may indicate that a particular form was being imposed by the knapper through retouch, an idea that seems to be supported through the Kruskal Wallis H Tests (Ebdon 1977:68) that once again indicate a statistically significant (to 0.05) relationship between flake length and width for the left and right edges, and a statistically significant relationship (to 0.05) between retouch delineation and flake length, width and thickness for the distal and flake width for the proximal edges (figure A2.79). If there is a genuine relationship between retouch distribution and flake proportion then perhaps we are seeing an indication of culturally significant form imposition on the retouch tools of Et Tabun, in that the type and extent of retouch present on the flake indicate a cultural preference for a particular tool type. However, given the collected nature of this assemblage, we must bear in mind that we are dealing with choice pieces here, and should subsequently be careful about inferring such possibilities.

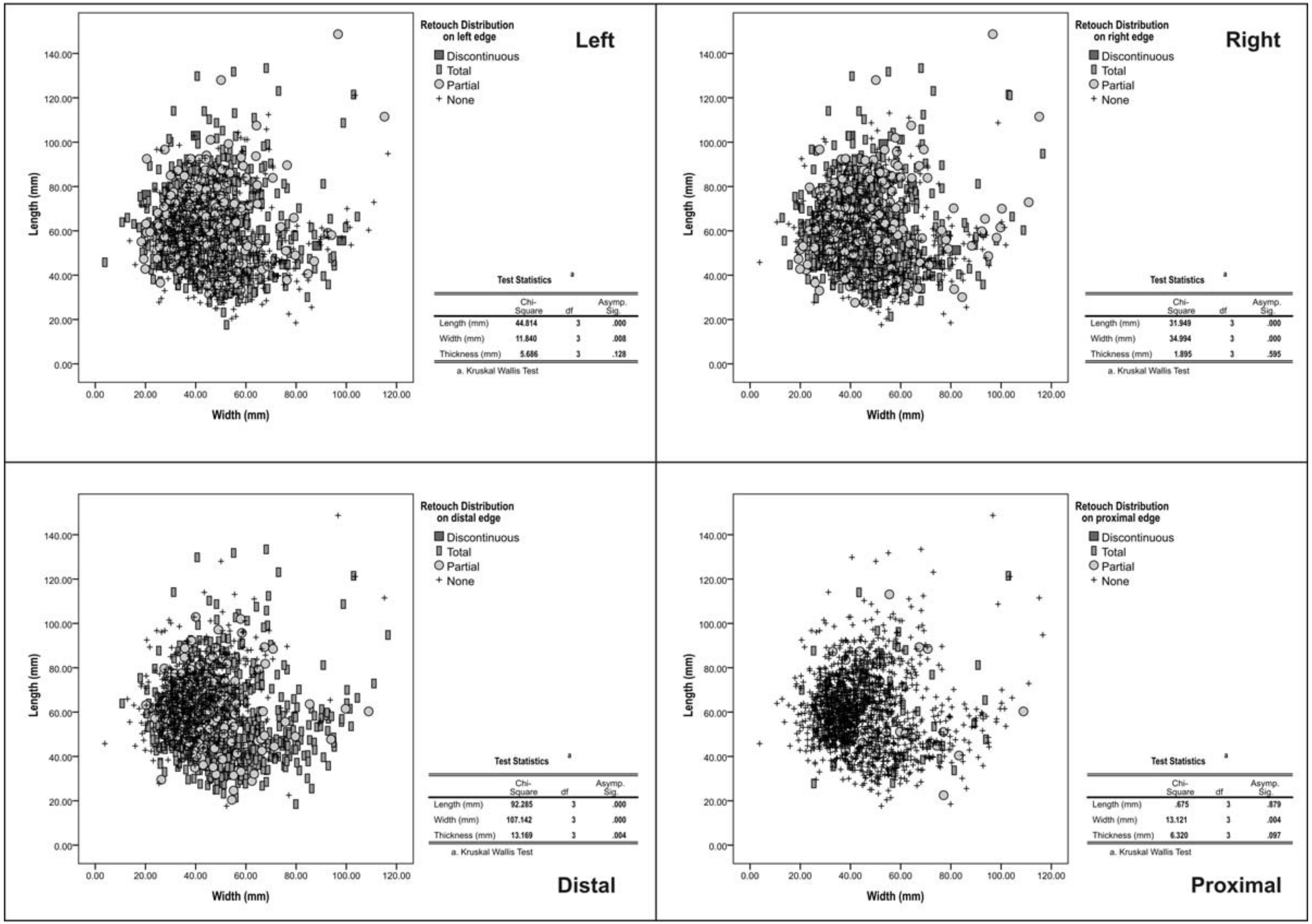


Figure A2.79: Showing the relationship between flake proportion and retouch distribution for Layers Ed - Ea.

Retouch Position

Figure A2.80 (below) shows the relationship between flake proportion and retouch position. There appears to be clear preference for a direct style of retouch position whilst inverse, alternating and bifacial retouch have a presence within the sample. A Kruskal Wallis H Test (Ebdon 1977:68) indicates a statistically significant (to 0.05) relationship between flake length and width for the right edge, and a statistically significant relationship (to 0.05) between retouch delineation and flake length, width and thickness for the distal and left edges and flake width for the proximal edges (figure A2.80) If there is a genuine relationship between retouch distribution and flake proportion then perhaps we are seeing an indication of culturally significant form imposition on the retouch tools of Et Tabun, in that the type and extent of retouch present on the flake indicate a cultural preference for a particular tool type. However, given the collected nature of this assemblage, we must bear in mind that we are dealing with choice pieces here, and should subsequently be careful about inferring such possibilities.

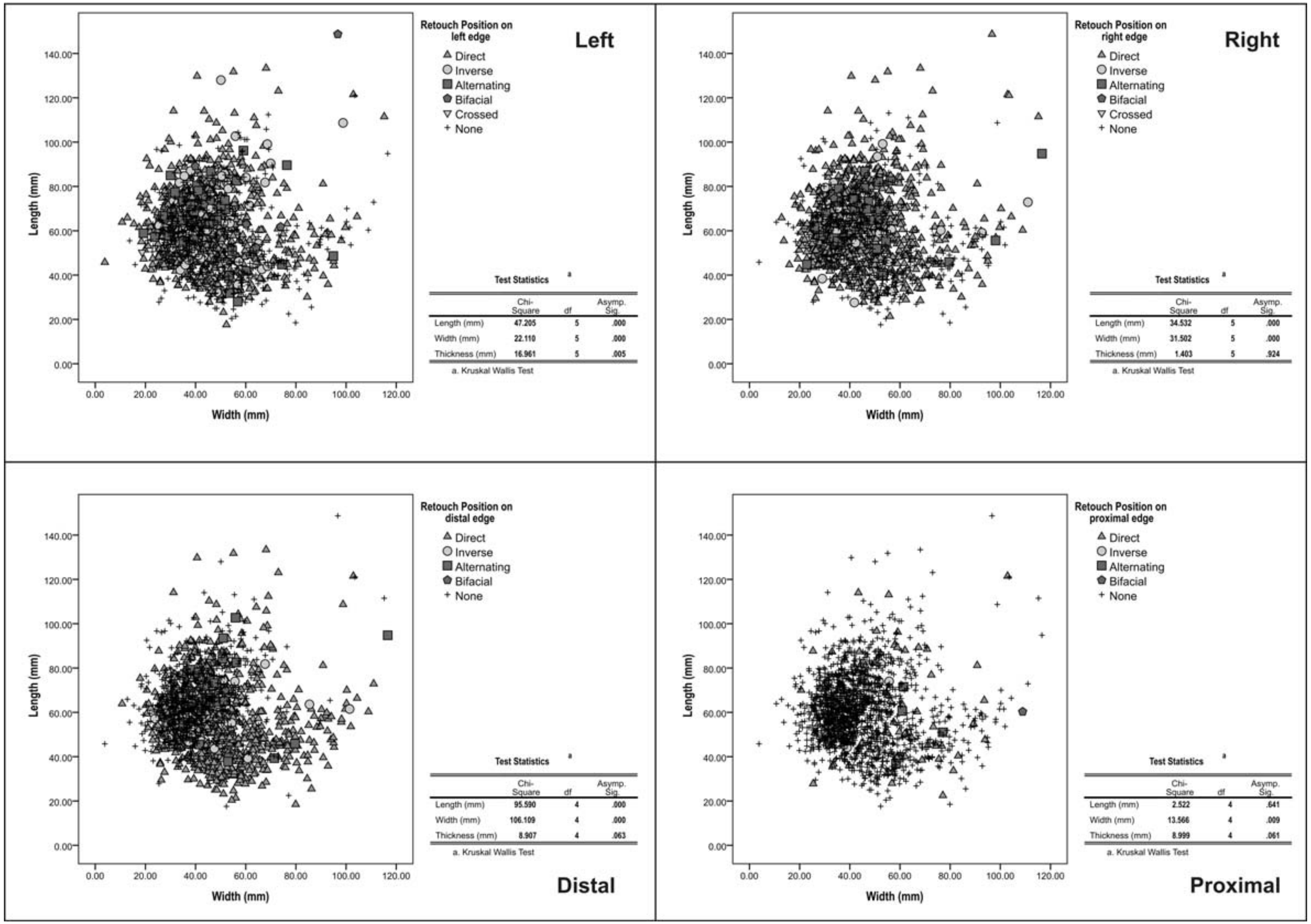


Figure A2.80: Showing the relationship between flake proportion and retouch position for Layers Ed - Ea.

Retouch Extent

Figure A2.81 (below) shows the relationship between flake proportion and retouch extent, where the dominant form retouch extent being short. A Kruskal Wallis H Test (Ebdon 1977:68) indicates a statistically significant (to 0.05) relationship between flake length and width for the left edge, a statistically significant relationship (to 0.05) between retouch delineation and flake length, width and thickness for the right and distal edges and flake width for the proximal edges (figure A2.81). Short retouch is not invasive across the surface of the flake and therefore is limited to edge manipulation only, which may indicate that the retouch being imposed on the flakes is limited to a primarily functional purpose. If there is a genuine relationship between retouch distribution and flake proportion then perhaps we are seeing an indication of culturally significant form imposition on the retouch tools of Et Tabun, in that the type and extent of retouch present on the flake indicate a cultural preference for a particular tool type. However, given the collected nature of this assemblage, we must bear in mind that we are dealing with choice pieces here, and should subsequently be careful about inferring such possibilities.

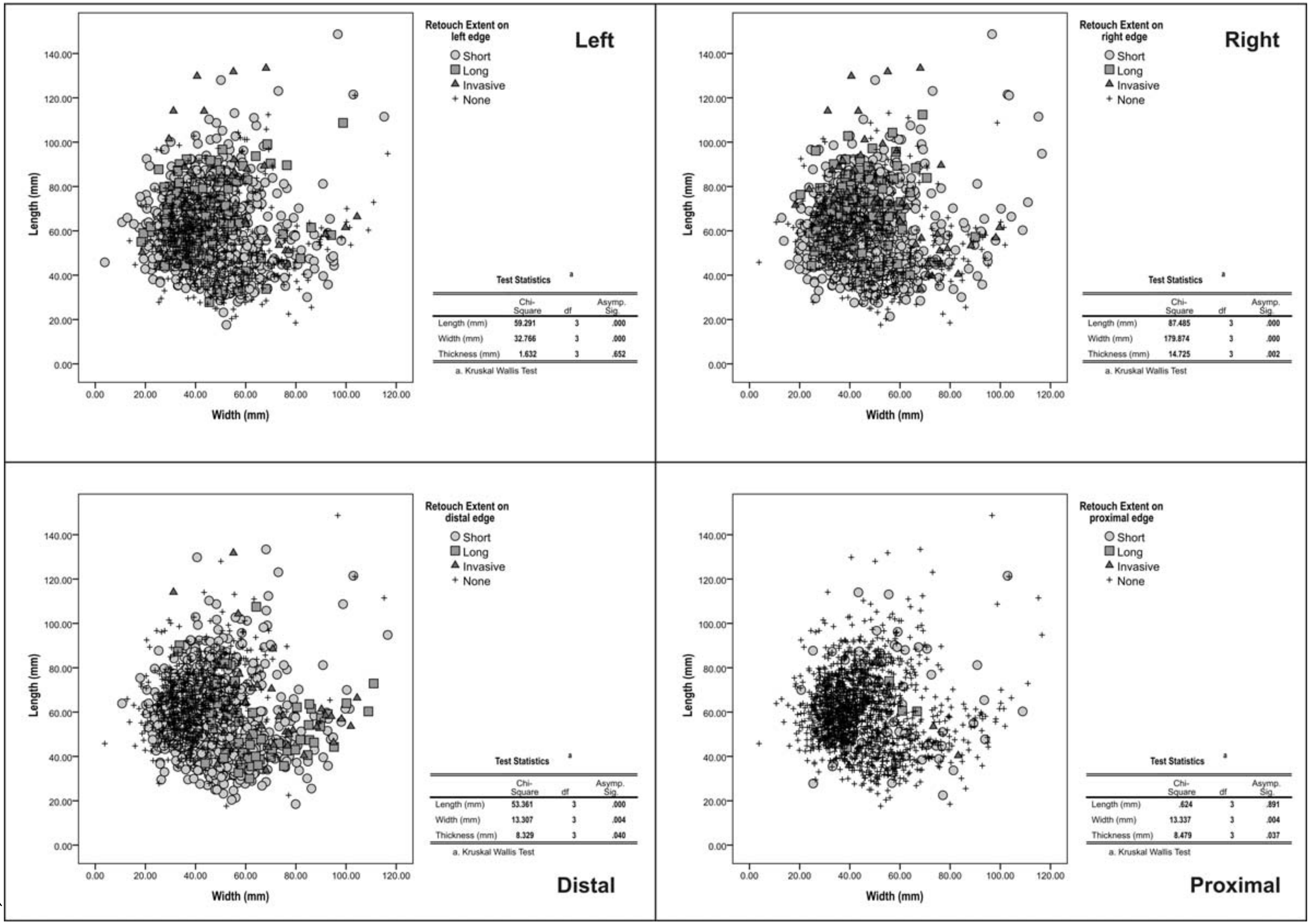


Figure A2.81: Showing the relationship between flake proportion and retouch extent for Layers Ed - Ea.

Conclusion

Given the range of artefact size and technology of production, and that the types of raw material represented at Et Tabun Layers Ed - Ea are generally known raw materials for their conducive knapping qualities it is unlikely that that raw material played an adverse role in artefact production. From examining the detached pieces where retouch was present, it would appear that there is no clear preference for a particular retouch delineation, although there does seem to be a preference for a total, direct and short retouch. Given the non-invasive nature of this type of retouch imposition on the flake edge, it may indicate that retouch was imposed for a primarily functional, rather than aesthetic purpose. However, the nature of collected and bias sample leaves any inference on hominin behaviour to be treated with caution. There would appear to be no degree of standardisation in terms of flake proportion for both retouched and unretouched flakes from Non-PCT and PCT manufacturing.

Cores

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. In correlation with the flake data, the cores from Et Tabun Layers Ea - Ed are a mixture of non-PCT and PCT (table A2.134).

		Artefact Type					
		Core		Core tool		**Total**	
Non-PCT Core - Generic Type	A1 - Alternate	2	*5.7%*	2	*5.7%*	**4**	***11.4%***
	A2 - Alternate and Parallel	2	*5.7%*	0	*.0%*	**2**	***5.7%***
	A3 - Parallel single platform	7	*20.0%*	0	*.0%*	**7**	***20.0%***
	A4 - Parallel multiple platform	2	*5.7%*	0	*.0%*	**2**	***5.7%***
	A5 - Single	1	*2.9%*	0	*.0%*	**1**	***2.9%***
	A6 - Mixture of A1 - A5	7	*20.0%*	2	*5.7%*	**9**	***25.7%***
	A7 - Other non-PCT	9	*25.7%*	1	*2.9%*	**10**	***28.6%***
	Total	**30**	***85.7%***	**5**	***14.3%***	**35**	***100.0%***
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	1	*1.4%*	0	*.0%*	**1**	***1.4%***
	B2 - Discoid	16	*22.9%*	0	*.0%*	**16**	***22.9%***
	B3 - Other	51	*72.9%*	2	*2.9%*	**53**	***75.7%***
	Total	**68**	***97.1%***	**2**	***2.9%***	**70**	***100.0%***
PCT Core Type	C1- Radial	5	*21.7%*	1	*4.3%*	**6**	***26.1%***
	C3 - Parallel / laminar	9	*39.1%*	1	*4.3%*	**10**	***43.5%***
	C3a - Simple prepared cores	7	*30.4%*	0	*.0%*	**7**	***30.4%***
	Total	**21**	***91.3%***	**2**	***8.7%***	**23**	***100.0%***

Total N = 128

Table A2.134: Showing the relationship between Core Type and Artefact Type for Layers Ed - Ea.

Table A2.134 shows that there are 128 unbroken cores in total from Layers Ed - Ea not restricted to a particular type of reduction sequence, although there would seem to be a preference for parallel / laminar preferential removals in the PCT cores (a pattern reflected in the PCT flakes). In terms of examining the cores of the Et Tabun Layers Ed - Ea assemblage for any form of standardisation in artefact proportion, figures A2.82 – A2.84 below show the relationship between length, width, raw material and the Layers Ed - Ea cores.

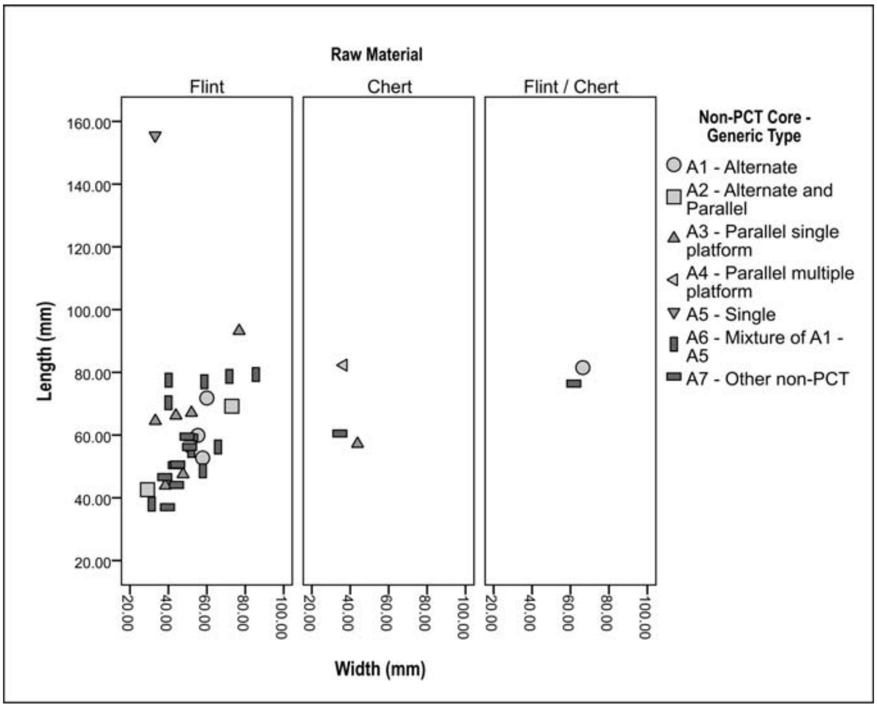


Figure A2.82: Showing the relationship between artefact proportion and Non-PCT Generic cores for Layers Ed - Ea.

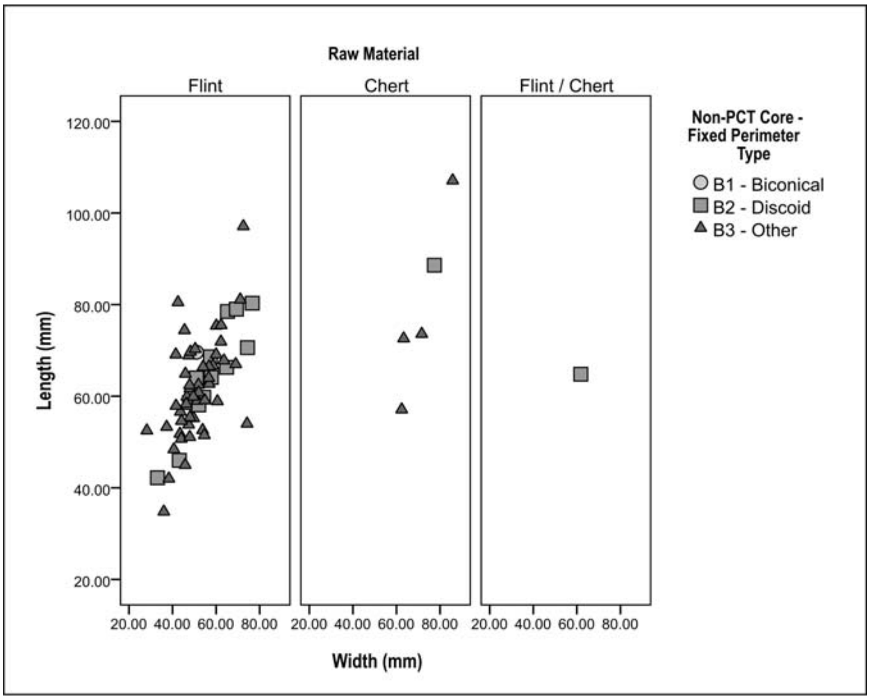


Figure A2.83: Showing the relationship between artefact proportion and Non-PCT fixed perimeter cores for Layer Ed – Ea.

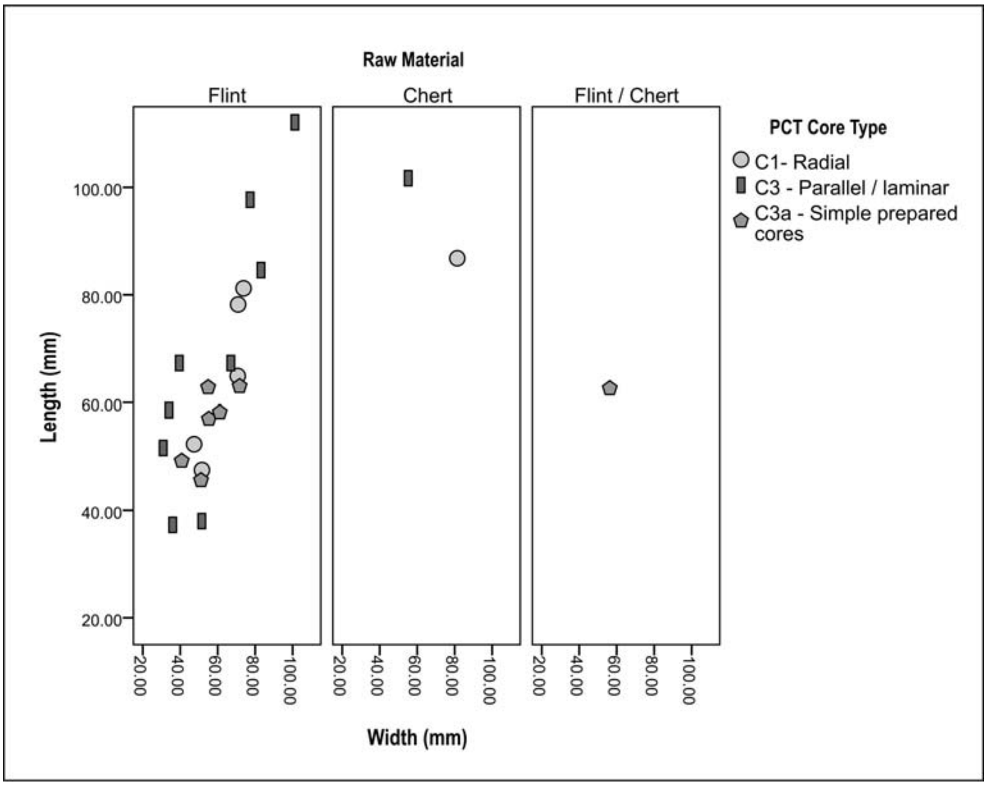


Figure A2.84: showing the relationship between artefact proportion and PCT cores for Layers Ed- Ea.

From figures A2.82 – A2.84 it would seem that all non-PCT cores and PCT cores are being reduced and discarded through a range of artefact proportions with no obvious influence from diverse raw materials. This in turn would indicate that there is no predetermined or socially significant standard to which these core types are being worked. Rather the core pattern would seem to support the conclusions from the flake analysis where flakes and cores are worked through opportunistic knapping to fulfil a specific need at a specific time, and then being discarded.

Conclusion

In conclusion, the three artefact categories under study in the Et Tabun Layers Ed - Ea assemblage (LCTs, detached pieces and cores) seem to display some evidence for imposed form but no standardisation. However, any patterns relating to hominin behaviour are difficult to interpret accurately due to the collected nature of the assemblage.

Et Tabun Layer D: 270 – 263,000 years BP

The artefact distribution in relation to Layer D can be seen in table A2.135.

		Context					
		D		T.D		Total	
Artefact Type	LCT	5	*4.4%*	1	*.9%*	**6**	***5.3%***
	Flake	1	*.9%*	0	*.0%*	**1**	***.9%***
	Flake tool	91	*80.5%*	0	*.0%*	**91**	***80.5%***
	Core	15	*13.3%*	0	*.0%*	**15**	***13.3%***
	Total	**112**	***99.1%***	**1**	***.9%***	**113**	***100.0%***

Table A2.135: Showing the relationship between artefact type and context Layer D.

The Layer D assemblage would appear to continue to follow the pattern of collector's bias where flakes are not well represented at all with the majority of the assemblage being made up of flake tools. LCTs are poorly represented, although this may be as a result of how the artefacts were distributed between Garrod's funding institutions. Table A2.136 shows the relationship between artefact type and completeness for Layer D.

		Completeness			
		Unbroken		Broken	
Artefact Type	LCT	6	*5.3%*	0	*.0%*
	Flake	1	*.9%*	0	*.0%*
	Flake tool	83	*73.5%*	8	*7.1%*
	Core	15	*13.3%*	0	*.0%*
	Total	**105**	***92.9%***	**8**	***7.1%***

Table A2.136: Showing the relationship between artefact type and artefact completeness for Layer D.

In order to remain consistent throughout my data collection, all broken artefacts are noted for presence only, and therefore shall not be included throughout the rest of this analysis, making the number of artefacts analysed from Layer D 105. Table A2.137 shows the relationship between artefact type and condition.

		Artefact Condition					
		Fresh		Lightly Abraded		**Total**	
Artefact Type	LCT	6	*5.7%*	0	*.0%*	**6**	***5.7%***
	Flake	1	*1.0%*	0	*.0%*	**1**	***1.0%***
	Flake tool	79	*75.2%*	4	*3.8%*	**83**	***79.0%***
	Core	15	*14.3%*	0	*.0%*	**15**	***14.3%***
	Total	**101**	***96.2%***	**4**	***3.8%***	**105**	***100.0%***

Table A2.137: Showing the relationship between artefact type and artefact condition for Layer D.

Table A2.137 shows that the majority of unbroken artefacts from Et Tabun Layer D are classified as fresh (96.2%) with a small minority classed as lightly abraded (3.8%). This pattern of artefact condition would suggest that the majority of the Et Tabun Layer D assemblage have not been subjected to a large degree of post depositional movement and abrasion and reinforces the contemporary nature of the artefacts labelled D and T.D.

I shall now examine the more specific elements to the Et Tabun Layer D assemblage by looking at the LCTs, Flakes, Flake Tools and Cores in greater depth.

Large Cutting Tools (LCTs)

See the methodology in Chapter 5 for specific details on the range of factors being looked at for LCTs. From tables A2.136 and A2.137 above it can be seen that the 6 unbroken LCTs from Et Tabun Layer D come in a fresh condition. From such a small sample, any patterns seen must be treated with certain degree of caution. In order to assess the imposition of form and symmetry upon the LCTs from the Layer D assemblage, table A2.138 shows the relationship between tip shape and symmetry.

		Symmetry by Eye								
		yes,yes,yes	yes,yes,no	yes,no,no	no,yes,yes	no,no,yes	no,no,no	no,yes,no	yes,no,yes	**Total**
Tip Shape	Markedly Convergent	.0%	.0%	.0%	.0%	16.7%	.0%	16.7%	.0%	**33.3%**
	Convergent with a Square Tip	.0%	.0%	16.7%	.0%	.0%	.0%	.0%	.0%	**16.7%**
	Convergent with an Oblique Tip	.0%	.0%	.0%	.0%	16.7%	16.7%	.0%	.0%	**33.3%**
	Convergent with a Generalised Tip	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Wide or Divergent	.0%	.0%	.0%	.0%	.0%	16.7%	.0%	.0%	**16.7%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	.0%	.0%	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Total	**.0%**	**.0%**	**16.7%**	**.0%**	**33.3%**	**33.3%**	**16.7%**	**.0%**	**100.0%**

Total N = 6

Table A2.138: Showing the relationship between Tip Shape and Symmetry by Eye for Layer D.

From the small sample in table A2.138 it would appear that the hominins from Et Tabun Layer D placed little to no significance on absolute LCT symmetry (0.0% of the assemblage described as wholly symmetrical). Only one artefact (16.7% of the assemblage) displayed any symmetrical form in tip shape, whilst 50.0% of the assemblage that displayed an symmetry in LCT form all have convergent elements to their tip form, although no symmetry in tip form. This may suggest that symmetry presence within the LCTs of Layer D are not entirely dependent upon a convergent element to tip shape. However, I stress that from such a small biased sample this pattern of behaviour cannot be extended into wider implications toward hominin behaviour. Overall, LCT symmetry does not seem to play an important role in the LCTS from Layer D.

Figures A2.85 below examines the relationship between symmetry and artefact proportion.

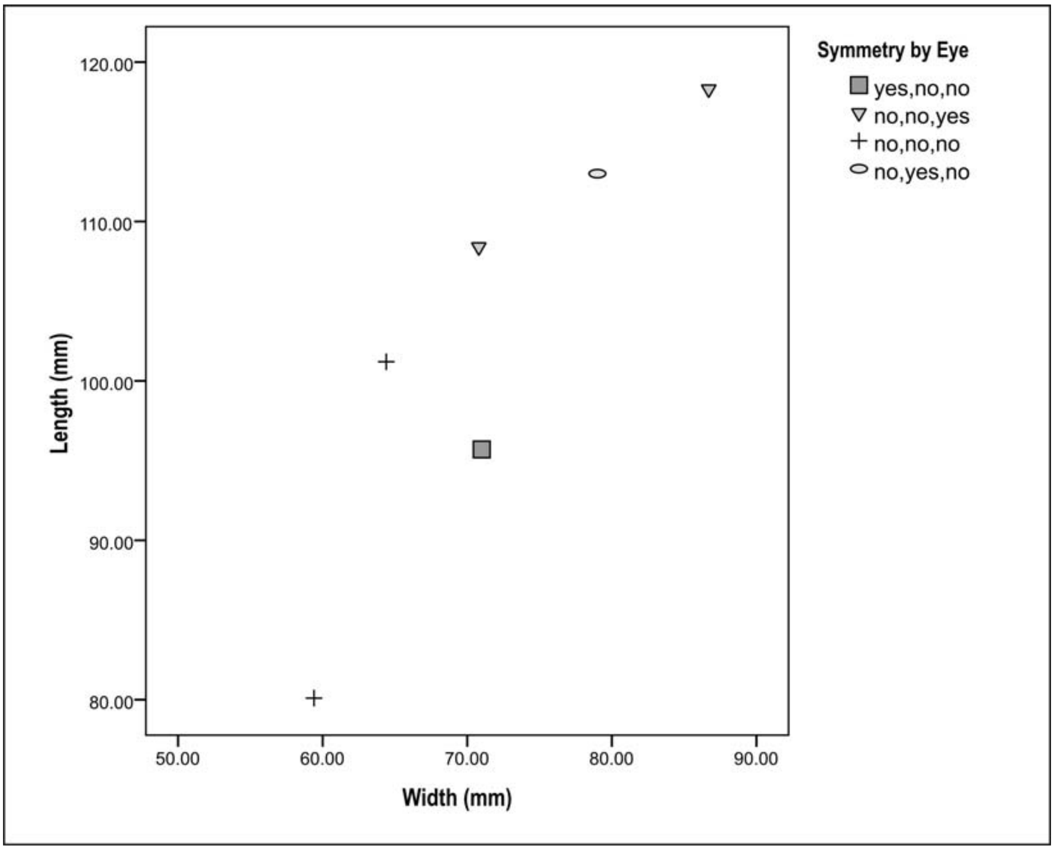


Figure A2.85: Showing the relationship between LCT proportion and symmetry for Layer D.

Figure A2.85 shows a general correlation between length and width (the longer the LCT, the wider it is) however this is unlikely to reflect any degree of standardisation in

LCT proportion. A Kruskal Wallis H Test (Ebdon 1977:68) suggests that there is no statistically significant relationship (to 0.05 significance) between symmetry and length (x^2 = 3.857; df = 3; p = 0.277), width (x^2 = 3.571; df = 3; p = 0.312), and thickness (x^2 = 0.857; df = 3; p = 0.836). However I emphasise again the extremely limited sample examined here and put forward that the sample is really too small for any patterns to emerge.

Figure A2.86 shows the relationship between tip shape and artefact proportion.

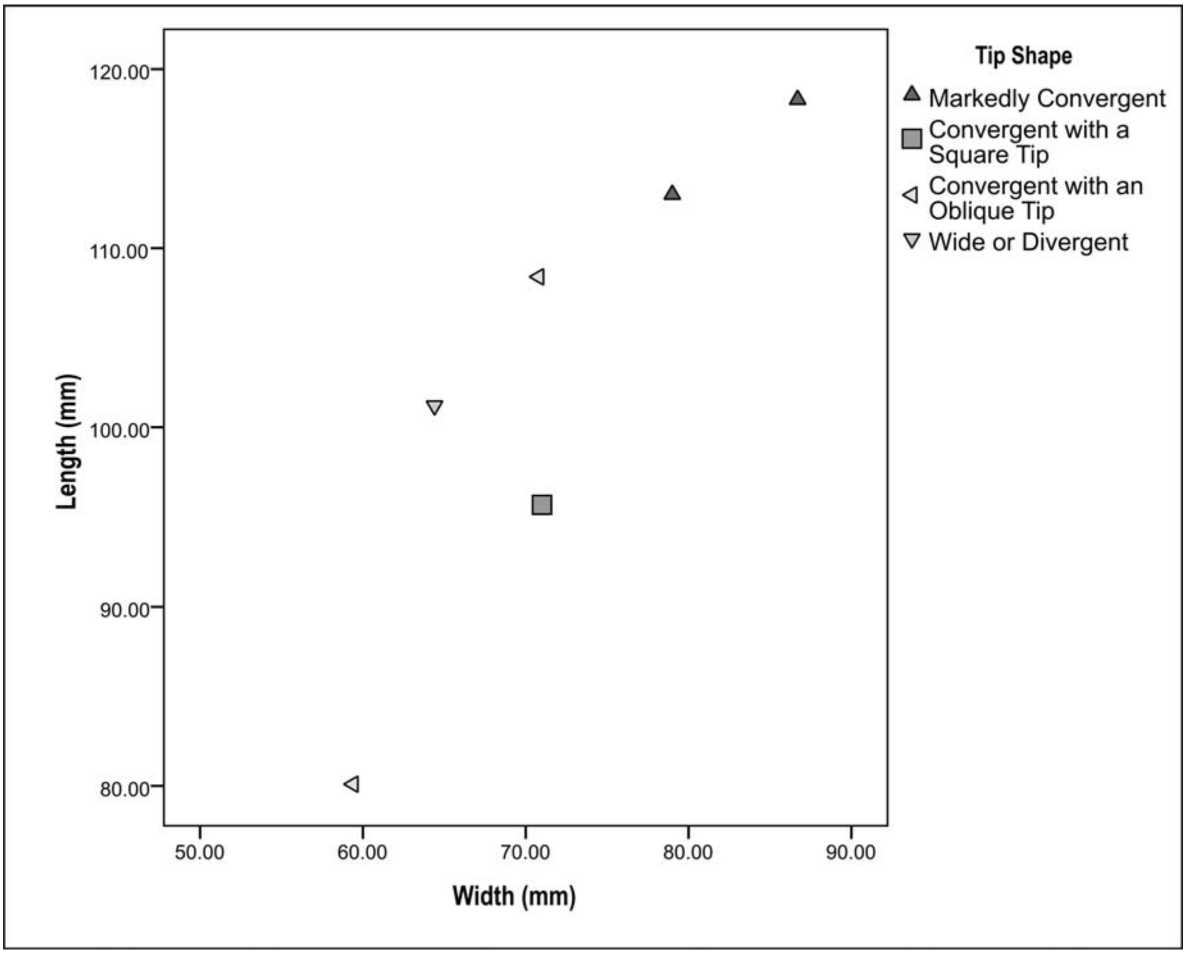


Figure A2.86: Showing the relationship between LCT proportion and tip shape for Layer D.

Figure A2.86 shows that there would appear to be no definitive relationships between artefact proportion and tip shape other than LCTs with a markedly convergent element to their tip shape are larger than other tip shape categories. A Kruskal Wallis H Test (Ebdon 1977:68) seems to confirm that there is no statistically significant relationship (to 0.05 significance) between observed tip shape and length (x^2 = 3.571; df = 3; p = 0.312), width (x^2 = 4.286; df = 3; p = 0.232) or thickness (x^2 = 4.286; df = 3; p = 0.232).

However I emphasise again the extremely limited sample examined here and put forward that the sample is really too small for any patterns to emerge.

The next criteria for assessment shall be the flaking patterns relating to the LCTs of the Et Tabun Layer D assemblage (table A2.139).

		Flaking Extent Second Face					
		Complete	Complete Marginal	Partial Marginal	Partial	Substantial	**Total**
Flaking Extent First Face	Complete	.0%	.0%	.0%	.0%	.0%	**.0%**
	Complete Marginal	.0%	.0%	.0%	.0%	.0%	**.0%**
	Partial Marginal	33.3%	.0%	33.3%	.0%	.0%	**66.7%**
	Partial	.0%	.0%	.0%	.0%	.0%	**.0%**
	Substantial	.0%	16.7%	16.7%	.0%	.0%	**33.3%**
	Total	**33.3%**	**16.7%**	**50.0%**	**.0%**	**.0%**	**100.0%**

Total N = 6

Table A2.139: Showing the relationship between Flaking Extent of the first and second LCT face for Layer D.

From table A2.139 it can be seen that the hominins from Layer D clearly seemed to have favoured a partial marginal (the easiest flaking option) flaking strategy, however, complete, complete marginal and substantial flaking extents are also represented within the sample. Furthermore, table A2.139 suggests that the first and second faces have been worked in different fashions, which may suggest that there is a lack of standardisation in LCT production. However the limited sample size and bias nature of the collection makes it difficult to ascertain whether this is a genuine reflection of hominin behaviour.

A relative index of edge working extent was described in Chapter 5 and applied to symmetry in table A2.140 below.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Symmetry by Eye	yes,yes,yes	.0%	.0%	.0%	.0%	**.0%**
	yes,yes,no	.0%	.0%	.0%	.0%	**.0%**
	yes,no,no	.0%	.0%	.0%	16.7%	**16.7%**
	no,yes,yes	.0%	.0%	.0%	.0%	**.0%**
	no,no,yes	16.7%	.0%	16.7%	.0%	**33.3%**
	no,no,no	16.7%	16.7%	.0%	.0%	**33.3%**
	no,yes,no	.0%	.0%	.0%	16.7%	**16.7%**
	yes,no,yes	.0%	.0%	.0%	.0%	**.0%**
	Total	**33.3%**	**16.7%**	**16.7%**	**33.3%**	**100.0%**
Total N = 6						

Table A2.140: Showing the relationship between Symmetry and Edge Working from Layer D.

From table A2.140 it can be seen that the majority of LCTs have a varied degree of edge working. Although from such a limited sample size it is difficult to infer genuine hominin behavioural traits.

Table A2.141 shows the relationship between tip shape and edge working.

		Grouping based on sum of edge working				
		12-24 (low index of edge working)	25-36 (medium to low index of edge working)	37-48 (medium to high index of edge working)	49-60 (high index of edge working)	Total
Tip Shape	Markedly Convergent	16.7%	.0%	.0%	16.7%	**33.3%**
	Convergent with a Square Tip	.0%	.0%	.0%	16.7%	**16.7%**
	Convergent with an Oblique Tip	.0%	16.7%	16.7%	.0%	**33.3%**
	Convergent with a Generalised Tip	.0%	.0%	.0%	.0%	**.0%**
	Wide or Divergent	16.7%	.0%	.0%	.0%	**16.7%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	.0%	.0%	**.0%**
	Wide with Convex Tip	.0%	.0%	.0%	.0%	**.0%**
	Total	**33.3%**	**16.7%**	**16.7%**	**33.3%**	**100.0%**
Total N = 6						

Table A2.141: Showing the relationship between Tip Shape and Edge Working for Layer D.

Table A2.141 shows that the degree of edge working is not dependent on particular tip shape although from such a limited sample size it is difficult to infer genuine hominin behavioural traits.

In order to assess whether raw material has influenced artefact proportion and form imposition, figure A2.87 shows the relationship between LCT proportion and raw material, whilst table A2.142 shows the relationship between symmetry, tip shape and raw material.

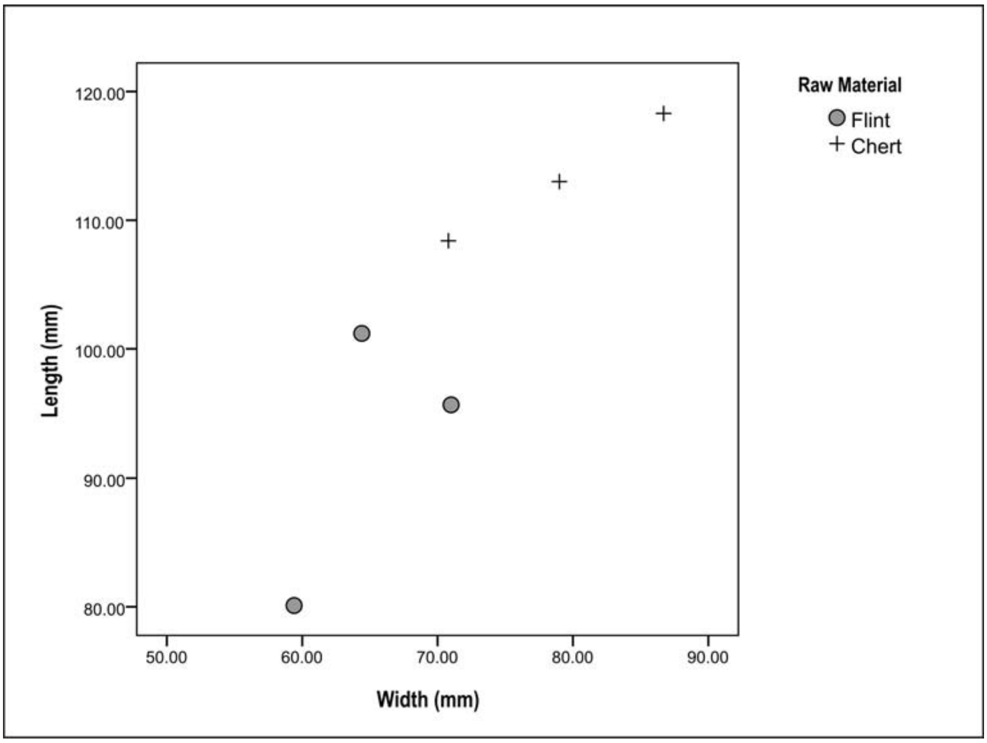


Figure A2.87: Showing the relationship between LCT Proportion and Raw Material from Layer D.

		Raw Material		
		Flint	Chert	**Total**
Symmetry by Eye	yes,yes,yes	.0%	.0%	**.0%**
	yes,yes,no	.0%	.0%	**.0%**
	yes,no,no	16.7%	.0%	**16.7%**
	no,yes,yes	.0%	.0%	**.0%**
	no,no,yes	.0%	33.3%	**33.3%**
	no,no,no	33.3%	.0%	**33.3%**
	no,yes,no	.0%	16.7%	**16.7%**
	yes,no,yes	.0%	.0%	**.0%**
	Total	**50.0%**	**50.0%**	**100.0%**
Tip Shape	Markedly Convergent	.0%	33.3%	**33.3%**
	Convergent with a Square Tip	16.7%	.0%	**16.7%**
	Convergent with an Oblique Tip	16.7%	16.7%	**33.3%**
	Convergent with a Generalised Tip	.0%	.0%	**.0%**
	Wide or Divergent	16.7%	.0%	**16.7%**
	Wide or Divergent with an Oblique Bit	.0%	.0%	**.0%**
	Wide with Convex Tip	.0%	.0%	**.0%**
	Total	**50.0%**	**50.0%**	**100.0%**
Total N = 6				

Table A2.142: Showing the relationship between symmetry by eye, tip shape and raw material for Layer D.

Figure A2.87 and Table A2.142 show that flint and chert are equally present within the LCT sample from Layer D. Furthermore, the raw material did not seem to have adversely affected LCT production given the spread of symmetry and tip types represented in all raw material categories.

Conclusion

Based on symmetry, tip shape and flaking extent analysis there would appear to be no definitive imposition of symmetry or edge working, although there may be deliberate and conscious form imposed through tip shape and initial flaking extent. Form imposition is unlikely to be linked to cultural significance. Although from such a limited sample number it is unwise to infer any definitive hominin behavioural traits. From the analysis in LCT proportion there would appear to be no standardisation in artefact proportion and tip form although a tips with a convergent element seem to have been preferred. Given the wide range in LCT proportions, artefact size is probably more an artifice of original blank size. Although from such a limited sample number it is unwise to infer any definitive hominin behavioural traits. Given the range of LCT proportions, symmetry categories and tip shapes represented across raw material categories, raw material is unlikely to have affected LCT production in the Layer D assemblage at Et Tabun.

Flake and Flake Tool Analysis

See the methodology in Chapter 5 for specific details on the range of factors being looked at for flakes and flake tools. All tables and figures relating to detached pieces below do not include broken pieces. In order to get an understanding on the number of detached pieces recorded from the Layer D assemblage, table A2.143 shows the breakdown of unbroken flakes and flake tools in relation to the flake types described in Chapter 5.

		Artefact Type					
		Flake		Flake tool		**Total**	
Flake Type	R1 - Denticulated edge	0	*.0%*	1	*1.2%*	**1**	***1.2%***
	R2 - Denticulated scraper	0	*.0%*	1	*1.2%*	**1**	***1.2%***
	R3 - Side scraper	0	*.0%*	15	*17.9%*	**15**	***17.9%***
	R4 - End / Traverse scraper	0	*.0%*	3	*3.6%*	**3**	***3.6%***
	R5 - Flake with scraper retouch	0	*.0%*	16	*19.0%*	**16**	***19.0%***
	R6 - Scraper used as wedge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R7 - Retouched point (awl)	0	*.0%*	0	*.0%*	**0**	***.0%***
	R8 - Retouched point (projectile)	0	*.0%*	33	*39.3%*	**33**	***39.3%***
	R9 - Retouched notch	0	*.0%*	0	*.0%*	**0**	***.0%***
	R10 - Retouch non diagnostic	0	*.0%*	0	*.0%*	**0**	***.0%***
	R11 - Flaked flake or flaked flake spall (burin)	0	*.0%*	0	*.0%*	**0**	***.0%***
	R12 - Multiple tool	0	*.0%*	2	*2.4%*	**2**	***2.4%***
	R13 - Unretouched flake used as a wedge	0	*.0%*	0	*.0%*	**0**	***.0%***
	R14 - Utilised flake with no retouch	1	*1.2%*	12	*14.3%*	**13**	***15.5%***
	R15 - Flake with edge damage	0	*.0%*	0	*.0%*	**0**	***.0%***
	R16 - Flake with no retouch	0	*.0%*	0	*.0%*	**0**	***.0%***
	Total	**1**	***1.2%***	**83**	***98.8%***	**84**	***100.0%***

Table A2.143: Showing the breakdown between flakes and flake tools in relation to flake type for Layer D.

As can be seen, due to collector's bias, there are far more flake tools than flakes present within the unbroken detached artefacts studied from Layer D. Within this collected sample there would appear to be a preference for retouched points, however, whether this is a genuine example of knapper's intent or a result of collection bias is uncertain.

Table A2.144 shows the relationship between flake type and Toth type (Toth 1985) illustrating that Toth types 2, 5 and 6 are present within the Layer D unbroken flake assemblage. Of particular dominance is Toth type 6 (completely non cortical) at 78.6% of the flakes and flake tools. This would suggest that the majority of the collected detached pieces from Layer D come from cores that were toward the end of the reduction sequence where most of the cortex has been knapped off the core through earlier reductions.

		Toth Type						
		1	2	3	4	5	6	**Total**
Flake Type	R1 - Denticulated edge	.0%	.0%	.0%	.0%	.0%	1.2%	**1.2%**
	R2 - Denticulated scraper	.0%	.0%	.0%	.0%	.0%	1.2%	**1.2%**
	R3 - Side scraper	.0%	2.4%	.0%	.0%	7.1%	8.3%	**17.9%**
	R4 - End / Traverse scraper	.0%	.0%	.0%	.0%	2.4%	1.2%	**3.6%**
	R5 - Flake with scraper retouch	.0%	.0%	.0%	.0%	6.0%	13.1%	**19.0%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R8 - Retouched point (projectile)	.0%	.0%	.0%	.0%	1.2%	38.1%	**39.3%**
	R9 - Retouched notch	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	.0%	.0%	.0%	.0%	2.4%	**2.4%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	.0%	.0%	.0%	2.4%	13.1%	**15.5%**
	R15 - Flake with edge damage	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	R16 - Flake with no retouch	.0%	.0%	.0%	.0%	.0%	.0%	**.0%**
	Total	**.0%**	**2.4%**	**.0%**	**.0%**	**19.0%**	**78.6%**	**100.0%**

Total N = 84

Table A2.144: Showing the relationship between Flake Type and Toth type for Layer D.

In terms of the technological make up of the collected Layer D detached pieces, table A2.145 shows that 84.5% of the unbroken collected detached pieces for Layer D are PCT in character, 4.8% (PCT?) display PCT characteristics but are not definitively PCT in nature, whilst 10.7% are Non-PCT.

		Flake Technology Type			
		Non-PCT	PCT	PCT?	**Total**
Flake Type	R1 - Denticulated edge	1.2%	.0%	.0%	**1.2%**
	R2 - Denticulated scraper	.0%	1.2%	.0%	**1.2%**
	R3 - Side scraper	7.1%	9.5%	1.2%	**17.9%**
	R4 - End / Traverse scraper	.0%	2.4%	1.2%	**3.6%**
	R5 - Flake with scraper retouch	2.4%	16.7%	.0%	**19.0%**
	R6 - Scraper used as wedge	.0%	.0%	.0%	**.0%**
	R7 - Retouched point (awl)	.0%	.0%	.0%	**.0%**
	R8 - Retouched point (projectile)	.0%	39.3%	.0%	**39.3%**
	R9 - Retouched notch	.0%	.0%	.0%	**.0%**
	R10 - Retouch non diagnostic	.0%	.0%	.0%	**.0%**
	R11 - Flaked flake or flaked flake spall (burin)	.0%	.0%	.0%	**.0%**
	R12 - Multiple tool	.0%	2.4%	.0%	**2.4%**
	R13 - Unretouched flake used as a wedge	.0%	.0%	.0%	**.0%**
	R14 - Utilised flake with no retouch	.0%	13.1%	2.4%	**15.5%**
	R15 - Flake with edge damage	.0%	.0%	.0%	**.0%**
	R16 - Flake with no retouch	.0%	.0%	.0%	**.0%**
	Total	**10.7%**	**84.5%**	**4.8%**	**100.0%**
Total N = 84					

Table A2.145: Showing the relationship between flake type and flake technology type for Layer D.

Table A2.145 further illustrates that there is a dominance of points present within this assemblage, which indicates that hominins are producing specific artefacts for specific purposes and form. However, whether this is a genuine reflection of hominin behaviour or a result of collection bias is difficult to ascertain. A closer look at the PCT flakes in table A2.146 shows that the majority of PCT flakes (72 in total) are convergent in character predominantly focused on producing flake points.

		PCT Flake Type									
		Radial		Convergent		Convergent / Laminar		Laminar		**Total**	
Flake Type	R2 - Denticulated scraper	0	*.0%*	0	*.0%*	0	*.0%*	1	*1.4%*	**1**	***1.4%***
	R3 - Side scraper	0	*.0%*	1	*1.4%*	5	*6.9%*	2	*2.8%*	**8**	***11.1%***
	R4 - End / Traverse scraper	1	*1.4%*	0	*.0%*	1	*1.4%*	0	*.0%*	**2**	***2.8%***
	R5 - Flake with scraper retouch	4	*5.6%*	2	*2.8%*	3	*4.2%*	5	*6.9%*	**14**	***19.4%***
	R8 - Retouched point (projectile)	0	*.0%*	24	*33.3%*	4	*5.6%*	4	*5.6%*	**32**	***44.4%***
	R12 - Multiple tool	0	*.0%*	1	*1.4%*	1	*1.4%*	0	*.0%*	**2**	***2.8%***
	R14 - Utilised flake with no retouch	1	*1.4%*	4	*5.6%*	2	*2.8%*	6	*8.3%*	**13**	***18.1%***
	Total	**6**	***8.3%***	**32**	***44.4%***	**16**	***22.2%***	**18**	***25.0%***	**72**	***100.0%***

Table A2.146: Showing the relationship between Flake type and PCT type for Layer D.

This suggests that the hominins are primarily producing the lithic artefacts for hunting purposes, although from such a small sample and potential collector's bias makes such a behavioural inference a difficult task on the wider stage. Table A2.147 (below) shows that the hominins of Et Tabun Layer D were able to extract Non-PCT and PCT flakes over the two main raw materials (flint and chert) found within the Layer D context. The majority of flakes are related to flint, however, chert is also a raw material conducive to knapping which suggests that raw material type did not play a limiting factor in flake or flake tool production.

		Flake Technology Type			
		Non-PCT	PCT	PCT?	**Total**
Raw Material	Flint	4.8%	70.2%	3.6%	**78.6%**
	Chert	6.0%	14.3%	1.2%	**21.4%**
	Total	**10.7%**	**84.5%**	**4.8%**	**100.0%**

Total N = 84

Table A2.147: Showing the relationship between raw material and flake technology type for Layer D.

Figure A2.88 shows the relationship between raw material and flake / flake tool size, and as can be seen, raw material would not appear to play a limiting factor in flake / flake tool production.

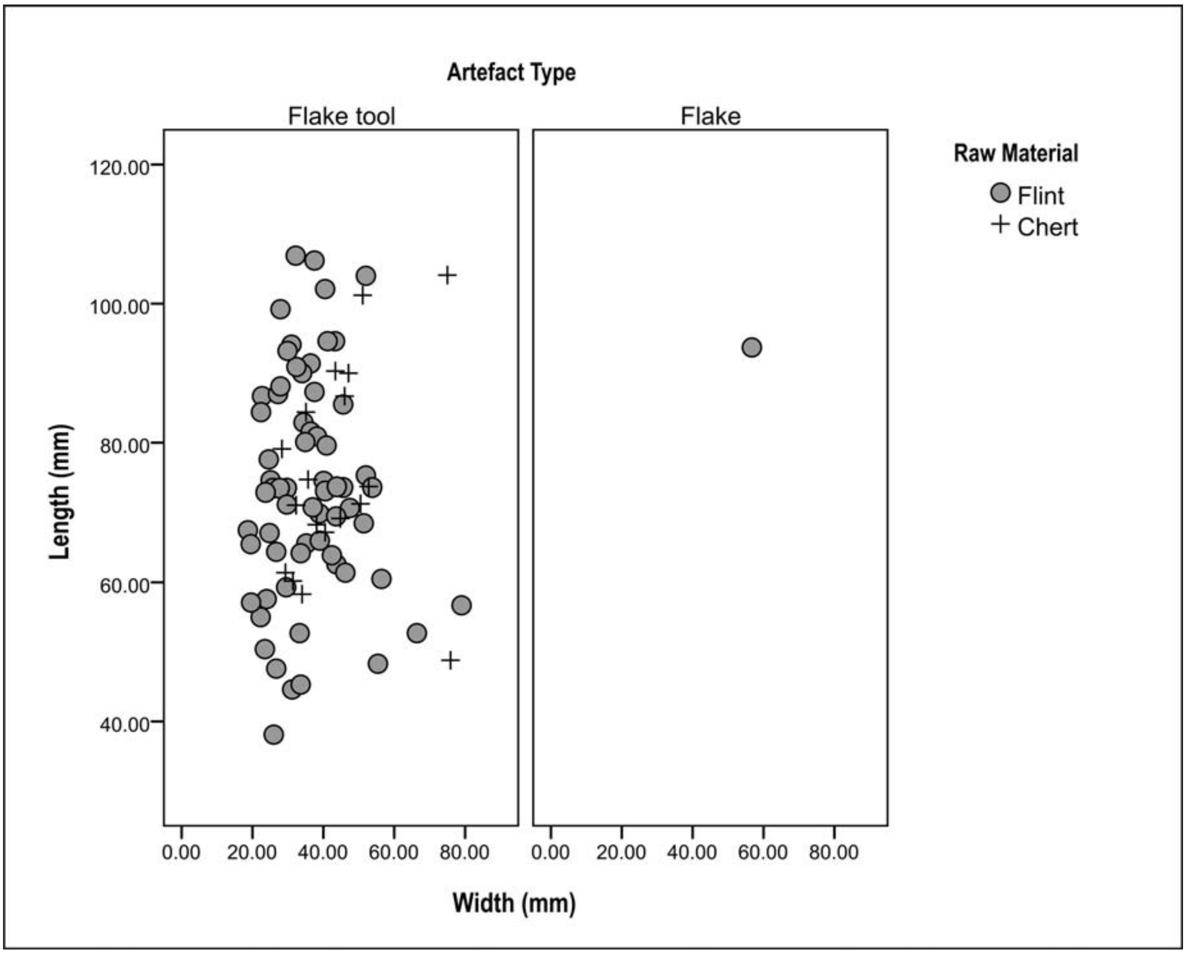


Figure A2.88: Showing the relationship between flake and flake tool proportion and raw material for Layer D.

Figure A2.89 illustrates the relationship between flake technology type and flake proportion.

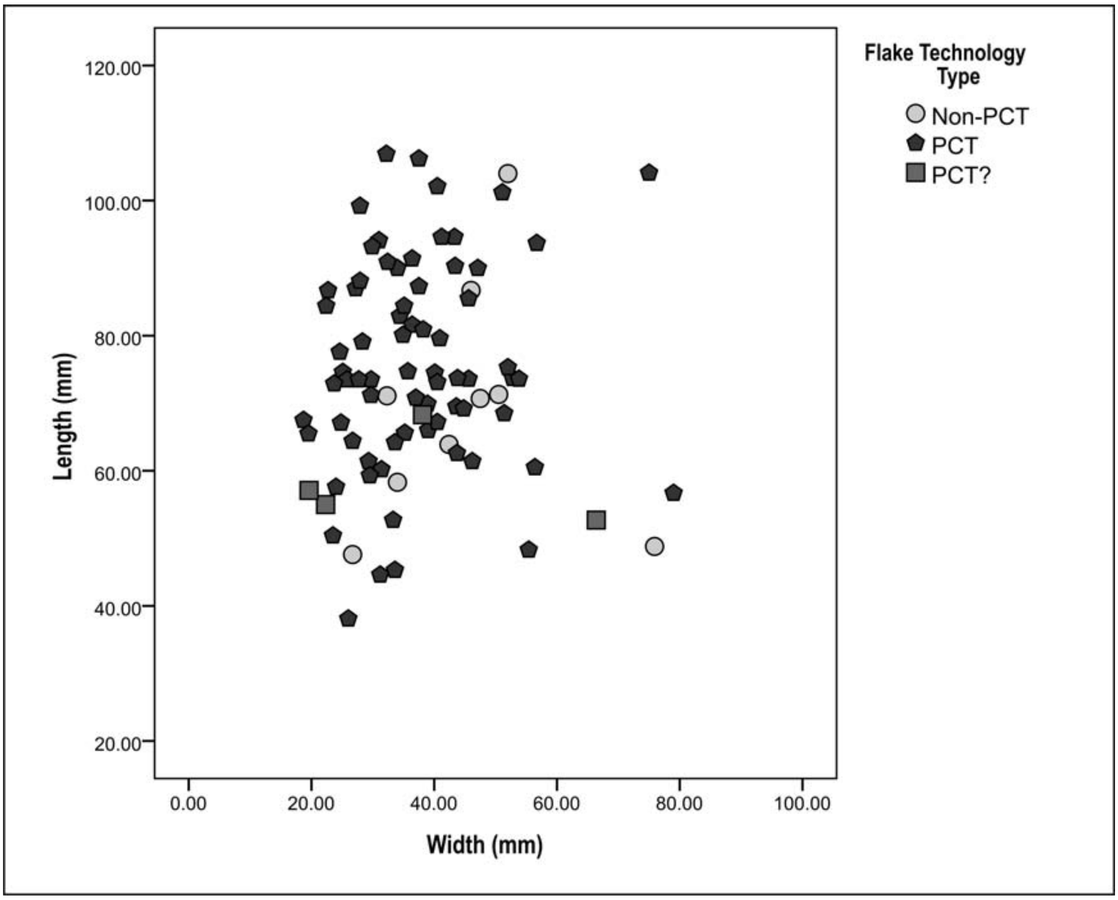


Figure A2.89: Showing the relationship between flake proportion and flake technology type for Layer D.

Once again there would not seem to be a relationship between flake proportion and technology type. Table A2.148 illustrates the relationship between retouch and flake technology.

		Flake Technology Type							
		Non-PCT		PCT		PCT?		**Total**	
Retouch present on left edge	Yes	8	*11.3%*	56	*78.9%*	0	*.0%*	**64**	***90.1%***
	No	1	*1.4%*	4	*5.6%*	2	*2.8%*	**7**	***9.9%***
	Total	**9**	***12.7%***	**60**	***84.5%***	**2**	***2.8%***	**71**	***100.0%***
Retouch present on distal edge	Yes	7	*9.9%*	24	*33.8%*	1	*1.4%*	**32**	***45.1%***
	No	2	*2.8%*	36	*50.7%*	1	*1.4%*	**39**	***54.9%***
	Total	**9**	***12.7%***	**60**	***84.5%***	**2**	***2.8%***	**71**	***100.0%***
Retouch present on right edge	Yes	6	*8.5%*	49	*69.0%*	1	*1.4%*	**56**	***78.9%***
	No	3	*4.2%*	11	*15.5%*	1	*1.4%*	**15**	***21.1%***
	Total	**9**	***12.7%***	**60**	***84.5%***	**2**	***2.8%***	**71**	***100.0%***
Retouch present on proximal edge	Yes	2	*2.8%*	4	*5.6%*	0	*.0%*	**6**	***8.5%***
	No	7	*9.9%*	56	*78.9%*	2	*2.8%*	**65**	***91.5%***
	Total	**9**	***12.7%***	**60**	***84.5%***	**2**	***2.8%***	**71**	***100.0%***

Table A2.148: Showing the relationship between retouch presence and artefact type for Layer D.

Table A2.148 shows that there are 71 flake tools with retouch on at least one flake edge. Table A2.148 seems to imply that where retouch is present, it is mostly present on more than one edge, which may indicate that specific form and shape is being applied to the flake tools. However, given the wide range of flake tools present in table A2.143, this may not be the case, although this is explored in greater detail below during the retouch analysis.

The following tests below regarding retouch and flake proportion are only conducted on the 71 unbroken detached pieces that have retouch present on at least one of their edges. Although I should stress that from such a small sample any patterns relating to retouch and form imposition must be treated with a degree of caution. According to the predictions in table 4.3 (Chapter 4) the form imposition through Non-PCT and PCT would be primarily functional in character, however if there was an extensive amount of secondary working on the flake after detachment (i.e. through retouch) then the artefacts may display some tendency toward being culturally significant.

Retouch Delineation

Figure A2.90 (below) shows the relationship between retouch delineation and flake proportion where there would appear to be a large spread of retouch delineation types present within the Et Tabun Layer D flake tools. Although all flake tool edges display a variety of retouch delineations, there is a clear preference for retouch presence on the lateral edges of the flake over the distal or proximal. A Kruskal Wallis H Test (Ebdon 1977:68) shows there is no statistically significant relationship (to 0.05 significance) between flake length, width, or thickness and retouch delineation for the left edge (figure A2.90). However, there would appear to be a statistically significant relationship (to 0.05 significance) between the right edge and length (x^2 = 15.731; df = 7; p = 0.028), the distal and width (x^2 = 14.256; df = 3; p = 0.003), thickness (x^2 = 13.482; df = 3; p = 0.004) and the proximal and thickness (x^2 = 8.930; df = 3; p = 0.030) (figure A2.90). From figure A2.90 it can be seen that retouch delineation on the right edge is present on all large flakes, or flakes that are proportionately longer than they are wide. Therefore, the statistical relationship alluded to above may simply reflect the fact that the hominins may have preferred to work the right edge to a greater extent than the other edges. Similarly, the relationship between the distal and width has been seen before in this analysis and may simply reflect the reliance of the distal’s effective edge on the width of the flake, for example, the wider the flake, the greater the distal edge. The relationship between the proximal and thickness may reflect the fact that the thicker the proximal, the more likely it would be able to sustain a degree of retouch upon it. However, as overall, there would not appear to be a specific pattern of retouch delineation, in that all edges display a range of retouch delineations, it is likely that deliberate form is not being imposed through retouch delineation, and that retouch is more a reaction to demand than cultural significance.

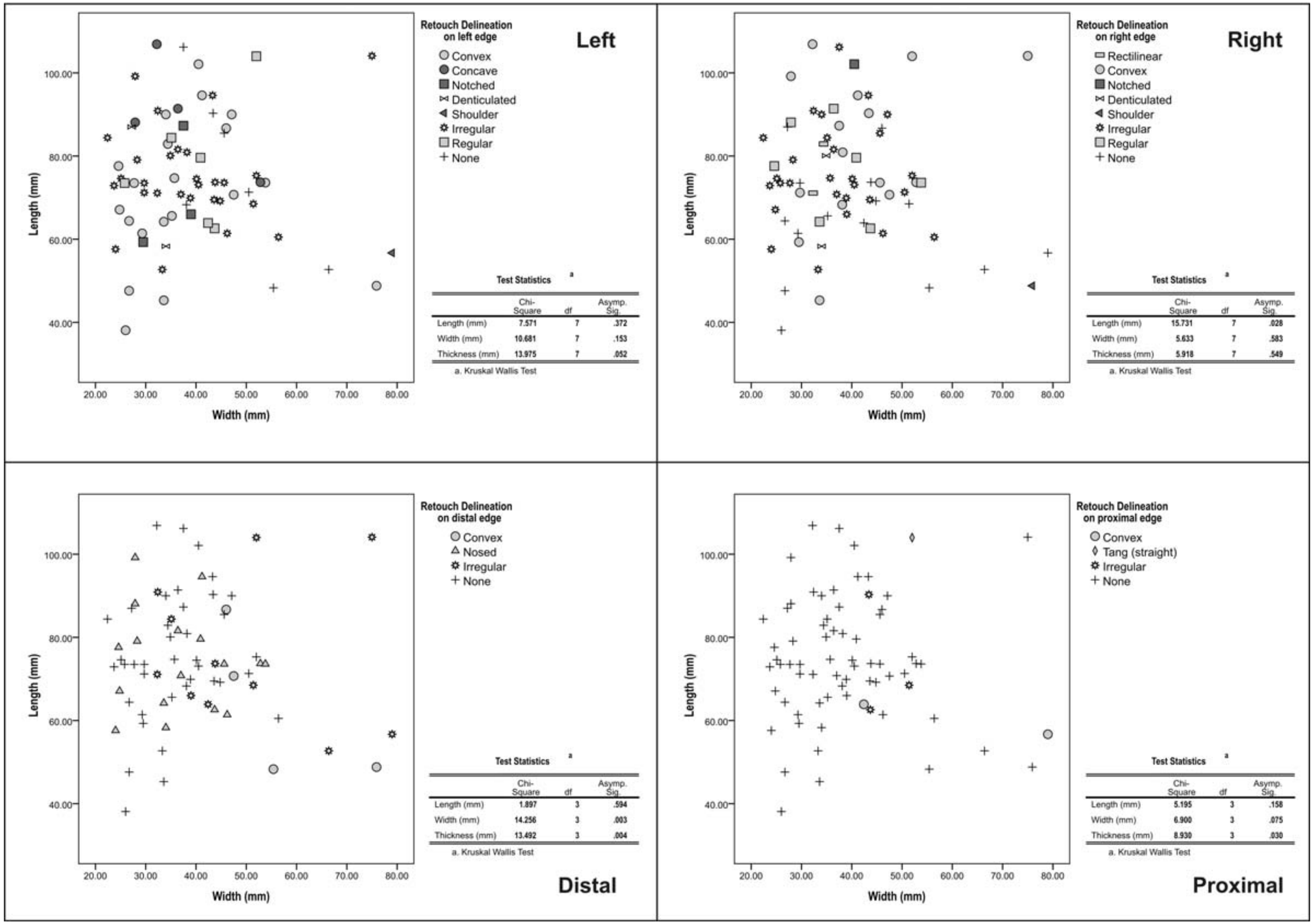


Figure A2.90: Showing the relationship between flake proportion and retouch delineation for Layer D.

Retouch distribution

Figure A2.91 (below) shows the relationship between flake proportion and retouch distribution. There does not appear to be clear preference for a particular style of retouch distribution. A Kruskal Wallis H Test (Ebdon 1977:68) shows that there would appear to be a statistically significant relationship (to 0.05 significance) between the left edge and thickness (x^2 = 9.787; df = 3; p = 0.020), the right edge and length (x^2 = 13.544; df = 3; p = 0.004), the distal edge and width (x^2 = 5.387; df = 2; p = 0.008) and the proximal and thickness (x^2 = 12.266; df = 3; p = 0.007) (figure A2.91). From figure A2.91 it can be seen that retouch delineation on the right edge is present on all large flakes, or flakes that are proportionately longer than they are wide. Therefore, the statistical relationship alluded to above may simply reflect the fact that the hominins may have preferred to work the right edge to a greater extent than the other edges. Similarly, the relationship between the distal and width has been seen before in this analysis and may simply reflect the reliance of the distal's effective edge on the width of the flake, for example, the wider the flake, the greater the distal edge. The relationship between the proximal and thickness may reflect the fact that the thicker the proximal, the more likely it would be able to sustain a degree of retouch upon it. However, as overall, there would not appear to be a specific pattern of retouch delineation, in that all edges display a range of retouch delineations, it is likely that deliberate form is not being imposed through retouch delineation, and that retouch is more a reaction to demand than cultural significance.

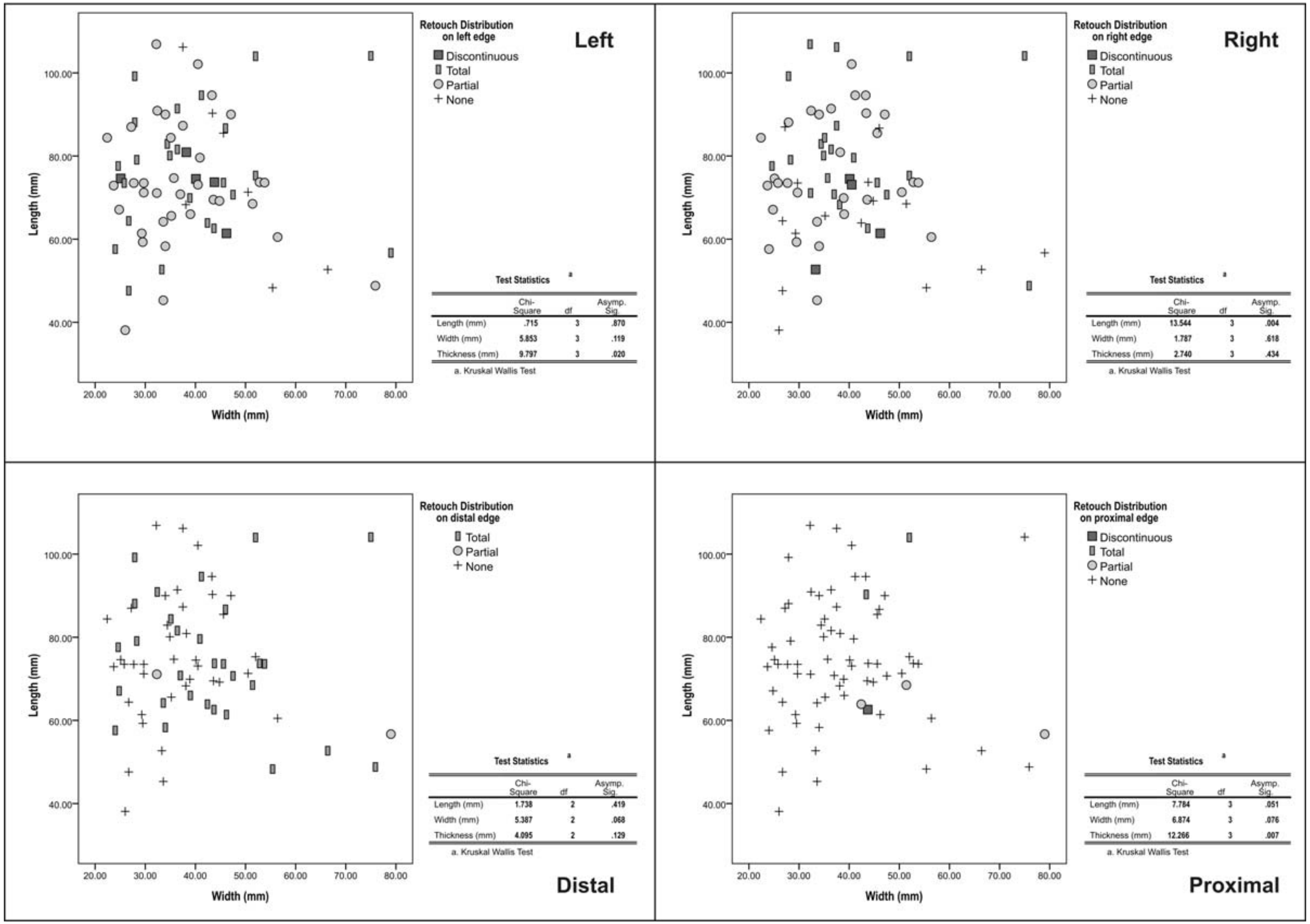


Figure A2.91: Showing the relationship between flake proportion and retouch distribution for Layer D.

Retouch Position

Figure A2.92 (below) shows the relationship between flake proportion and retouch position. There appears to be clear preference for a direct style of retouch position whilst inverse, alternating and bifacial retouch have a limited presence within the sample. A Kruskal Wallis H Test (Ebdon 1977:68) shows that there would appear to be a statistically significant relationship (to 0.05 significance) between the left edge and thickness (x^2 = 12.264; df = 4; p = 0.015), the right edge and length (x^2 = 13.658; df = 3; p = 0.003), the distal edge and thickness (x^2 = 11.920; df = 3; p = 0.008) and the proximal and width (x^2 = 6.779; df = 2; p = 0.034) and thickness (x^2 = 8.755; df = 2; p = 0.013) (figure A2.92). This example of statistical significance is likely linked to the reasons given above and as the favoured type of retouch position is direct, the pattern plays out again here. That is, where retouch is present on the distal it is total in distribution, direct in position and varied in delineation. Therefore I would suggest that figures A2.90- A2.92 do not suggest culturally mediated form imposition on flake tools through secondary retouch.

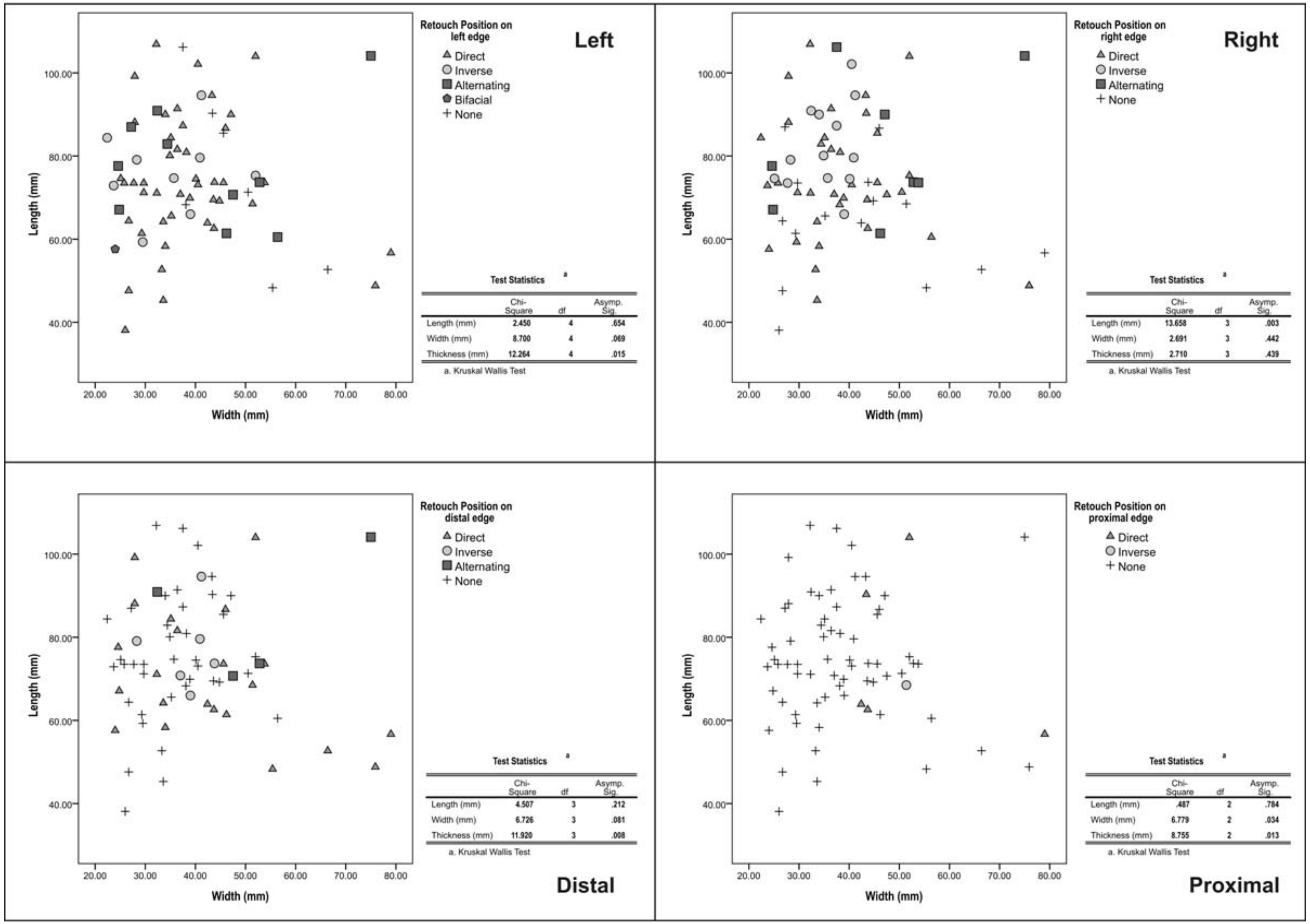


Figure A2.92: Showing the relationship between flake proportion and retouch position for Layer D.

Retouch Extent

Figure A2.93 (below) shows the relationship between flake proportion and retouch extent, where the dominant form of retouch extent being short. A Kruskal Wallis H Test (Ebdon 1977:68) shows that there would appear to be a statistically significant relationship (to 0.05 significance) between the left edge and thickness (x^2 = 10.400; df = 3; p = 0.015), the right edge and length (x^2 = 10.833; df = 3; p = 0.013), and the proximal and width (x^2 = 7.291; df = 2; p = 0.026) and thickness (x^2 = 6.704; df = 2; p = 0.013) (figure A2.93). Short retouch is not invasive across the surface of the flake and therefore is limited to edge manipulation only. Therefore I would propose that the pattern of retouch extent seen in figures A2.90, - A2.93 supports the idea that deliberate form imposition through secondary working in terms of artefact aesthetic is not present within the Et Tabun Layer D assemblage. The retouch would appear to be functional in character and limited to edge modification that mirrors the shape of the original edge (personal observation), rather than deliberately changing it to a different preconceived form.

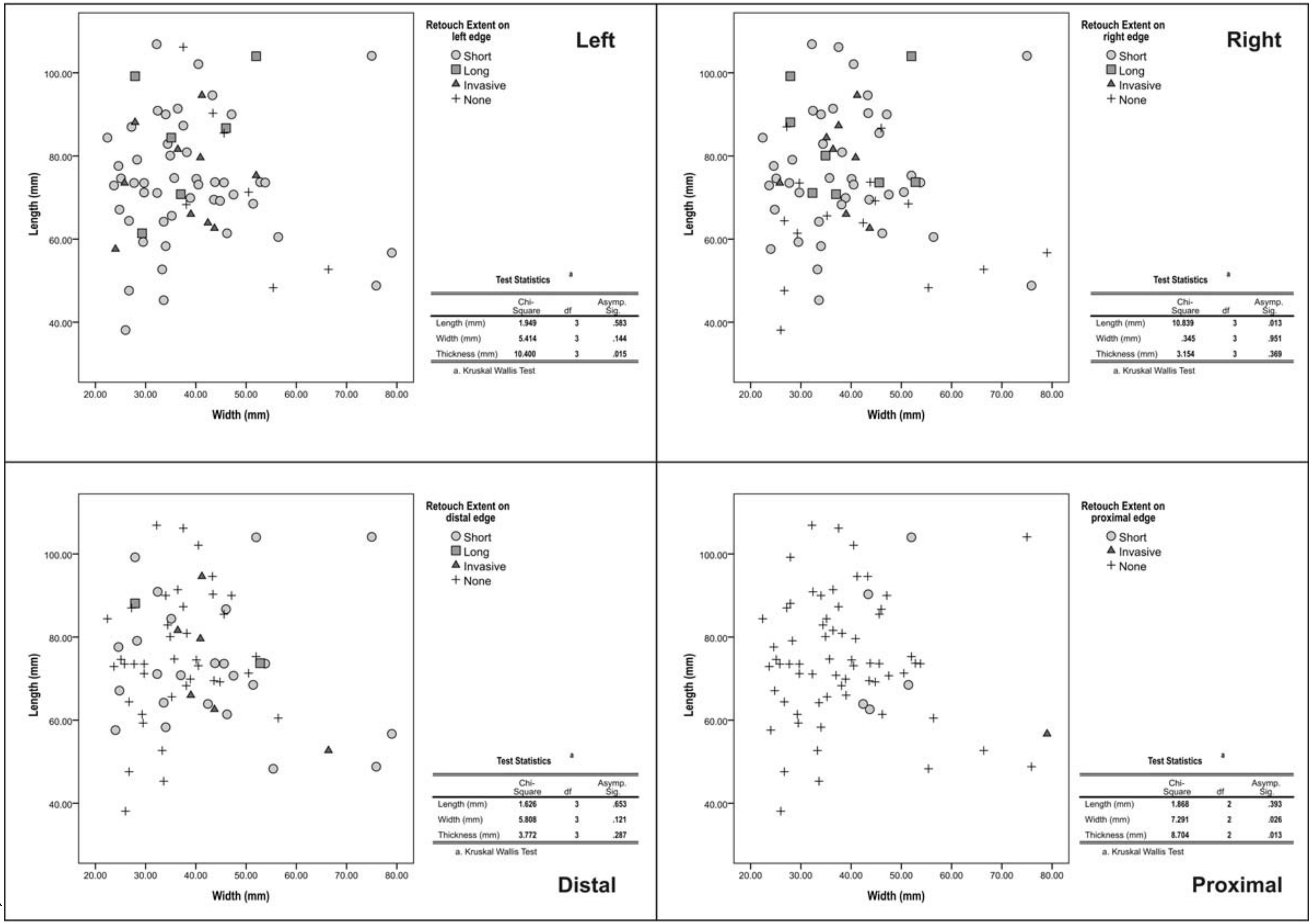


Figure A2.93: Showing the relationship between flake proportion and retouch extent for Layer D.

Conclusion

Given the range of artefact size and technology of production, and that the types of raw material represented at Et Tabun Layer D are generally known raw materials for their conducive knapping qualities it is unlikely that that raw material played an adverse role in artefact production. From examining the detached pieces where retouch was present, it would appear that there is no clear preference for a particular retouch delineation, although there does seem to be a preference for a total, direct and short retouch. Given the non-invasive nature of this type of retouch imposition on the flake edge, it may indicate that retouch was imposed for a primarily functional, rather than aesthetic purpose. However, the nature of collected and bias sample leaves any inference on hominin behaviour to be treated with caution. There would appear to be no degree of standardisation in terms of flake proportion for both retouched and unretouched flakes from Non-PCT and PCT manufacturing.

Cores

See the methodology in Chapter 5 for specific details on the range of factors being looked at for cores. In correlation with the flake data, the cores from Et Tabun Layer D are a mixture of non-PCT and PCT (table A2.149).

		Artefact Type	
		Core	
Non-PCT Core - Generic Type	A1 - Alternate	0	*.0%*
	A2 - Alternate and Parallel	1	*50.0%*
	A3 - Parallel single platform	0	*.0%*
	A4 - Parallel multiple platform	0	*.0%*
	A5 - Single	0	*.0%*
	A6 - Mixture of A1 - A5	0	*.0%*
	A7 - Other non-PCT	1	*50.0%*
	Total	**2**	***100.0%***
Non-PCT Core - Fixed Perimeter Type	B1 - Biconical	1	*33.3%*
	B2 - Discoid	0	*.0%*
	B3 - Other	2	*66.7%*
	Total	**3**	***100.0%***
PCT Core Type	C1- Radial	2	*20.0%*
	C2 - Convergent	2	*20.0%*
	C3 - Parallel / laminar	4	*40.0%*
	C3a - Simple prepared cores	1	*10.0%*
	C4 - Other	1	*10.0%*
	Total	**10**	***100.0%***

Total N = 15

Table A2.149: Showing the relationship between Core Type and Artefact Type for Layer D.

Table A2.149 shows that there are 15 unbroken cores in total from Layer D not restricted to a particular type of reduction sequence, although there would seem to be a small preference for parallel / laminar preferential removals in the PCT cores. In terms of examining the cores of the Et Tabun Layer D assemblage for any form of standardisation in artefact proportion, figure A2.95 below show the relationships between length, width and the Layer D cores.

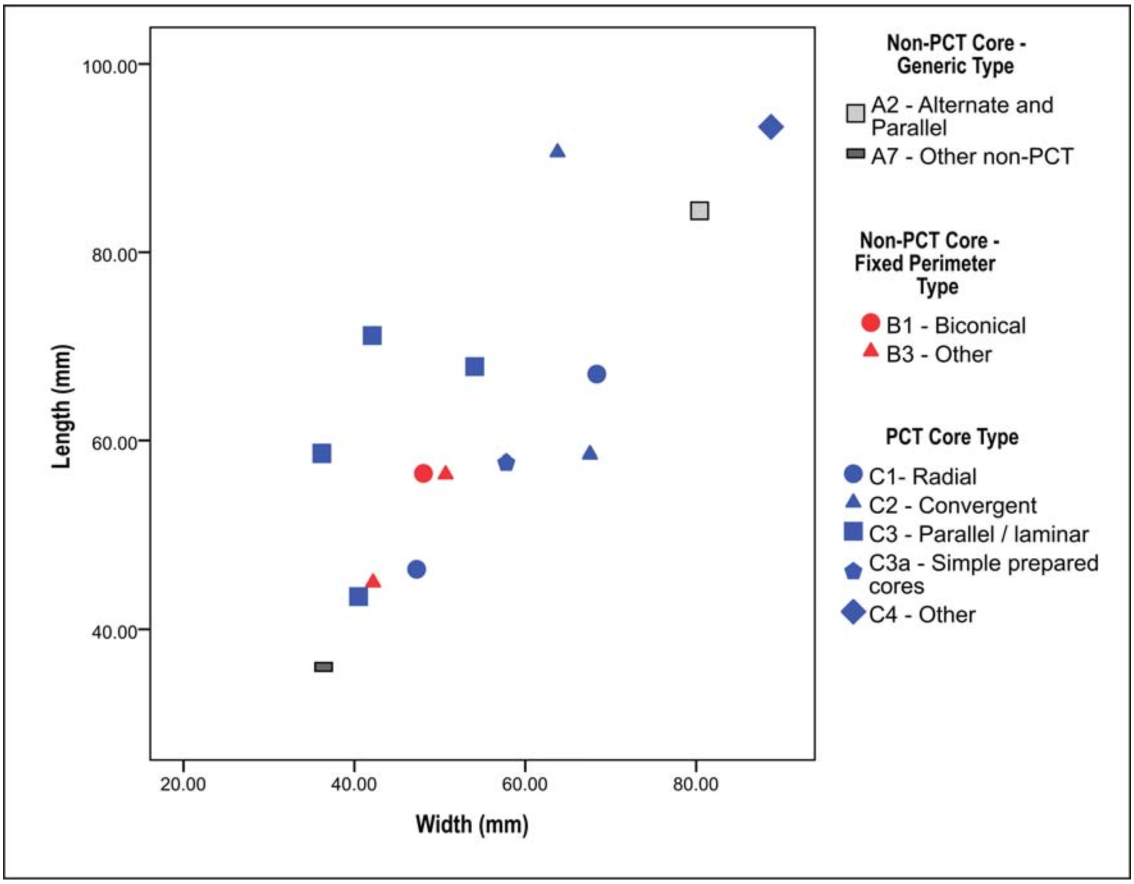


Figure A2.95: Showing the relationship between artefact proportion and Non-PCT Generic, Non-PCT Fixed Perimeter cores and PCT cores for Layer D.

From figure A2.95 it would seem that all non-PCT generic cores and PCT cores are being reduced and discarded through a range of artefact proportions. This in turn would indicate that there is no predetermined or socially significant standard to which these core types are being worked. Rather the core pattern would seem to support the conclusions from the flake analysis where flakes and cores are worked through opportunistic knapping to fulfil a specific need at a specific time, and then being discarded. In terms of raw material, the predominant raw material is flint with only the Non-PCT fixed margin cores and the PCT cores showing any variety in raw material (figures A2.96, A2.97).

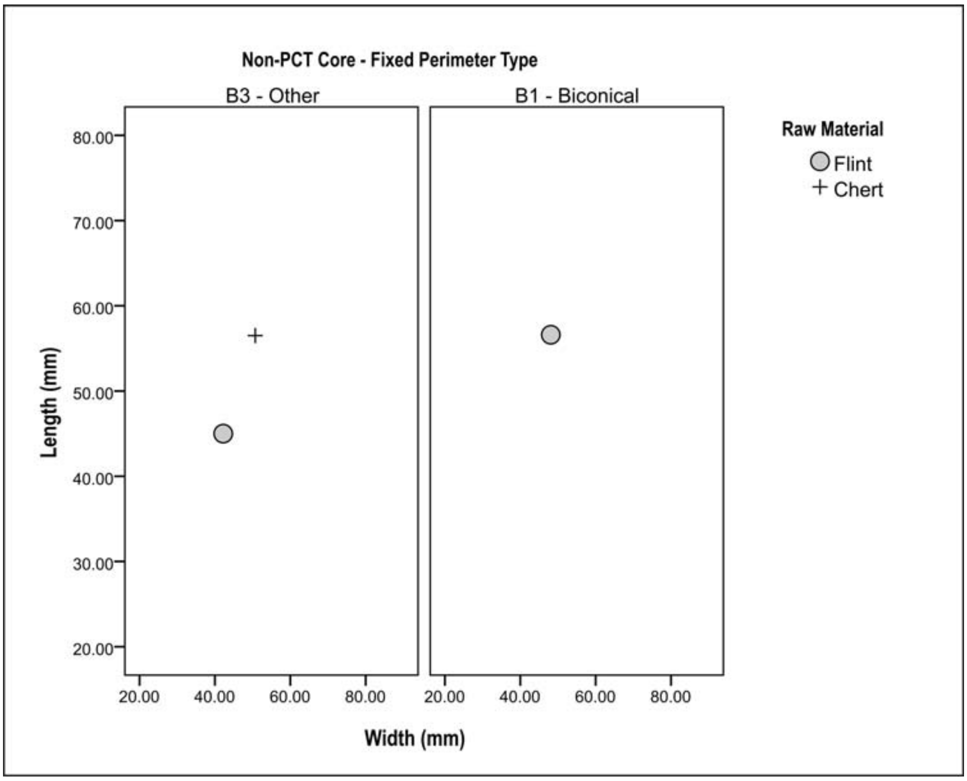


Figure A2.96: showing the relationship between artefact proportion, Non-PCT fixed Perimeter Type and Raw Material for Layer D.

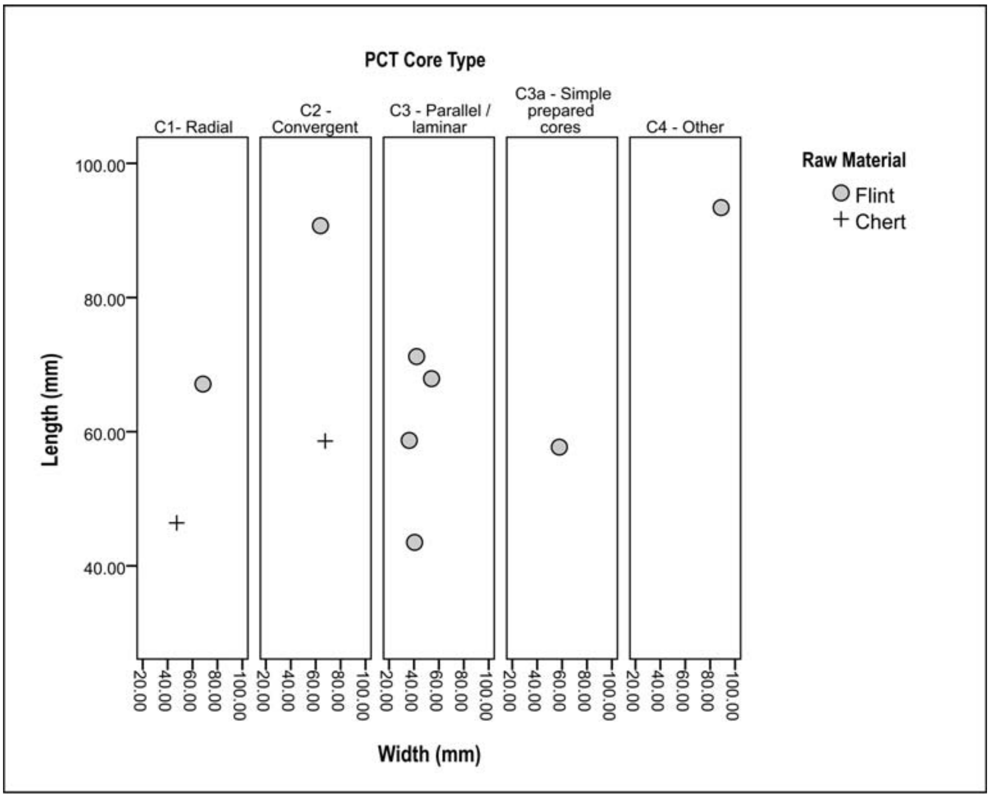


Figure A2.97: showing the relationship between artefact proportion, PCT cores and Raw Material for Layer D.

Given the small sample of cores, it is difficult to tell from figures A2.96 and A2.97 whether the use of an alternate raw material to flint adversely affected core reduction or not.

Conclusion

In conclusion, the three artefact categories under study in the Et Tabun Layer D assemblage (LCTs, detached pieces and cores) seem to display some evidence for deliberate form imposition and standardisation in the PCT flakes – although this is probably the result of a standardised manufacturing technique, rather than cultural significance.

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